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**DIAGNOSTIC STUDY ON VARIATIONS OF ESTIMATES OF  
COTTON PRODUCTION : A STUDY OF MAHARASHTRA**

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## Foreword

Cotton is one of the principal commercial crops and the textile industry, which is predominantly cotton based, continues to be one of the largest industries in our country. With the introduction of high yielding varieties, the production of cotton has increased substantially. It exceeded the domestic requirements during some years. The excess production over demand emerged as an export outlet, in addition to the export of cotton yarn and textiles.

Such being the importance of the cotton crop, a reliable estimate of its production naturally assumes importance. Keeping this in view, the present study was undertaken at the Institute to investigate the differences in the estimates of production of cotton in the state of Maharashtra.

The study revealed that the records of estimates of area under cotton crop maintained by the agricultural development officers at Zilla Parishads in each district differ from the estimates of area under cotton crop obtained from the Directorate of Agriculture. Factors such as inaccurate estimation due to the exclusion of certain varieties during the sampling procedure, which can affect estimates of production, have also been discussed. The study also indicated the movement of cotton across the border areas which naturally resulted in divergence between estimated production by the Directorate of Agriculture and the quantity ginned and pressed into bales by the Maharashtra State Co-operative Cotton Growers' Marketing Federation after procurement.

It is hoped that the findings presented in this report will be useful to researchers and policy-makers.

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## Chapter I

### Introduction

Cotton is one of the principal commercial crops to the Indian economy. The Indian textile industry is pre-dominantly cotton based, with about 70 per cent raw materials consumed being cotton. The textile industry continues to be the largest industry in our country, accounts for 20 per cent of total industrial output, provides employment to 20 million people and contributes nearly 30 per cent of the total value of exports.<sup>1</sup> There are also a large number of ginning and pressing factories in the country which guarantee seasonal employment to millions of people. Further in the recent past, Indian cotton is also acquiring importance in the international markets and in the year 1993-94, 3.89 lakh bales of cotton, valued at Rs. 238.24 crores were exported.<sup>2</sup> Thus the crop other than providing raw material to the textile industry also has export potential. Even cotton yarn and cotton textiles are a major source of export earnings.

Since, the cotton crop assumes considerable importance in the Indian economy, reliable estimates of its production from year to year also assume importance.

#### 1.1 Area, Production and Yield of Cotton (State-wise)

The figures relating to Area, Production and Yield of cotton (state-wise) are indicated in Table 1.1. It can be observed that among all the states in India, Maharashtra has the largest area under cotton accounting for about 33 to 39 per cent of the total area in the country. Next to Maharashtra comes Gujarat which accounts for about 15 per cent of the total area under cotton. The other cotton growing states viz., Punjab, Haryana, Rajasthan, Madhya Pradesh, Karnataka and Andhra Pradesh each account for about 6 to 9 per cent of the total area under cotton while Tamil Nadu's share in the total area is 3.3 per cent. Out of the total, of approximately 75 lakh hectares under cotton,

Table 1.1 : Statewise Area, Production and Yield of Cotton

		1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
Andhra Pradesh	A	5.74	6.28	6.50	6.55	7.07	8.05	7.26
	Ir	.52	3.25	.85	1.82	.93	NA	NA
	P	5.36 (8.4)	5.65 (6.4)	9.31 (8.15)	11.01 (11.2)	12.98 (13.3)	11.90 (10)	13.4 (12.5)
	Y	159	133	244	283	312	252	314
Gujarat	A	7.18	10.91	11.87	9.21	11.35	11.51	11.26
	Ir	2.08	4.24	4.36	4.36	3.37	NA	NA
	P	2.95 (4.6)	14.69 (16.7)	17.55 (15.36)	13.22 (13.4)	11.80 (12.1)	19.88 (17.4)	16.22 (15.1)
	Y	70	229	251	244	177	294	245
Haryana	A	4.17	4.33	4.68	4.90	5.09	5.31	5.63
	Ir	4.13	4.30	4.6	4.89	5.04	NA	NA
	P	6.90 (10.7)	8.45 (9.6)	11.83 (10.2)	11.55 (11.66)	13.50 (13.9)	14.06 (12.3)	11.24 (10.8)
	Y	281	332	430	401	451	450	339
Karnataka	A	4.89	6.54	6.17	5.96	5.86	6.30	5.72
	Ir	1.00	1.36	1.77	1.45	1.46	NA	NA
	P	5.43 (8.5)	8.95 (10.2)	9.23 (8.03)	6.89 (7)	7.95 (8.2)	8.65 (7.6)	7.70 (7.2)
	Y	194	233	225	197	231	234	229
Madhya Pradesh	A	5.04	5.62	5.77	6.08	5.60	4.70	4.77
	Ir	.79	1.31	1.36	1.42	1.45	NA	NA
	P	2.85 (4.4)	3.54 (4.0)	4.11 (3.6)	3.96 (4)	2.45 (2.5)	3.52 (3.1)	4.06 (3.8)
Maharashtra	A	25.17	26.28	26.36	27.30	27.24	24.79	24.78
	Ir	.30	.53	.91	.91	.64	.66	.53
	P	14.67 (12.8)	13.73 (15.6)	22.11 (19.2)	18.80 (19)	11.55 (11.9)	18.07 (15.8)	26.25 (24.5)

contd.

Table 1.1:(contd.)

		1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
Punjab	A	6.21	7.58	7.32	7.01	6.60	6.9	5.79
	Ir	6.16	7.54	7.28	6.96	7.13	N.A.	N.A.
	P	18.59 (29)	21.18 (24)	24.54 (21.3)	19.09 (19.2)	23.57 (24.2)	23.14 (20.3)	15.15 (14.14)
	Y	509	475	570	463	607	570	445
Rajasthan	A	3.43	2.99	4.34	4.55	4.75	4.76	5.18
	Ir	3.27	2.77	4.10	4.28	4.59	N.A.	N.A.
	P	2.18 (3.4)	6.00 (6.64)	9.86 (8.5)	9.18 (9.3)	8.45 (8.7)	10.16 (9)	8.38 (7.8)
	Y	108	341	386	343	303	363	275
Tamil Nadu	A	2.43	2.43	2.67	2.89	2.64	2.71	2.54
	Ir	1.08	1.00	1.11	.77	.89	N.A.	N.A.
	P	4.36 (6.8)	4.76 (5.4)	5.11 (4.4)	4.08 (4.1)	4.37 (4.5)	4.71 (4)	4.21 (4)
	Y	305	332	325	290	281	296	282
All India	A	64.59	73.42	76.95	74.39	76.61	75.42	73.37
	Ir	19.54	26.53	26.64	26.06	25.65	N.A.	N.A.
	P	63.62	87.43	114.21	98.42	97.13	114.02	107.12
	Y	168	202	252	225	216	257	248

Note: A - Area in lakh hectares. Ir - Irrigated Area in lakh hectares. P - Production (lakh bales of 170 kg. each). Y - Yield in kg. per hectare. Figures in brackets are percentage to All India.

Source: Area and Production of Principal Crops in India 1990-93, Directorate of Economics and Statistics, Department of Agriculture & Co-operation.



about 32 per cent is irrigated while the rest is rainfed. Differences in area irrigated in different states is a factor which accounts for differences in yield and hence differences in production. For example, in states such as Punjab, Haryana and Rajasthan virtually the entire area under cotton is irrigated but in states such as Maharashtra only 3 per cent of the area under cotton is irrigated. Maharashtra has around 4 times Punjab's area under cotton but each of the two states on an average contributes about 21 per cent of the country's production. The average yield in Maharashtra over the last 22 years (Table 1.2) is barely 96 kgs. per hectare against an All India average of 180 kgs. per hectare which means that the yield in Maharashtra is virtually half that of the All India average despite the fact that Maharashtra accounts for about 40 to 45 per cent of the area under Hybrid varieties. However, the year 1993-94 seems to have been an exceptional year when the yield in Maharashtra was 180 kg. per hectare.

#### 1.2 Area, Production and Yield of Cotton in Maharashtra (District-wise)

Despite the fact that barely 3 per cent of the area under cotton is under irrigation, while the rest is rainfed, cotton continues to be an important cash crop in Maharashtra, next to sugarcane. In 1993-94, out of Maharashtra's total cropped area of 214.04 lakh hectares, the area cultivated by cotton was 24.78 lakh hectares i.e. cotton accounts for 11.6 per cent of the area cultivated.<sup>3</sup> In Maharashtra there are 22,000 villages from 23 cotton producing districts, where 22.5 lakh cultivators grow cotton in 26 lakh hectares.<sup>4</sup>

Due to climatic conditions Vidarbha and Marathwada are the major cotton producing regions in the state. Table 1.3 throws light on the area under cotton in Maharashtra (District-wise) while Table 1.4 indicates the District-wise production

Table 1.2 : Production & Yield of Cotton in India & Maharashtra

Prod. in lakh bales of 170 kg.  
Yield in Kg. per hectare.  
(Area in '000 hectares)

	India					Maharashtra				
	Area	Area under Irrigation	Area under Hybrid Varieties	Yield	Production	Area	Area under Irrigation	Area under Hybrid	Yield	Production
1972-73	76.78	19.88	2.06	127	54.16	25.3	.53	.20	71	10.5
1973-74	75.74	18.76	5.24	142	63.08	22.5	.32	1.33	77	10.2
1974-75	75.62	17.42	7.51	161	71.55	25.0	.78	2.57	117	17.2
1975-76	74.60	18.60	7.53	139	61.00	23.1	.59	3.13	57	7.7
1976-77	68.85	17.82	5.65	144	58.39	21.2	.63	2.78	67	8.3
1977-78	78.66	21.09	6.23	157	72.43	23.1	.74	2.44	93	12.6
1978-79	81.19	22.70	7.63	166	79.57	25.1	1.03	2.96	89	13.2
1979-80	81.26	23.73	8.67	160	76.47	25.9	1.41	3.94	111	16.9
1980-81	78.23	22.78	8.23	152	70.10	26.7	1.52	4.23	82	12.7
1981-82	80.57	23.70	9.92	165	78.83	27.1	1.41	4.74	92	14.6
1982-83	78.70	23.83	10.46	163	75.34	26.5	1.18	5.34	104	16.3
1983-84	77.21	21.51	10.37	141	63.86	26.8	1.03	5.47	52	8.1
1984-85	73.82	20.41	14.27	196	85.06	26.8	1.00	6.05	93	14.7
1985-86	75.32	21.86	17.92	197	87.27	27.5	1.09	8.94	125	19.9
1986-87	69.48	21.46	14.68	169	69.05	26.92	.66	5.70	57	9.03
1987-88	64.59	19.55	13.45	168	63.82	25.17	.30	6.00	102	15.01
1988-89	73.43	26.53	20.22	202	87.43	26.27	.53	7.75	89	13.79
1989-90	76.95	26.64	21.84	252	114.21	26.35	.91	9.47	143	22.01
1990-91	74.39	26.06	18.47	225	98.42	27.30	.91	7.98	117	18.80
1991-92	76.61	25.65	19.23	217	97.13	27.24	.64	8.50	72	11.55
1992-93	75.42	N.A.	20.02	257	115.83	24.71	.66	9.00	124	18.07
1993-94	73.37	N.A.	N.A.	248	107.12	24.79	.53	11.22	180.4	26.25

Source : 1) Indian Cotton Annual (Published by East India Cotton Association) Various Issues.  
2) District-wise Agriculture Statistical Information of Maharashtra, Part II (1993-94 and 1994-95), Commissionerate of Agriculture, Pune.

Table 1.3 : Districtwise Area Under Cotton in Maharashtra

	(Area in '00 hectares)								
	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
Nashik	17	20	13	26	5	8	7	5	3
Dhule	615	645	632	690	662	662	699	587	711
Jalgaon	2212	1901	1584	1582	1689	1881	2090	1751	2101
<b>Total Nashik Division</b>	<b>2844</b>	<b>2564</b>	<b>2229</b>	<b>2298</b>	<b>2356</b>	<b>2551</b>	<b>2796</b>	<b>2343</b>	<b>2815</b>
Ahmednagar	9	6	7	13	12	17	24	7	7
Pune	4	4	2	1	2	2	2	1	-
Solapur	67	33	35	26	18	24	29	36	23
<b>Total Pune Division</b>	<b>80</b>	<b>43</b>	<b>44</b>	<b>40</b>	<b>32</b>	<b>43</b>	<b>55</b>	<b>44</b>	<b>30</b>
Satara	24	19	2	14	8	7	7	13	5
Sangli	15	16	14	13	11	13	12	13	13
Kolhapur	2	2	1	1	1	2	2	1	1
<b>Total Kolhapur Division</b>	<b>41</b>	<b>37</b>	<b>17</b>	<b>28</b>	<b>20</b>	<b>22</b>	<b>21</b>	<b>27</b>	<b>19</b>
Aurangabad	562	522	524	557	595	639	655	584	586
Jalna	1269	1257	1107	1068	1219	1329	1288	1081	1100
Beed	204	325	284	326	288	317	345	350	384
<b>Total Aurangabad Division</b>	<b>2035</b>	<b>2104</b>	<b>1915</b>	<b>1951</b>	<b>2102</b>	<b>2285</b>	<b>2288</b>	<b>2015</b>	<b>2070</b>
Latur	206	226	233	332	200	234	283	247	246
Osmanabad	-	-	-	1	-	-	-	-	-
Nanded	2364	2280	2079	2179	2189	2278	2349	2369	2261
Parbhani	2358	2461	2527	2733	2564	2661	2807	2687	2680
<b>Total Latur Division</b>	<b>4928</b>	<b>4967</b>	<b>4839</b>	<b>5245</b>	<b>4953</b>	<b>5173</b>	<b>5439</b>	<b>5303</b>	

Table 1.3: (contd.)

	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
Buldhana	2432	2564	2287	2442	2553	2654	2582	2169	2161
Akola	3607	3767	3439	3541	3593	3719	3585	3054	3018
Amravati	3632	3676	3488	3628	3523	3734	3621	3336	3233
Yavatmal	4336	4399	4149	4383	4356	4248	4158	4038	3877
<b>Total Amravati Division</b>	<b>14007</b>	<b>14410</b>	<b>13388</b>	<b>13994</b>	<b>14025</b>	<b>14355</b>	<b>13946</b>	<b>12597</b>	<b>12289</b>
Wardha	1881	1778	1500	1457	1489	1539	1478	1315	1292
Nagpur	713	673	576	591	657	695	591	547	512
Chandrapur	560	568	602	669	631	639	628	607	574
Gadchiroli	1	1	2	2	2	-	-	-	-
<b>Total Nagpur Division</b>	<b>3155</b>	<b>3020</b>	<b>2680</b>	<b>2719</b>	<b>2779</b>	<b>2873</b>	<b>2697</b>	<b>2469</b>	<b>2378</b>
<b>Total Maharashtra State</b>	<b>27090</b>	<b>27145</b>	<b>25087</b>	<b>26287</b>	<b>26267</b>	<b>27302</b>	<b>27242</b>	<b>24798</b>	<b>24788</b>

Source : Districtwise Agriculture Statistical Information of Maharashtra, Part. II (1993-94 and 1994-95)  
Commissionerate of Agriculture, Pune

**Table 1.4 : Districtwise Production and Yield of Cotton in Maharashtra**

	(Production in '00 bales of 170 kg.) (Yield in kg. per hectare)								
	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
Nashik	25 (250)	14 (119)	14 (183)	15 (98)	6 (195)	14 (306)	3 (170)	8 (272)	5 (283)
Dhule	366 (101)	156 (41)	288 (78)	512 (126)	602 (155)	539 (139)	375 (91)	650 (188)	638 (152)
Jalgaon	1563 (120)	679 (61)	1077 (116)	1231 (132)	2016 (203)	1896 (171)	1116 (91)	2015 (196)	2553 (207)
<b>Total Nashik Div.</b>	1954 (117)	849 (56)	1379 (105)	1758 (130)	2624 (189)	2449 (163)	1498 (91)	2673 (194)	3196 (193)
Ahmednagar	19 (359)	7 (193)	10 (243)	14 (183)	20 (283)	25 (247)	19 (135)	11 (267)	11 (267)
Pune	6 (255)	5 (217)	2 (226)	2 (275)	3 (297)	4 (350)	4 (297)	2 (309)	-
Solapur	57 (145)	25 (129)	50 (243)	44 (288)	28 (260)	24 (175)	36 (211)	63 (298)	31 (229)
<b>Total Pune Div.</b>	82 (174)	37 (146)	62 (240)	60 (255)	51 (271)	53 (210)	59 (182)	76 (294)	42 (238)
Satara	34 (241)	17 (151)	3 (275)	23 (279)	17 (359)	13 (300)	16 (389)	26 (340)	10 (326)
Sangli	21 (238)	24 (251)	17 (206)	22 (288)	21 (326)	23 (296)	21 (298)	20 (262)	20 (261)
Kolhapur	2 (137)	1 (48)	1 (94)	1 (122)	1 (166)	2 (175)	1 (70)	1 (185)	1 (185)
<b>Total Kolhapur Div.</b>	57 (236)	42 (193)	21 (210)	46 (279)	39 (332)	38 (294)	38 (308)	47 (296)	31 (277)

Table 1.4 : (contd.)

	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
Aurangabad	466 (141)	193 (63)	354 (115)	633 (193)	679 (194)	708 (188)	281 (73)	480 (140)	575 (167)
Jalna	1176 (158)	563 (76)	1007 (155)	527 (84)	900 (126)	945 (121)	541 (72)	780 (123)	863 (133)
Beed	146 (122)	228 (120)	244 (146)	187 (98)	272 (161)	232 (125)	159 (78)	292 (142)	367 (162)
Total Aurangabad Div.	1788 (149)	984 (80)	1605 (142)	1347 (117)	1851 (150)	1885 (140)	981 (73)	1552 (131)	1805 (148)
Latur	132 (109)	25 (19)	147 (107)	126 (65)	163 (143)	103 (75)	89 (54)	139 (96)	231 (160)
Osmanabad									
Nanded	1691 (122)	492 (37)	1491 (122)	802 (63)	2216 (172)	1201 (90)	744 (54)	1337 (96)	1631 (123)
Parbhani	2097 (151)	861 (60)	1525 (103)	1128 (70)	1977 (131)	1307 (84)	915 (55)	1592 (101)	3053 (194)
Total Latur Div.	3920 (135)	1378 (47)	3163 (111)	2057 (67)	4361 (150)	2611 (86)	1748 (55)	3068 (98)	4915 (161)

contd.

Table 1.4 : (contd.)

	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94
Buldhana	1616 (113)	518 (34)	1148 (85)	1177 (82)	2033 (135)	1691 (108)	718 (47)	1247 (98)	2122 (167)
Akola	2476 (117)	980 (44)	2101 (104)	1630 (78)	2591 (123)	2605 (119)	1158 (55)	2410 (134)	3796 (214)
Amravati	2021 (95)	849 (39)	1580 (77)	1798 (84)	2715 (131)	2541 (116)	1724 (81)	2538 (129)	3764 (198)
Yeotmal	2815 (110)	1520 (59)	2408 (99)	1473 (57)	2934 (115)	2134 (85)	1685 (69)	2822 (119)	4141 (181)
Total Amravati Div.	8928 (108)	3867 (46)	7237 (92)	6078 (74)	10273 (125)	8971 (106)	5285 (64)	9017 (122)	13823 (191)
Wardha	1985 (179)	1079 (103)	867 (98)	1356 (158)	1785 (204)	1813 (200)	1184 (136)	923 (119)	1435 (189)
Nagpur	653 (156)	474 (120)	351 (104)	626 (180)	519 (134)	547 (134)	402 (116)	353 (110)	453 (150)
Chandrapur	467 (142)	322 (96)	330 (93)	461 (117)	561 (151)	436 (116)	356 (96)	368 (103)	554 (164)
Gadchiroli	1 (138)	1 (93)	1 (84)	2 (161)	2 (151)	-	-	-	-
Total Nagpur Div.	3106 (167)	1876 (106)	1549 (98)	2445 (153)	2867 (175)	2796 (165)	1942 (122)	1644 (113)	2442 (174)
Total Maharashtra State	19835 (125)	9033 (57)	15016 (102)	13791 (89)	22066 (143)	18803 (117)	11551 (72)	18077 (124)	26254 (180)

Note : Figures in brackets refer to yield in kg. per hectare.

Source : Districtwise Agriculture Statistical Information of Maharashtra, Part II (1993-94 and 1994-95)

and yield of cotton as published by the Commissionerate of Agriculture. About 63 percent of the area under cotton is cultivated in Vidarbha which includes Amravati and Nagpur Divisions while around 25 per cent of the area is cultivated in Marathwada which includes Aurangabad and Latur Divisions. Production figures indicate that the production of cotton fluctuates from a low of 9 lakh bales in the year 1986-87 to a high of 26.25 lakh bales in the year 1993-94. Cotton is mainly rainfed in Maharashtra and the rainfall pattern being erratic, its quantity and distribution during the successive stages of plant development often account for annual fluctuations in production of cotton.

### 1.3 Importance of Cotton to the Indian Economy

As mentioned earlier, India has a highly developed textile industry which consumes the major production of cotton in the country. The domestic requirement of cotton by mills is met mainly by local production and if the production is well in excess of domestic requirements, it is often exported. In the 1992-93 season, as much as 13.7 lakh bales valued at Rs.725.3 Crores were exported.<sup>3</sup> Since cotton is the main raw material to the textile industry, which perhaps is the largest industry in the country, its availability and hence its production no doubt assumes great importance to the mills. Further, the Ministry of Textiles is also in a position to announce the export quota, once the cotton production is known. It is therefore very important that the estimated cotton production should be reliable.

### 1.4 Methodology Used by the Directorate of Agriculture to Estimate Cotton Production

In order to estimate the production of lint cotton in, any state, it is necessary to estimate the area under cotton in the state, the yield and further the ginning out-turn.

In the state of Maharashtra, the data relating to area under cotton are collected under the scheme namely, "Timely



Reporting of Agricultural Intelligence". Under this scheme, a sample of 20 per cent of the total villages in a tehsil are selected every year. The concerned talatis report the area under the crop through cards prescribed for this purpose. Area under each crop for the previous year was also reported through the same cards. The ratio method is then used for estimating area. In the first instance, ratio of actual area under cotton in the sample villages selected for conducting the experiments to that in the preceding year in the same villages is worked out at the tehsil level. This ratio is multiplied by the actual total area under cotton in the tehsil during the preceding year to obtain tehsil-wise sample estimates of area for the current year. The tehsil-wise estimates of area were subsequently pooled to get district estimates of area which again are added to get state estimate. In a similar way, irrigated area is also estimated.<sup>4</sup>

For yield estimation, another survey viz. (Crop Estimation Survey on cotton is conducted every year. The objects of the survey are :

- i) To obtain the estimates of average yield per hectare and total production of the crop in the cotton growing districts of the state and subsequently for the state as a whole.
- ii) To collect useful ancillary information on the extent of adoption of cultivation practices from the selected farmers for broadly assessing the cultivation states of the crop.

The sampling design adopted for the survey is the multi stage stratified random sampling design with tehsil as stratum, village as a primary unit of sampling and plot size of .02 hectares i.e. 20 m x 10m as the ultimate unit of sampling. Two fields per village are randomly selected and one plot per field is randomly located for recording crop yield. In each taluka, a simple arithmetic mean of net yield of the sample plots are obtained. The average yield in each taluka is multiplied by its area in

order to arrive at its production. The production estimates of all talukas in the district are combined together and divided by the total area under cotton in the district in order to arrive at the district average yield which is thus weighted by area. The state average is obtained by combining the district average yield in proportion to the net area under cotton in the districts.

The Crop Estimation survey is carried out under the technical and supervisory control of the Chief Statistician, Department of Agriculture, Maharashtra State, Pune with Co-operation of the Revenue Department. The field work of the survey is entrusted to the Revenue Inspectors of the Revenue Department who are instructed to attend to all the pickings of cotton. Ancillary information is also collected during the course of the survey on the agronomic aspects of cotton cultivation. While conducting the crop cutting experiments, the following details of the plot which is the ultimate unit of sampling is noted :

1. Name of the Taluka, Circle, Village and Survey Number.
2. Type of Soil
3. Date of Sowing
4. Variety of Cotton Grown
5. Plant Protection Measures Used, if any.
6. Seed rate (kg. per hectare)
7. Type of manure used (per hectare)
8. Type of Fertilizer used (per hectare)
9. Whether plot is irrigated (source of irrigation)
10. Date of Harvest
11. Weight of fodder
12. Yield of the plot in each picking (In case of cotton there can be as many as eight pickings)
13. Crop loss due to disease, pest etc.
14. Mixed crop and its yield, Proportion of mixed crop with experimental crop
15. If the cultivator has taken a bank loan, if so, from which institution and amount of loan received by him.

The results of the survey conducted on the basis of the above questionnaire addressed to farmers of the sample plot are thus useful for framing the yield estimates from year to year. Out of the total experiments conducted, some experiments may be rejected for calculation of yield estimates due to factors such as incomplete data or unreliable data.

In order to arrive at production estimates of cotton lint from the yield estimates of kapas, it is important to estimate the ginning outturn. The ginning percentages are normally based on returns received from ginning factories on cotton ginned and lint obtained and also on the basis of tests conducted by Technological Laboratories. As per the Directorate of Economics and Statistics, approximately 66 per cent of kapas accounts for cotton seed, while 33 per cent is lint and 1 per cent is waste. This percentage is however subject to variations depending upon the variety of cotton grown.

Thus taking the average yield of kapas, the forecasted area and the ginning outturn, the total production of lint can be estimated. The Directorate of Agriculture estimates the yield on the basis of crop cutting experiments in two groups. In the first group yield is estimated for HYVs and traditional varieties whereas in the second group, it is estimated for irrigated and unirrigated varieties.

### 1.5 Objectives of the Study

While the above method of estimating production of cotton in Maharashtra is supposed to reveal a more or less precise estimate, it is possible that these production estimates made by the Directorate of Agriculture on the basis of crop cutting experiments are at variance with the actual amount of cotton ginned and pressed into bales by the mills. Further, in the state of Maharashtra, the Monopoly Procurement scheme of cotton came into existence from the 1972-73 cotton season. According

to this scheme, the Maharashtra state government entered the cotton market in the state through its agent, the Maharashtra State Co-operative Cotton Growers' Marketing Federation, as a monopolist, banning all private traders and fixing the price of cotton to be paid to the producers. Theoretically, therefore, the estimated production of cotton in the state must more or less match the procurement of cotton. <sup>The sale of cotton</sup> ~~outside Maharashtra~~ to the border areas and vice-versa is not in consonance with the spirit of the Monopoly Procurement scheme. However, inter-state flow of cotton is seen to persist bringing about a divergence between estimated cotton production and kapas procured by the Federation which is subsequently ginned and pressed into bales.

Arising out of this, a study on variations of estimates of cotton production has been undertaken by us to investigate the reliability of cotton production estimates and plausible reasons in case of divergent trends. The reference year of the study is 1993-94.

In Chapter II we have estimated the production of cotton (district-wise and variety-wise and by irrigation status) with the help of data obtained from the Crop Cutting Experiments. These estimated production figures for each district as well as for the state as a whole have been checked with the production estimates published by the Directorate of Agriculture to examine if there are any discrepancies and the plausible reasons for such variations.

Further, while conducting crop cutting experiments in order to estimate yield, it is important that all pickings are taken into account. Cotton is picked four to six times during the harvesting period and if all pickings are not taken into consideration, there is a possibility that yield estimates from the sample plot could be inaccurate.

In order to estimate whether all pickings are taken into consideration in the crop cutting experiments while estimating yield it was recommended by the co-ordinating agency of this project that 50 per cent sample households from the crop cutting experiments should be selected from three districts having maximum coverage under experimental plots and the yield in each picking should be verified from the sample farmers. Comparison of the field level data with that obtained by the Directorate, it was suggested, would throw light, on variations, if any. However, since the reference year for our study is 1993-94, it was thought, collecting sample households and presently interviewing them on their production estimates (and the number of pickings) two years ago may not give reliable estimates as we have to depend upon the memory of the farmers. Obtaining yield estimates for the current year may also not help our analysis as there are wide fluctuations in yield from year to year (for example while yield of cotton in 1991-92 in Maharashtra was 72 kgs. per hectare, in the year 1993-94 it was estimated at 180.4 kgs. per hectare). Hence a field survey in order to verify the number of pickings taken into consideration while estimating yield on the sample plot was not undertaken but a close scrutiny of the number of pickings noted in the crop cutting experiments was observed.

In the state of Maharashtra, inter-state inflow or outflow of cotton, particularly in border areas could boost up or reduce the availability of cotton in the state, thus creating a divergence between the Directorate's figure and the quantity of cotton ginned and pressed in the state by the ginning and pressing mills. We have therefore checked, in Chapter III, the zone-wise procurement of kapas and the number of bales of cotton lint thus obtained from it with the quantity of cotton actually produced in that zone. Further, we also selected certain talukas in

border areas and compared procurement of cotton in these talukas with the estimated cotton production in these talukas. Any variation in the two estimates would be indicative of inflow or outflow of cotton.

Thus with the above framework we proceed to our estimates of cotton production, compare these estimates with that of the Directorate and observe the reliability of the estimates.

#### References

1. Economic Survey 1994-95, Government of India, Ministry of Finance, Economic Division, p.113.
2. Indian Cotton Annual, 1993-94, No.74, published by East India Cotton Association, p.180.
3. Indian Cotton Annual, 1992-93, No.73, published by East India Cotton Association, p.238.
4. Directorate of Agriculture, Central Building, Pune.  
(Unpublished material).
5. Directorate of Agriculture, Krishi Bhawan, Pune  
(Unpublished material).

## Chapter II

### Estimates of Cotton Production I Maharashtra

As explained in the previous chapter, the cotton crop in Maharashtra is estimated every year on the basis of crop cutting experiments conducted by the Directorate of Agriculture. It is however possible that these estimates may at times be quite inaccurate especially when we consider the wide varieties in which cotton is grown. The yield of cotton varies widely over varieties and is naturally higher in case of High Yielding Varieties and in case where area is under irrigation. Thus, it is necessary that factors like variety and irrigation are given proper weightage in the selection of experimental plots so that cotton production is more precisely estimated.

#### 2.1 Variety-wise Area Under Cotton in Maharashtra and Number of Crop-Cutting Experiments

In order to check the precision of cotton production estimates as published by the Directorate of Agriculture, we have also tried to estimate the cotton production (districtwise, variety-wise and by irrigation status) with the help of certain data obtained from the crop cutting experiments for the year 1993-94.

Table 2.1 indicates the area under cotton in Maharashtra, variety-wise and by irrigation status as well as the number of crop cutting experiments conducted by the Directorate of Agriculture. It is observed that the total area under cotton in Maharashtra is 24.13 lakh hectares out of which 1.8 lakh hectares is irrigated while the remaining 22.28 lakh hectares which is 92.2 per cent of the total area is unirrigated<sup>1</sup>.

A total of 2973 crop cutting experiments were conducted out of which 416 experiments were conducted on irrigated area while 2557 experiments were conducted on unirrigated area. In Appendix A2.1 and A2.2, the number of crop cutting experiments conducted and the area district-wise and variety-wise have been

**Table 2.1 : Area Under Cotton and Number of Crop Cutting Experiments Performed (Varietywise) 1993-94**

	Area			No. of Equipments		
	Irriga- ted	Unirri- gated	Total	Irriga- ted	Unirri- gated	Total
H-4	2029 (1.09)	20169 (.90)	22198 (.92)	60 (14.4)	140 (5.5)	200 (6.7)
H-6	31249 (16.8)	47927 (2.1)	79176 (3.2)	47 (11.3)	117 (4.6)	164 (5.5)
Varalaxmi	367 (.20)	-	367 (.20)	27 (6.5)	-	27 (.91)
PKV-2 (AHH-468)	12915 (7)	176284 (7.9)	189199 (7.8)	4 (.96)	525 (20.5)	529 (17.8)
DCH-32	1896 (1.02)	7622 (.34)	9518 (.39)	6 (1.4)	8 (.31)	14 (.47)
NHH-44	82818 (44.6)	395055 (17.7)	477873 (19.8)	68 (16.3)	698 (27.3)	766 (25.8)
LRA-5166	1998 (1.08)	531470 (23.8)	533468 (22.1)	120 (28.8)	450 (17.6)	570 (19.2)
MCH-1	N.A.	N.A.	N.A.	5 (1.2)	35 (1.4)	40 (1.3)
MCH Others	N.A.	N.A.	N.A.	41 (9.8)	63 (2.5)	104 (3.5)
Laxmi	N.A.	N.A.	N.A.	11 (2.6)	-	11 (0.37)
Y-1	-	211210 (9.4)	211210 (8.7)	-	292 (11.4)	292 (9.8)
SRT-1	-	10624 (.47)	10624 (.44)	-	9 (.35)	9 (.3)
AKH 425	-	93452 (4.2)	93452 (3.9)	-	70 (2.7)	70 (2.3)
Buri 1007 & L-147	-	10705 (.48)	10705 (.44)	-	16 (.62)	16 (.54)
DHY-286	-	91108 (4.08)	91108 (3.77)	-	16 (.62)	16 (.54)
Gaorani-6	N.A.	N.A.	N.A.	-	8 (.3)	8 (.27)
Other HYV's	52226 (28.1)	457619 (20.5)	509848 (21.1)	17 (4.08)	86 (3.3)	103 (3.5)
Other tra- ditional	-	174899 (7.8)	174899 (7.2)	10 (2.4)	24 (.93)	34 (1.1)
Total	185498 (7.7)	2228144 (92.3)	2413645 (100)	416	2557	2973

**Note:** Figures in brackets are percentage to total Maharashtra  
**Source:** Directorate of Agriculture, M.S. (Unpublished data)



indicated respectively. It is observed that in Maharashtra from the disaggregated data, the highest area under cotton is under LRA-5166 variety which accounts for 5.33 lakh hectares of cotton grown of which 3.63 lakh hectares are in Amravati division. The number of experiments conducted in Amravati division for this variety are 282. NHH-44 which is cultivated on 4.78 lakh hectares occupies the second largest area under cotton and its yield is estimated on the basis of 766 experiments. All in all, the data reveal that out of the total area of 24.3 lakh hectares under cotton in Maharashtra, 46 per cent is under Hybrid varieties, 34 percent under American while 20 percent is under Deshi varieties. The largest number of experiments are naturally observed in case of hybrid varieties because experiments have to be carried out in case of both irrigated as well as unirrigated field conditions. Out of the total 1.85 lakh hectares under irrigated varieties, 1.83 lakh hectares are under hybrid varieties whereas .02 lakh hectares of American variety is irrigated. Deshi varieties of cotton are grown mainly under rainfed conditions.

## 2.2 Estimation of Cotton Production

An attempt has been made to estimate the production of cotton in Maharashtra for the year 1993-94 by using a simple methodology. The data available in the crop cutting experiments enables us to arrive at average yield, district-wise, variety-wise, and also by irrigation status. The area under cotton, district-wise, variety-wise and by irrigated status has been obtained from the unpublished sources of the crop, Directorate of Agriculture. The yield data has been obtained from the crop cutting experiments. This data has been furnished in Appendix A2.3. Thus using the data on average yield<sup>2</sup>, area and ginning out-turn (indicated in Appendix A2.4) we have estimated production of cotton lint district-wise, variety-wise and by irrigation status and aggregated it to arrive at the

overall production of cotton in Maharashtra.<sup>3</sup> This is indicated in Table 2.2. This aggregated production is checked with the production estimates of the Directorate of Agriculture.

The method used by the Directorate of Agriculture in estimating production of cotton lint has already been explained in Chapter I. While we have estimated the production, district-wise, variety-wise and by irrigation status and then aggregated the figures to arrive at the state total, the Directorate's estimate for each district are in two groups. Production is estimated for each district by the Directorate in two groups. Firstly, production is calculated separately for High Yielding Varieties and Traditional Varieties and secondly it is calculated separately for irrigated and unirrigated cotton. Hence, in order to compare our production estimates with that of the Directorate's, we have reclassified the varieties, district-wise into two groups viz. High Yielding Varieties and Traditional varieties in the first and Irrigated and Unirrigated cotton in the second, just as the Directorate has done so that checking our production estimates with that of the Directorate is made comparable. Thus, our production estimates in the two groups viz. (1) HYVs and Traditional (2) Irrigated and Unirrigated are indicated in Table 2.3 while the Directorate's estimates are available in Table 2.4. In Table 2.3, production estimates in the two groups have been obtained from Table 2.2 and production estimates in Table 2.2 have been calculated on the basis of area and yield estimates as indicated in Appendix A2.3.

The important point to note is that when this disaggregated data relating to area is aggregated, the district-wise figures do not match with the district-wise figures published by the Directorate of Agriculture which they have used to estimate production. This difference can be observed by comparing column (4) and (5) in Appendix A2.2. While the

total area under cotton cultivation in Maharashtra in the two series do not show much variation, the difference was sometimes marked with respect to certain varieties and certain districts. For example, while the disaggregated data when aggregated indicated that the area under LRA-5166 variety was 5.33 lakh hectares in Maharashtra, the Directorate's estimate was that of 6.89 lakh hectares. While no major discrepancy was observed in the case of total area under Hybrid Varieties for the state, the total area under American and Deshi varieties showed wide variations. While the disaggregated data when aggregated showed that area under American varieties was 8.20 lakh hectares and that under Deshi was 4.7 lakh hectares, the Directorate's estimate indicate that area under American varieties were 10.43 lakh hectares and that under Deshi was 2.72 lakh hectares. This difference in area estimation was observed not only variety-wise for the state as a whole, but also district-wise. For example, in case of Akola the variety-wise data when aggregated indicated that 2.4 lakh hectares were under cotton cultivation but the published sources of the Directorate of Agriculture revealed that 3.01 lakh hectares are under cotton. Again, the disaggregated data, variety-wise presented in Table 2.1 indicated that area under irrigation in Maharashtra was 1.8 lakh hectares whereas the Directorate's published sources revealed that only 53,000 hectares were irrigated. Thus, differences in estimates of area variety-wise as well as by irrigation status are bound to reflect differences in production estimates. These differences in area are again reflected when we compare Table 2.3 with Table 2.4.

An enquiry was made with the officials of the Directorate of Agriculture regarding major discrepancies in area between their published estimates and that of the disaggregated data when aggregated. The officials stated that their estimates

Table 2.2 : Estimated Production of Cotton (bales of 170 kg.) for the year 1993-94

	Hybrid									
	H-4		H-6		Varalaxmi		PKV-2(AHH 468)		DCH-32	
	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated
Nashik	-	-	-	-	-	-	-	-	-	-
Dhule	1054	38	9709.8	15.2	-	-	860	-	120.6	-
Jalgaon	39	31.6	16552.1	12737	-	-	4931	4579.3	1856.5	1592
Total Nashik Div.	1093	69.6	26261.9	12752.2	-	-	5791	4579.3	1977.1	1592
Pune	-	-	-	-	-	-	-	-	-	-
Solapur	60	-	16	-	163	-	-	-	-	-
Ahmednagar	109	-	-	-	267	-	-	-	68.7	-
Total Pune Div.	169	-	16	-	430	-	-	-	68.7	-
Sangli	19.6	-	-	-	-	-	-	-	14.8	-
Satara	10.5	-	-	-	135	-	-	-	-	-
Kolhapur	80	31.5	-	-	-	-	-	-	-	55.8
Total Kolhapur Div.	110.1	31.5	-	-	135	-	-	-	14.8	55.8
Aurangabad	3.3	2	1.6	-	-	-	66.4	33	1067.5	224.2
Jalna	-	-	-	-	-	-	-	264.4	-	544.2
Beed	-	-	-	-	-	-	-	600.7	343.5	-
Total Aurangabad Div.	3.3	2	1.6	-	-	-	66.4	898.1	1411	768.4
Latur	-	-	-	-	-	-	-	-	-	-
Parbhani	605	726	-	-	-	-	3320	48468.4	-	-
Nanded	260	-	-	-	-	-	-	25762.7	-	38
Total	-	726	-	-	-	-	3320	74231.1	-	38

Table 2.2 : (contd.)

## Hybrid (contd.)

	H-4		H-6		Varalaxmi		PKV-2(AHH 468)		DCH-32	
	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated
Buldhana	128.5	4189	557.2	10453.7	-	-	948	18941.8	-	404.9
Akola	-	3828	-	915	-	-	-	32911.5	-	61.8
Amravati	-	731	-	1713	-	-	-	14166.9	-	-
Yeotmal	339	11737.5	175	4878	-	-	2473.5	30122	44.5	1013.3
Total Amravati Div.	467.5	20485.5	732.2	17959.7	-	-	3421.5	96142.2	44.5	1480
Wardha	121	1631	3206	11955.7	-	-	-	2578.4	-	-
Nagpur	323.6	41	19125.5	2879.7	-	-	8841.5	1471.3	3.7	-
Chandrapur	-	723	-	3672.7	-	-	-	1747.5	-	4853.8
Total Nagpur Div.	444.6	2395	22331.5	18508.1	-	-	8841.5	5797.2	3.7	4853.8
Total Maharashtra State	3152.5	23709.6	49343.2	49220	565	-	21440.4	181647.9	3519.8	8788
Irr + Unirr	26862.1		98563.2		565		203088.3		12307.8	
Production estimates of Directorate of Agriculture (Irr + Unirr)	26400		103700		600		209200		14000	

Table 2.2 : (contd.)

## Hybrid (contd.)

	NHH-44		JKHY-1		Other Hybrid		Total Hybrid		Total Hybrid Irrigated + Unirrigated
	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	
Nashik	-	-	-	-	-	-	-	-	-
Dhule	1633.2	1739.2	1989	-	18813	-	33179.6	92.4	33272
Jalgaon	1014.1	1727.2	2611	1205	63233	24773	90236.7	46645.1	136881.8
Total Nashik Div.	1647.3	1766.4	4600	1205	82046	24773	123416.3	46737.5	170153.8
Pune	-	-	-	-	-	-	-	-	-
Solapur	-	-	-	-	445.4	-	684.4	-	684.4
Ahmednagar	2141.8	-	-	-	916.4	-	3502.9	-	3502.9
Total Pune Div.	2141.8	-	-	-	1361.8	-	4187.3	-	4187.3
Sangli	-	-	-	-	-	-	34.4	-	34.4
Satara	-	-	-	-	-	-	145.5	-	145.5
Kolhapur	-	-	-	-	-	-	80	87.3	167.3
Total Kolhapur	-	-	-	-	-	-	259.9	87.3	347.2
Aurangabad	18581.9	11830.6	-	-	9275.8	3849.6	28996.5	15939.4	44935.9
Jalna	13333.2	20286.6	-	-	531.8	29959.7	13865	51054.9	64919.9
Beed	23070	6631.3	-	-	3448.5	-	26862	7232	34094
Total Aurangabad Div.	54985.1	38748.5	-	-	13256.1	33809.3	69723.5	74226.3	143949.8
Latur	4358.6	1856.1	-	-	1998.5	334	6357.1	2190.1	8547.2
Parbhani	29057.1	113425.8	-	-	3798.6	6957.2	36780.7	169577.4	206358.1
Nanded	1917.8	36662.5	-	-	2113	20646.7	4290.8	83109.9	87400.7
Total Latur Div.	35333.5	151944.4	-	-	7910.1	27937.9	47428.6	254877.4	302306

Table 2.2 : (contd.)

	Hybrid (contd.)								
	NHH-44		JKHY-1		Other Hybrid		Total Hybrid		Total Hybrid Irrigated+ Unirrigated
	Irriga- ted	Unirri- gated	Irriga- ted	Unirri- gated	Irriga- ted	Unirri- gated	Irriga- ted	Unirri- gated	
Buldhana	1002.5	14338.4	118.7	1213.7	748	64407.4	3502.9	113948.9	117451.8
Akola	-	24272.5	-	93.7	-	17871.6	-	79954.1	79954.1
Amravati	-	15483	-	41.8	-	16927.3	-	49063	49063
Yestmal	2316	97546	424.7	1368.5	5016.6	52196.7	10789.3	198862	209651.3
<b>Total Amravati Div.</b>	<b>3318.5</b>	<b>151639.9</b>	<b>543.4</b>	<b>2717.7</b>	<b>5764.6</b>	<b>151403</b>	<b>14292.2</b>	<b>441828</b>	<b>456120.2</b>
Wardha	3136.7	608.4	-	2.5	114	16255.9	6577.7	33031.9	39609.6
Nagpur	13529	310.4	546	48.5	12113	765.4	54482.3	5516.3	59998.6
Chandrapur	-	540	-	-	-	8483.4	-	20020.4	20020.4
<b>Total Nagpur Div.</b>	<b>16665.7</b>	<b>1458.8</b>	<b>546</b>	<b>51</b>	<b>12227</b>	<b>25504.7</b>	<b>61060</b>	<b>58568.6</b>	<b>119628.6</b>
<b>Total Maharashtra State</b>	<b>114091.9</b>	<b>345558</b>	<b>5689.4</b>	<b>3973.7</b>	<b>122565</b>	<b>263427.9</b>	<b>320367.8</b>	<b>876325.1</b>	<b>1196692.9</b>
<b>Irr + Unirr</b>	<b>459649.9</b>		<b>9663.1</b>		<b>385992.9</b>		<b>1196692.9</b>		
Production estimates of Directorate of Agriculture (Irr + Unirr)	360200		4800		414700		1133600		

Table 2.2 : (contd.)

	American									
	DHY-286		B-1007		L-147		SRT-1		O-81	
	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated
Nashik	-	-	-	-	-	-	-	-	-	-
Dhule	-	-	-	-	-	-	-	30.5	-	-
Jalgaon	-	-	-	-	-	-	-	-	-	-
<b>Total Nashik Div.</b>	-	-	-	-	-	-	-	30.5	-	-
Pune	-	-	-	-	-	-	-	-	-	-
Solapur	-	-	-	-	-	-	-	-	-	-
Ahmednagar	-	-	-	-	-	-	-	-	-	-
<b>Total Pune Div.</b>	-	-	-	-	-	-	-	-	-	-
Sangli	-	-	-	-	-	-	-	-	-	-
Satara	-	-	-	-	-	-	-	-	-	-
Kolhapur	-	-	-	-	-	-	-	-	-	-
<b>Total Kolhapur Div.</b>	-	-	-	-	-	-	-	-	-	-
Aurangabad	-	-	-	-	-	-	-	-	-	-
Jalna	-	-	-	-	-	-	-	-	-	-
Beed	-	-	-	-	-	-	-	-	-	-
<b>Total Aurangabad Div.</b>	-	-	-	-	-	-	-	-	-	-
Latur	-	-	-	-	-	-	-	-	-	-
Parbhani	-	-	-	-	-	-	-	-	-	-
Nanded	-	5165.6	-	-	-	-	-	-	-	-
<b>Total Latur Div.</b>	-	5165.6	-	-	-	-	-	-	-	-

contd.



Table 2.2 : (contd.)

	American (contd.)									
	DHY-286		B-1007		L-147		SRT-1		O-81	
	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated
Buldhana	5	3605	7	1409.7	-	924.4	-	508.6	-	1048
Akola	-	39578.2	-	53.7	-	-	-	244.1	-	1251
Amravati	-	37221.2	-	-	-	-	-	-	-	6023
Yeotmal	-	22506.5	-	3410	-	623.4	-	1673	-	1443
<b>Total Amravati Div.</b>	-	102910.9	-	4873.4	-	1547.8	-	2425.7	-	9765
Wardha	-	2110.8	-	-	-	-	-	-	-	-
Nagpur	-	220.3	-	682.6	-	145	-	405	-	-
Chandrapur	-	2769.3	-	1780.4	-	-	-	7832.3	-	-
<b>Total Nagpur Div.</b>	-	5100.4	-	2463	-	145	-	8232.3	-	-
<b>Total Maharashtra State</b>	119146	113176.9	-	7336.4	-	1692.8	-	84829.2	-	9765
<b>Irr + Unirr</b>	-	113176.9	-	7336.4	-	1692.8	-	84829.2	-	9765
Production Estimates of Directorate of Agriculture	122600		8700		1800		10700		9600	

Table 2.2 : (contd.)

## American (contd.)

	LRA-5166		MCU-5		Other American		Total American		Total American Irrigated+ Unirrigated
	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	
Nashik	-	-	-	-	-	440	-	440	440
Dhule	-	2341.5	-	-	-	2007	-	4379	4379
Jalgaon	1030	35103.5	-	-	-	-	1030	35103.5	36133.5
Total Nashik Div.	1030	37445	-	-	-	2447	1030	39922.5	40952.5
Pune	-	-	-	-	-	-	-	-	-
Solapur	-	-	-	-	-	-	-	-	-
Ahmednagar	-	-	-	-	-	-	-	-	-
Total Pune Div.	-	-	-	-	-	-	-	-	-
Sangli	1022.5	162	-	-	-	-	1022.5	162	1184.5
Satara	-	-	-	-	-	-	-	-	-
Kolhapur	-	-	-	-	-	-	-	-	-
Total Kolhapur Div.	1022.5	162	-	-	-	-	1022.5	162	1184.5
Aurangabad	125.5	-	-	-	-	-	125.5	-	125.5
Jalna	-	1009	-	-	-	-	-	1009	1009
Beed	687.4	-	-	-	-	-	687.4	-	687.4
Total Aurangabad Div.	812.9	1009	-	-	-	-	812.9	1009	1821.9
Latur	739	248.6	-	-	37.5	13	776.5	261.6	1038.1
Parbhani	-	36602.9	-	-	-	-	-	36602.9	36602.9
Nanded	-	21589.2	-	-	-	-	-	26754.8	26754.8
Total Latur Div.	739	58440.7	-	-	-	13	776.5	63619.8	64395.8

contd..

Table 2.2 : (contd.)

	American (contd.)									
	LRA-5166		MCU-5		Other American		Total American		Total American Irrigated+ Unirrigated	
	Irri- gated	Unirri- gated	Irri- gated	Unirri- gated	Irri- gated	Unirri- gated	Irri- gated	Unirri- gated		
Buldhana	-	21470.8	-	1907.4	-	4696.7	-	35570.6	35570.6	
Akola	-	147712.7	-	991.8	-	4933.2	-	194764.7	194764.7	
Amravati	-	148596.7	-	-	-	114630.4	-	306471.3	306471.3	
Yeotmal	-	110645.8	-	-	-	51807.2	-	192108.9	192108.9	
Total Amravati Div.	-	428426	-	2899.2	-	176067.5	-	728915.5	728915.5	
Wardha	-	67970.7	-	-	-	-	-	70081.5	70081.5	
Nagpur	-	3504.2	-	-	-	14.3	-	4971.4	4971.4	
Chandrapur	-	5447.4	-	-	-	13	-	17842.4	17842.4	
Total Nagpur Div.	-	76922.3	-	-	-	27.3	-	92895.3	92895.3	
Total Maharashtra State	3604.4	602405	-	2899.2	37.5	176107.8	3641.9	926523.6	930165.5	
Irr + Unirr	606009.4		2899.2		176107.8		930165.5			
Production Estimates of Directorate of Agriculture	835100		44600		209200		1241500			

Table 2.2 : (contd.)

District	AKH 4 & 5		AKA 8401		Deshi		Other Deshi		Total Deshi	
	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated
Nashik	-	-	-	-	-	-	-	276	-	276
Dhule	-	-	-	1176.8	-	33893	-	-	-	35069.8
Jalgaon	-	703	-	3103.1	-	132197.3	-	401	-	136404.4
Total Nashik Div.	-	703	-	4279.9	-	166090.3	-	677	-	171750.2
Pune	-	-	-	-	-	-	-	-	-	-
Solapur	-	-	-	-	-	-	-	-	-	-
Ahmednagar	-	-	-	-	-	-	-	-	-	-
Total Pune Div.	-	-	-	-	-	-	-	-	-	-
Sangli	-	-	-	-	-	-	-	-	-	-
Satara	-	-	-	-	-	-	-	-	-	-
Kolhapur	-	-	-	-	-	-	-	-	-	-
Total Kolhapur Div.	-	-	-	-	-	-	-	-	-	-
Aurangabad	-	-	-	-	-	12092.7	-	51.5	-	12144.2
Jalna	-	533.4	-	-	-	7502.1	-	22654.1	-	30689.6
Beed	-	1090.5	-	-	-	8052.6	-	106.6	-	9249.7
Total Aurangabad Div.	-	1623.9	-	-	-	27647.4	-	22812.2	-	52083.5
Latur	-	-	-	-	-	258.4	-	13523.1	-	13781.5
Parbhani	-	11477.4	-	-	-	8742	-	27676.8	-	47896.2
Nanded	-	17842.9	-	71.5	-	7441.4	-	12652	-	38007.8
Total Latur Div.	-	29320.3	-	71.5	-	16441.8	-	53851.9	-	99685.5

Table 2.2 : (contd.)

District	Deshi (contd.)									
	AKH 4 & 5		AKA-8401		Y-1		Other Deshi		Total Deshi	
	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated
Buldhana	-	28451.8	-	25197.6	-	528	-	2289	-	56466.4
Akola	-	21448.8	-	13437	-	2919.8	-	2190.5	-	39996.1
Amravati	-	13080.1	-	5239	-	34	-	1234.9	-	19588
Yeotmal	-	10274.4	-	4979	-	87.4	-	-	-	15340.8
Total Amravati Div.	-	73255.1	-	48852.6	-	3569.2	-	5714.4	-	131391.3
Wardha	-	-	-	98.7	-	-	-	-	-	98.7
Nagpur	-	-	-	-	-	-	-	-	-	-
Chandrapur	-	-	-	-	-	-	-	-	-	-
Total Nagpur Div.	-	-	-	98.7	-	-	-	-	-	98.7
Total Maharashtra State	-	104902.3	-	53302.7	-	213748.7	-	83055.5	-	455009.2
Irr + Unirr	104902.3		53302.7		213748.7		83055.5		455009.2	
Production Estimates of Directorate of Agriculture	53600		N. A.		143100		250300		250300	

Note : Estimated from Appendix A2.3

Table 2.3 : Area and Estimated Production of Cotton Lint

(Area : hectares, Production: In bales of 170 Kg.)

District	HY Varieties		Traditional		Total	
	Area	Production	Area	Production	Area	Production
Nashik	400	440	300	276	700	716
Dhule	24984	37651	42251	35069.8	67235	72720.8
Jalgaon	112460	173015.3	115249	136404.4	227709	309419.7
<b>Total Nashik Div.</b>	<b>137844</b>	<b>211106.3</b>	<b>157800</b>	<b>171750.2</b>	<b>295644</b>	<b>380539</b>
Pune	-	-	-	-	-	-
Solapur	869	684.4	-	-	869	684.4
Ahmednagar	1289	3502.9	-	-	1289	3502.9
<b>Total Pune Div.</b>	<b>2158</b>	<b>4187.3</b>	<b>-</b>	<b>-</b>	<b>2158</b>	<b>4187.3</b>
Sangli	766	1218.9	-	-	766	1218.9
Satara	85	145.5	-	-	85	145.5
Kolhapur	130	167.3	-	-	130	167.3
<b>Total Kolhapur Div.</b>	<b>981</b>	<b>1531.7</b>	<b>-</b>	<b>-</b>	<b>981</b>	<b>1531.7</b>
Aurangabad	40519	45061.4	17701	12144.2	58220	57205.6
Jalna	70173	65928.9	42626	30689.6	112799	96618.5
Beed	30677	34781.4	10523	9249.7	41200	44031.1
<b>Total Aurangabad Div.</b>	<b>141369</b>	<b>145771.7</b>	<b>70850</b>	<b>52083.5</b>	<b>212219</b>	<b>197855.2</b>
Latur	6737	9585.3	18663	13781.5	25400	23366.8
Parbhani	209000	242961	56852	47896.2	265852	290857.2
Nanded	172499	114155.5	40801	38007.8	213300	152163.3
<b>Total Latur Div.</b>	<b>388236</b>	<b>366701.8</b>	<b>116316</b>	<b>99685.5</b>	<b>504552</b>	<b>466387.3</b>

contd

Table 2.3 : (contd.)

District	HY Varieties		Traditional		Total	
	Area	Production	Area	Production	Area	Production
Buldhana	157516	153022.4	60384	56466.4	217900	209488.8
Akola	200079	274718.8	36932	39996.1	237011	314714.9
Amravati	307910	355534.3	15305	19588	323215	375122.3
Yeotmal	378178	401760.2	12796	15340.8	390974	417101
<b>Total Amravati Div.</b>	<b>1043683</b>	<b>1185035.7</b>	<b>125417</b>	<b>131391.3</b>	<b>1169100</b>	<b>1316427</b>
Wardha	130702	109691.1	98	98.7	130800	109789.8
Nagpur	45835	64970	-	-	45835	64970
Chandrapur	52356	37862.8	-	-	52356	37862.8
<b>Total Nagpur Div.</b>	<b>228893</b>	<b>212523.9</b>	<b>98</b>	<b>98.7</b>	<b>228991</b>	<b>212622.6</b>
<b>Total Maharashtra State</b>	<b>1943164</b>	<b>2126858.4</b>	<b>470481</b>	<b>455009.2</b>	<b>2413645</b>	<b>2581867.6</b>

contd.

Table 2.3 : (contd.)

District	Irrigated		Unirrigated		Total	
	Area	Production	Area	Production	Area	Production
Nashik	-	-	700	716	700	716
Dhule	21006	33179.6	46229	39541.2	67235	72720.8
Jalgaon	36280	91266.7	191429	218153	227709	309419.7
Total Nashik Div.	57286	124446.3	238358	258410.2	295644	380539
Pune	-	-	-	-	-	-
Solapur	869	684.4	-	-	869	684.4
Ahmednagar	1289	3502.9	-	-	1289	3502.9
Total Pune Div.	2158	4187.3	-	-	2158	4187.3
Sangli	616	1056.9	150	162	766	1218.9
Satara	85	145	-	-	85	145.5
Kolhapur	53	80	77	87.3	130	167.3
Total Kolhapur Div.	754	1282.4	227	249.3	981	1531.7
Aurangabad	18424	29122	39796	28083.6	58220	57205.6
Jalna	9124	13865	103675	82753.5	112799	96618.5
Beed	22811	27549.4	18389	16481.7	41200	44031.1
Total Aurangabad Div.	50359	70536.4	161860	127318.8	212219	197855.2
Latur	4296	7133.6	21104	16233.2	25400	23366.8
Parbhani	24000	36780.7	241852	254076.5	265852	290857.2
Nanded	2382	4290.8	210918	147872.5	213300	152163.3
Total Latur Div.	30678	48205.1	473874	418182.2	504552	466387.3

contd.



Table 2.3 : (contd.)

District	Irrigated		Unirrigated		Total	
	Area	Production	Area	Production	Area	Production
Buldhana	2061	3502.9	215839	205985.9	217900	209488.8
Akola	-	-	237011	314714.9	237011	314714.9
Amravati	-	-	323215	375122.3	323215	375122.3
Yeotmal	5734	10789.3	385240	406311.7	390974	417101
<b>Total Amravati Div.</b>	<b>7795</b>	<b>14292.2</b>	<b>1161305</b>	<b>1302134.8</b>	<b>1159100</b>	<b>1316427</b>
Wardha	4301	6577.7	126499	103212.1	130800	109789.8
Nagpur	32200	54482.3	13635	10487.7	45835	64970
Chandrapur	-	-	52356	37862.8	52356	37862.8
<b>Total Nagpur Div.</b>	<b>36501</b>	<b>61060</b>	<b>192490</b>	<b>151562.6</b>	<b>228991</b>	<b>212622.6</b>
<b>Total Maharashtra State</b>	<b>185531</b>	<b>324009.7</b>	<b>2228114</b>	<b>2257857.9</b>	<b>2413645</b>	<b>2581867.6</b>

Note : Compiled from Table 2.2.

**Table 2.4: Crop Estimation Survey on Cotton, 1993-94**  
Statement showing area, average yield and production of cotton in terms of lint

District	HYV		
	Area in hectares	Average yield kg/ha (Lint)	Prod. in bales of 170 kg. each
1. Nashik	200	309.9	400
2. Dhule	64500	151.8	57600
3. Jalgaon	187200	212.4	233900
Total Nashik	251900	197.0	291900
4. Ahmednagar	500	280.5	800
5. Pune	-	-	-
6. Solapur	2200	231.8	3000
Total Pune	2700	239.3	3800
7. Satara	500	326.1	1000
8. Sangli	1100	262.7	1700
9. Kolhapur	100	185.4	100
Total Kolhapur	1700	280.8	2800
10. Aurangabad	49700	166.9	48800
11. Jalna	101500	130.8	78100
12. Beed	34700	161.7	33000
Total Aurangabad	185900	146.2	159900
13. Latur	18500	161.8	17600
14. Nanded	202200	118.9	141400
15. Parbhani	229100	200.2	269800
Total Latur	449800	162.1	428800
16. Buldhana	183100	169.2	182200
17. Akola	264900	222.1	346100
18. Amravati	297500	201.7	353000
19. Yavatmal	361000	183.6	389900
Total Amravati	1106500	195.3	1271200
20. Wardha	123700	190.4	138500
21. Nagpur	43300	149.7	38100
22. Bhandara	-	-	-
23. Chandrapur	40600	167.8	40100
24. Gadchiroli	-	-	-
	207600	177.5	216700
Maharashtra State	2206100	183.0	2375100

Table 2.4: (Continued)

District	TRAD			
	Area in hectares	Average yield kg/ha. (Lint)	Prodn. in bales of 170 kg. each	Total prodn. of HYV+TRAD bales of 170 kg.
1. Nashik	100	154.4	100	500
2. Dhule	6600	160.0	6200	63800
3. Jalgaon	22900	158.9	21400	255300
Total Nashik	29600	159.1	27700	339600
4. Ahmednagar	200	222.6	300	1100
5. Pune	-	-	-	-
6. Solapur	100	222.6	100	3100
Total Pune	300	222.6	400	4200
7. Satara	-	-	-	1000
8. Sangli	200	222.6	300	2000
9. Kolhapur	-	-	-	100
Total Kolhapur	200	222.6	300	3100
10. Aurangabad	8900	166.2	8700	57500
11. Jalna	8500	164.0	8200	86300
12. Beed	3700	170.0	3700	36700
Total Aurangabad	21100	166.0	20600	180500
13. Latur	6100	154.4	5500	23100
14. Nanded	23900	154.4	21700	163100
15. Parbhani	38900	155.1	35500	305300
Total Latur	68900	154.7	62700	491500
16. Buldhana	33000	154.4	30000	212200
17. Akola	36900	154.4	33500	379600
18. Amravati	25800	154.4	23400	376400
19. Yavatmal	26700	154.4	24200	414100
Total Amravati	122400	154.4	111100	1382300
20. Wardha	5500	154.4	5000	143500
21. Nagpur	7900	154.4	7200	45300
22. Bhandara	-	-	-	-
23. Chandrapur	16800	154.4	15300	55400
24. Gadchiroli	-	-	-	-
	30200	154.4	27500	244200
<b>Maharashtra State</b>	<b>2727</b>	<b>156.0</b>	<b>250300</b>	<b>2625400</b>

(Continued)

Table 2.4: (Continued)

District	IRRIGATED		
	Area in hectares	Average yield kg/ha (Lint)	Prodn. in bales of 170 kg. each
1. Nashik	100	338.9	200
2. Dhule	5200	225.6	6900
3. Jalgaon	15000	370.6	32700
Total Nashik	20300	333.3	39800
4. Ahmednagar	700	267.1	1100
5. Pune	-	-	-
6. Solapur	2000	238.0	2800
Total Pune	2700	245.6	3900
7. Satara	500	326.1	1000
8. Sangli	1100	278.2	1800
9. Kolhapur	-	-	-
Total Kolhapur	1600	297.5	2800
10. Aurangabad	10200	228.3	13700
11. Jalna	7600	272.9	12200
12. Beed	8500	210.0	10500
Total Aurangabad	26300	235.3	36400
13. Latur	-	-	-
14. Nanded	-	-	-
15. Parbhani	2100	234.8	2900
Total Latur	2100	234.8	2900
16. Buldhana	-	-	-
17. Akola	-	-	-
18. Amravati	-	-	-
19. Yavatmal	-	-	-
Total Amravati	-	-	-
20. Wardha	-	-	-
21. Nagpur	-	-	-
22. Bhandara	-	-	-
23. Chandrapur	-	-	-
24. Gadchiroli	-	-	-
Maharashtra State	53000	275.2	85800

(Continued)

Table 2.4: (Continued)

District	UNIRRIGATED				
	Area in hectares	Average yield kg/ha (Lint)	Prodn. in bales of 170 kg. each	Total Prodn. Irri.+ Unirri. bales of 170 kg. each	Total Area Irr.+Un-irr.
1. Nashik	200	255.0	300	500	300
2. Dhule	65900	146.8	56900	63800	71100
3. Jalgaon	195100	194.0	222600	255300	210100
Total Nashik	261200	182.1	279800	319600	281500
4. Ahmednagar	-	-	-	1100	700
5. Pune	-	-	-	-	-
6. Solapur	300	185.4	300	3100	2300
Total Pune	300	185.4	300	4200	3000
7. Satara	-	-	-	1000	500
8. Sangli	200	185.4	200	2000	1300
9. Kolhapur	100	185.4	100	100	100
Total Kolhapur	300	185.4	300	3100	1900
10. Aurangabad	48400	153.8	43800	57500	58600
11. Jalna	102400	123.0	74100	86300	110000
12. Beed	29900	143.0	26200	36700	38400
Total Aurangabad	180700	135.6	144100	180500	207000
13. Latur	24600	159.6	23100	23100	24600
14. Nanded	226100	122.6	163100	163100	226100
15. Parbhani	265900	193.3	302400	305300	268000
Total Latur	516600	160.8	488600	491500	518700
16. Buldhana	216100	166.9	212200	212200	216100
17. Akola	301800	213.8	379600	379600	301800
18. Amravati	323300	197.9	376400	376400	323300
19. Yavatmal	387700	181.6	414100	414100	387700
Total Amravati	1228900	191.2	1382300	1382300	1228900
20. Wardha	129200	188.8	143500	143500	129200
21. Nagpur	51200	150.4	45300	45300	51200
22. Bhandara	-	-	-	-	-
23. Chandrapur	57400	164.1	55400	55400	57400
24. Gadchiroli	-	-	-	-	-
	237800	174.5	244200	244200	237800
Maharashtra State	2425800	178.0	2539600	2625400	2478800

Source: Directorate of Agriculture (Krishi Bhavan), Pune, Unpublished Records.

relating to cotton area were collected under the scheme named "Timely Reporting of Agricultural Intelligence" where a sample of 20 per cent of the total villages in each taluka is selected every year and the concerned talatis report the area under the crop for the current year as well as for the previous year. The ratio method as explained earlier is used for estimating the tehsil area. All such estimated area at the tehsil level are pooled to arrive at district and state level data. The Directorate through its procedure of sampling does not make any attempt to calculate the area for every district, variety-wise and by irrigation status but the varieties are clubbed into two categories for each district i.e. (1) HYV and traditional (2) Irrigated area and unirrigated area.

The disaggregated data relating to district-wise, variety-wise area under cotton are obtained from the records of the Agricultural Development officers in each district. Since the Directorate's estimates are based on sampling while the disaggregated data is obtained from the records of the Agricultural Development Officers, there are bound to be differences in area estimates which are at times major and which will naturally result in different production estimates as area is vital in determining production.

Thus while making a comparison between Table 2.3 and Table 2.4 we have to keep in mind that differences in area in each district are sometimes quite large and this may at times seem to render comparison meaningless.

### 2.3 Comparison Between Our Estimates and That of the Directorate of Agriculture

Despite the differences in district-wise area estimates, we find that for the state as a whole the disaggregated data when aggregated does more or less tally with the area estimated by the Directorate on the basis of ratio method. The same is

observed with respect to production as can be observed from Table 2.3 and Table 2.4. While in Table 2.3 production as estimated by us is 25.82 lakh bales, the Directorate's estimate is 26.25 lakh bales which is slightly more than that of our estimate. In certain districts, the production estimates show minor variation but in certain other cases the difference is major. For example, in cases of major cotton producing districts such as Yeotmal, Akola, Amravati and Buldhana, the difference in production estimates are negligible. In Yeotmal and Amravati while our estimates show production of 4.17 lakh bales and 3.75 lakhs, the Directorate's estimate is that of 4.14 lakh bales and 3.76 lakh bales respectively. In case of Buldhana also while our estimates showed a production 2.09 lakh bales, the Directorate's estimate was that of 2.12 lakh bales. A contrasting feature was however observed in case of Jalgaon where our estimates show a production of 3.09 lakh bales whereas that of the Directorate was 2.55 lakh bales. This difference in the two estimates is naturally attributed to differences in area because while unirrigated area in both the estimates is 1.9 lakh hectares, the production too in both the estimates is 2.2 lakh bales. In case of irrigated area in Jalgaon, however, disaggregated data show that 36,280 hectares are under irrigation, the Directorate's estimate of area under irrigation is only 15,000 hectares. This difference in area under irrigation naturally resulted in substantial difference in production of 58566 bales between our estimates and that of the Directorate.

Comparison of production figures as estimated by us and those of the Directorate thus reveal that any difference in the two estimates for any district can be largely attributed to differences in area.

Yield, which is the other vital factor determining production, as mentioned earlier is estimated by conducting crop cutting experiments. While crop cutting experiments have been

conducted with respect to most varieties in most districts, in case of certain varieties such as JKHY-1 which has approximately 7000 hectares under cultivation, no experiments have been conducted. In case of certain varieties and certain districts also, very few experiments have been conducted. For example, Wardha has 2560 hectares under PKV-2 and its yield in terms of kapas which is 496.3 kg. per hectare is estimated on the basis of only 3 crop cutting experiments. This yield in terms of kapas is lower than the average yield in Maharashtra of PKV-2 which is 542.8 kg. per hectare. Thus it can be observed that our estimation of production in Wardha is an underestimation of the Directorate's though our area is an overestimate of that of the Directorate. The number of crop cutting experiments with respect to certain varieties may at times be too few to give any reliable estimate of yield and hence production.

Further, while estimating yield, it is also important that all pickings of cotton are taken into account. It is well known that cotton is picked during the harvesting period four to six times as all the bales in the field do not mature at the same time and even the bolls on the same plant open at different times. It is therefore important that all pickings must be taken into consideration while estimating yield on the sample plot because if all pickings are not taken into consideration, there is a possibility that yield estimates could be inaccurate.

However, a close look at the data on crop cutting experiments with respect to all districts and all varieties, seemed to indicate that all pickings have been taken into consideration for estimating the yield on the sample plot. For example, in case of LRA 5166 which has the largest area under cotton, in a number of samples plots in Yeotmal and Akola, as many as eight pickings were observed and the yield was lower in the last picking. With respect to PKV-2 (AHH68) variety also six to eight pickings were observed in Buldhana and



Yeotmal. In some sample plots the number of pickings was less but the yield in each picking was high. In case of H-4 and H-6 variety, most often five to six pickings were observed and at times the yield was as high as 7 to 10 kg. per picking. This was apparently due to irrigation on the sample plots. In case of Deshi varieties such as Y-1 only three to four pickings were observed.

#### 2.4 Conclusions

On the whole, it appears that all pickings of cotton seem to have been taken into consideration while estimating yield on the sample plots. The main cause of divergence in production estimates between the Directorate's estimate and our estimates could be attributed mainly to difference in area estimates as the disaggregated data on area when aggregated varies from the Directorate's estimate based on sampling. This can be observed for example in case of MCU-5 variety where the disaggregated data show that only 2888 hectares are under cultivation, but the Directorate's estimate based on sampling shows that 42,100 hectares of MCU-5 are cultivated. This large difference in area between the two estimates is bound to have its repercussion on production and thus while our estimates showed a production of 2899 bales, the Directorate's estimates showed an estimate of 44,600 bales ! However, the production estimates of certain varieties such as NHH-44 and JKHY-1 need to be examined. While the Directorate's estimates and the disaggregated data when aggregated show no divergence in case of area for the state of Maharashtra as a whole, the production estimates show wide variation. Our estimate of the production of NHH-44 is 4.6 lakh bales while that of the Directorate is 3.6 lakh bales and in case of JKHY-1 while our estimate is 9663 bales, the Directorate's estimate is 4,800 bales. In case of JKHY-1 as explained earlier no crop cutting experiments were conducted and so production estimates were arrived at by using yield of

"other hybrids". They will naturally not yield reliable figures. In case of NHH-44 only few experiments have been conducted. The sampling design was based on irrigated and unirrigated plots rather than varieties.

To conclude however, we feel that area estimates more than yield estimates must be checked into while arriving at variety-wise production estimates. While the aggregate estimate of cotton production <sup>seems</sup> reliable and does not seem to pose a major problem, variety-wise estimates may not be reliable and hence need to be looked into as they are equally important to industry.

#### Foot Notes:

1. The estimates/area in Table 2.1 are obtained from the unpublished records of the Directorate of Agriculture. It must be noted that these unpublished estimates differ from that published by the Directorate in its publication "District-wise Agriculture Statistical Information of Maharashtra, Part II, 1993-94 and 1994-95.
2. In case of certain districts for certain varieties crop cutting experiments have not been conducted and hence the average yield in Maharashtra for that particular variety has been taken into consideration while estimating production. Further, in case of certain varieties where experiments were not conducted the yield of varieties which have comparable characteristics have been used.
3. In order to arrive at the production of kapas or raw cotton we have multiplied the area by yield for every district, variety-wise and by irrigation status. After obtaining the kapas produced in kgs. we have applied the ginning-outturn (which varies from variety to variety but is normally around 33 percent) to arrive at the lint cotton produced in kgs. This lint cotton is divided by 170 kgs to arrive at the number of bales produced as each bale has a weight of 170 kgs.

Appendix A2.1 : Districtwise, Varietywise Number of Crop-Cutting Experiments (1993-94)

	Hybrid																	
	H-4		H-6		Varalaxmi		PKV-2		DCH-32		NHH-44		JKHY-1		Other Hybrid		Total Hybrid	
	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U
Nashik	-	-	-	-	-	-	-	-	2	-	16	-	-	-	-	-	-	18
Dhule	12	2	16	-	-	-	-	-	-	-	2	-	-	-	12	-	42	2
Jalgaon	46	19	31	22	-	-	4	20	-	-	1	-	-	-	32	7	114	68
Total Nashik	58	21	47	22	-	-	4	20	-	2	3	16	-	-	44	7	156	88
Pune	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solapur	-	-	-	-	7	-	-	-	-	-	-	-	-	-	1	-	8	-
Ahmednagar	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	3	-
Total Pune	-	-	-	-	7	-	-	-	-	-	3	-	-	-	1	-	11	-
Sangli	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Satara	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	20	-
Kolhapur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kolhapur	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	20	-
Aurangabad	1	-	-	4	-	-	-	-	6	2	20	20	-	-	5	8	32	34
Jalna	1	3	-	-	-	-	-	4	-	-	27	51	-	-	10	38	38	96
Beed	-	-	-	-	-	-	-	2	-	-	15	15	-	-	3	5	18	22
Total Aurangabad	2	3	-	4	-	-	-	6	6	2	63	86	-	-	18	51	88	152

(continued)

Appendix A2.1 : (continued)

	Hybrid																		
	H-4		H-6		Varalaxmi		PKV-2		DCH-32		NHH-44		JKHY-1		Other Hybrid		Total Hybrid		
	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	
Latur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parbhani	-	4	-	-	-	-	-	18	-	-	-	144	-	-	-	6	-	-	172
Nanded	-	10	-	-	-	-	-	25	-	-	-	171	-	-	-	11	-	-	217
Total Latur	-	14	-	-	-	-	-	43	-	-	-	315	-	-	-	17	-	-	389
Buldhana	-	6	-	16	-	-	-	83	-	2	-	7	-	-	-	45	-	-	159
Akola	-	6	-	6	-	-	-	147	-	-	-	19	-	-	-	11	-	-	189
Amravati	-	3	-	1	-	-	-	124	-	-	-	10	-	-	-	9	-	-	147
Yavatmal	-	14	-	3	-	-	-	67	-	2	-	112	-	-	-	19	-	-	217
Total Amravati	-	29	-	26	-	-	-	421	-	4	-	148	-	-	-	84	-	-	712
Wardha	-	11	-	24	-	-	-	3	-	-	-	91	-	-	-	3	-	-	132
Nagpur	-	35	-	29	-	-	-	18	-	-	-	1	-	-	-	12	-	-	95
Chandrapur	-	27	-	12	-	-	-	14	-	-	-	41	-	-	-	5	-	-	99
Total Nagpur	-	73	-	65	-	-	-	35	-	-	-	133	-	-	-	20	-	-	326
Total Maharashtra State	60	140	47	117	27	-	4	525	6	8	68	698	-	-	63	179	275	1667	
Total Maharashtra Ir & Unirri.	200	164	27	529	14	766	242	1942											

(continued)

Appendix A2.1 : (continued)

	American															
	DHY-286		B-1007 L-147		SRT-1		O-81		IRA-5166		MCU-5		Other American		Total American	
	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U
Nashik	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dhule	12	2	-	-	-	-	-	-	-	5	-	2	-	-	-	7
Jalgaon	-	-	-	-	-	-	-	-	12	58	-	-	-	-	12	58
Total Nashik	-	-	-	-	-	-	-	-	12	63	-	2	-	-	12	65
Pune	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solapur	-	-	-	-	-	-	-	-	80	-	-	-	-	-	80	-
Ahmednagar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Pune	-	-	-	-	-	-	-	-	80	-	-	-	-	-	80	-
Sangli	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Satara	-	-	-	-	-	-	-	-	28	-	-	-	-	-	28	-
Kolhapur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kolhapur	-	-	-	-	-	-	-	-	28	-	-	-	-	-	28	-
Aurangabad	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	2
Jalna	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	4
Beed	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Total Aurangabad	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	7

(continued)

Appendix A311 : (continued)

	American																
	DHY-286		B-1007 L-147		SRT-1		O-81		LRA-5166		MCU-5		Other American		Total American		
	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U	
Latur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Parbhani	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	3	
Nanded	-	-	-	-	-	1	-	-	-	27	-	-	-	-	-	28	
Total Latur	-	-	-	1	-	1	-	-	-	29	-	-	-	-	-	31	
Buldhana	-	-	-	-	-	-	-	-	-	60	-	-	-	-	-	60	
Akola	-	12	-	3	-	-	-	-	-	36	-	-	-	-	-	51	
Amravati	-	-	-	7	-	3	-	-	-	120	-	-	-	-	-	130	
Yavatmal	-	4	-	-	-	-	-	-	-	66	-	-	-	-	-	70	
Total Amravati	-	16	-	10	-	3	-	-	-	282	-	-	-	-	-	311	
Wardha	-	-	-	-	-	-	-	-	-	61	-	-	-	-	-	61	
Nagpur	-	-	-	5	-	3	-	-	-	5	-	-	-	-	-	13	
Chandrapur	-	-	-	-	-	-	-	-	-	3	-	1	-	-	-	4	
Total Nagpur	-	-	-	5	-	3	-	-	-	69	-	1	-	-	-	78	
Total Maharashtra State	-	16	-	16	-	7	-	-	-	120	450	-3	3	-	-	120	492
Total Maharashtra Ir + Unirri.	16	-	16	-	9	-	-	-	-	570	-	3	-	-	-	612	

(continued)

Appendix A2.1 : (Continued)

	Deshi								Total Experiments		Total		
	AKH-425		AKA-8401		Y-1		Other Deshi		Total Deshi				
	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U			
Nashik	-	-	-	-	-	-	-	2	-	2	-	20	20
Dhule	-	-	-	-	-	129	-	6	-	135	42	144	186
Jalgaon	-	-	-	-	-	122	4	3	4	125	130	251	381
Total Nashik	-	-	-	-	-	351	4	11	4	262	172	415	587
Pune	-	-	-	-	-	-	-	-	-	-	-	-	-
Solapur	-	-	-	-	-	-	-	-	-	-	88	-	88
Ahmednagar	-	-	-	-	-	-	11	-	11	-	14	-	14
Total Pune	-	-	-	-	-	-	11	-	11	-	102	-	102
Sangli	-	-	-	-	-	-	-	-	-	-	-	-	-
Satara	-	-	-	-	-	-	-	-	-	-	48	-	48
Kolhapur	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kolhapur	-	-	-	-	-	-	-	-	-	-	48	-	48
Aurangabad	-	-	-	-	-	16	-	2	-	18	32	54	86
Jalna	-	-	-	-	-	3	-	8	-	11	38	111	149
Beed	-	1	-	-	-	19	-	5	-	25	18	48	66
Total Aurangabad	-	1	-	-	-	38	-	15	-	54	88	213	301

(continued)

Appendix A2.1 : (continued)

	Deahi										Total Experi-ments	Total
	AKH-425		AKA-8401		Y-1		Other Deahi		Total Deahi			
	Ir	U	Ir	U	Ir	U	Ir	U	Ir	U		
Latur	-	-	-	-	-	-	-	-	-	-	-	-
Parbhani	-	-	-	-	-	-	-	3	-	3	-	178
Nanded	-	-	-	-	-	-	-	6	-	6	-	251
Total Latur	-	-	-	-	-	-	-	9	-	9	-	429
Buldhana	-	28	-	-	-	3	-	-	-	31	-	250
Akola	-	32	-	-	-	-	-	-	-	32	-	272
Amravati	-	6	-	-	-	-	-	1	-	7	-	284
Yavatmal	-	3	-	-	-	-	-	-	-	3	-	290
Total Amravati	-	69	-	-	-	3	-	2	-	73	-	1096
Wardha	-	-	-	-	-	-	-	-	-	-	-	193
Nagpur	-	-	-	-	-	-	-	2	-	2	-	110
Chandrapur	-	-	-	-	-	-	-	4	-	4	-	107
Total Nagpur	-	-	-	-	-	-	-	6	-	6	-	410
Total Maharashtra State	-	70	-	-	-	292	21	35	21	398	416	2557
Total Maharashtra Ir. + Unirri.	70	-	-	-	292	-	56	-	419	-	2973	2973

Source: Directorate of Agriculture, Krishi Bhavan, Pune (unpublished material).



Appendix A2.2 : Districtwise Varietywise Area Under Cotton 1993-94 Area in hectares Irrigated+Unirrigated

	Hybrid								Total Hybrid
	H-4	H-6	Vara-laxmi	PKV-2 AHH-468	DCH-32	NHH-44	JKHY-1	Other Hybrid	
1) Nashik	-	-	-	-	-	-	-	-	-
2) Dhule	695	7015	-	518	65	338	838	11615	21084
3) Jalgaon	60	21660	-	6570	2340	2990	2540	44270	80430
Total Nashik	755	28675	-	7088	2405	3328	3378	56085	101514
4) Pune	-	-	-	-	-	-	-	-	-
5) Solapur	40	10	124	-	-	-	-	695	869
6) Ahmednagar	72	-	165	-	37	626	-	386	1289
Total Pune	112	10	289	-	37	626	-	1081	2154
7) Sangli	13	-	-	-	8	-	-	-	21
8) Satara	7	-	78	-	-	-	-	-	85
9) Kolhapur	83	-	-	-	47	-	-	-	130
Total Kolhapur	103	-	78	-	55	-	-	-	236
10) Aurangabad	5	1	-	70	1000	30500	-	8870	40446
11) Jalna	-	-	-	306	458	35671	-	32365	68800
12) Beed	-	-	-	640	185	27003	-	2449	30277
Total Aurangabad	5	1	-	1016	1643	93174	-	43684	139523
13) Latur	-	-	-	-	-	4800	-	1231	6031
14) Parbhani	1000	-	-	40000	-	130000	-	12000	183000
15) Nanded	172	-	-	40558	32	53069	-	45662	139493
Total Latur	1172	-	-	80558	32	187869	-	58893	328524

(continued)

Appendix A2.2 : (continued)

	Hybrid								Total Hybrid
	H-4	H-6	Vara-laxmi	PKV-2 AHH-468	DCH-32	NHH-44	JKHY-1	Other Hybrid	
16) Buldhana	4240	11850	-	20536	350	18340	1500	66780	123596
17) Akola	3382	785	-	26590	52	15945	112	11050	57916
18) Amravati	512	1120	-	12488	-	14700	50	10385	39255
19) Yavatmal	9633	4930	-	29870	857	91859	1814	55955	194918
Total Amravati	17767	18685	-	89484	1259	140844	3476	144170	415685
20) Wardha	1520	12120	-	22560	-	29600	3	16914	62717
21) Nagpur	267	15017	-	6657	2	11640	288	6379	40250
22) Chandrapur	497	4668	-	1336	4085	10792	-	10440	32318
Total Nagpur	2284	31805	-	11053	4087	52032	291	33733	135285
Total Maharashtra State	22198	79176	367	189199	9518	477873	7145	337646	1122925
Estimates of Directorate of Agriculture	22200	79200	400	189200	9500	477900	7100	377400	1162900

(continued)

Appendix A2.2 : (continued)

	American								Total American
	DHY-286	B-1007	L-147	SRT-1	O-81	LRA-5166	MCU-5	Other American	
1) Nashik	-	-	-	-	-	-	-	400	400
2) Dhule	-	-	-	30	-	2045	-	1825	3900
3) Jalgaon	-	-	-	-	-	32030	-	-	32030
Total Nashik	-	-	-	30	-	34075	-	2225	36330
4) Pune	-	-	-	-	-	-	-	-	-
5) Solapur	-	-	-	-	-	-	-	-	-
6) Ahmednagar	-	-	-	-	-	-	-	-	-
Total Pune	-	-	-	-	-	-	-	-	-
7) Sangli	-	-	-	-	-	745	-	-	745
8) Satara	-	-	-	-	-	-	-	-	-
9) Kolhapur	-	-	-	-	-	-	-	-	-
Total Kolhapur	-	-	-	-	-	745	-	-	745
10) Aurangabad	-	-	-	-	-	73	-	-	73
11) Jalna	-	-	-	-	-	1373	-	-	1373
12) Beed	-	-	-	-	-	400	-	-	400
Total Aurangabad	-	-	-	-	-	1846	-	-	1846
13) Latur	-	-	-	-	-	660	-	46	706
14) Parbhani	-	-	-	-	-	26000	-	-	26000
15) Nanded	3940	-	-	-	-	29066	-	-	33006
Total Latur	3940	-	-	-	-	55726	-	46	59712

(continued)

Appendix A2.2 : (continued)

	American								Total American
	DHY-286	B-1007	L-147	SRT-1	O-81	LRA-5166	MCU-5	Other American	
16) Buldhana	2750	1525	1000	500	975	21000	1900	4270	33920
17) Akola	27389	35	-	240	1163	107863	988	4485	142163
18) Amravati	28390	-	-	-	5600	130450	-	104215	268655
19) Yavatmal	24761	3689	675	1645	1342	104048	-	47100	183260
Total Amravati	83290	5249	1675	2385	9080	363361	2888	160070	627998
20) Wardha	1610	-	-	-	-	66375	-	-	67985
21) Nagpur	168	1530	325	509	-	3040	-	13	5585
22) Chandrapur	2100	1926	-	7700	-	8300	-	12	20038
Total Nagpur	3878	3456	325	8209	-	77715	-	25	93608
Total Maharashtra State	91108	8705	2000	10624	9080	533468	2888	162366	820239
Estimates of Directorate of Agriculture	91100	8700	2000	10600	9100	689200	42100	190400	1043200

(continued)

Appendix A2.2 : (continued)

	Deshi				Total Deshi	Total H+A+D	Directorate of Agriculture
	AKH-425	AKA-8401	Y-1	Other Deshi			
1) Nashik	-	-	-	300	300	700	300
2) Dhule	-	1168	41083	-	42251	67235	71100
3) Jalgaon	625	3080	111000	544	115249	227709	210100
<b>Total Nashik</b>	<b>625</b>	<b>4248</b>	<b>152083</b>	<b>844</b>	<b>157800</b>	<b>295644</b>	<b>281500</b>
4) Pune	-	-	-	-	-	-	-
5) Solapur	-	-	-	-	-	869	2360
6) Ahmednagar	-	-	-	-	-	1289	700
<b>Total Pune</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2158</b>	<b>3000</b>
7) Sangli	-	-	-	-	-	766	1300
8) Satara	-	-	-	-	-	85	500
9) Kolhapur	-	-	-	-	-	130	100
<b>Total Kolhapur</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>981</b>	<b>1900</b>
10) Aurangabad	-	-	17631	70	17701	58220	58600
11) Jalna	474	-	11333	30819	42626	112799	110000
12) Beed	808	-	9570	145	10523	41200	38400
<b>Total Aurangabad</b>	<b>1282</b>	<b>-</b>	<b>38534</b>	<b>31034</b>	<b>70850</b>	<b>212219</b>	<b>207000</b>
13) Latur	-	-	266	18397	18663	25400	24600
14) Parbhani	10200	-	9000	37652	56852	265852	268000
15) Nanded	15857	71	7661	17212	40801	213300	226100
<b>Total Latur</b>	<b>26057</b>	<b>71</b>	<b>16927</b>	<b>73261</b>	<b>116316</b>	<b>504552</b>	<b>518700</b>

(continued)

Appendix A2.2 : (continued)

	Deshi					Total H+A+D	Directorate of Agriculture
	AKH-425	AKA-8401	Y-1	Other Deshi	Total Deshi		
16) Buldhana	31725	25010	535	3114	60384	217900	216100
17) Akola	17609	13337	3006	2980	36932	237011	301800
18) Amravati	8390	5200	35	1680	15305	323215	323300
19) Yavatmal	7764	4942	90	-	12796	390974	387700
Total Amravati	65488	48489	3666	7774	125417	1169100	1228900
20) Wardha	-	98	-	-	98	130800	129200
21) Nagpur	-	-	-	-	-	45835	51200
22) Chandrapur	-	-	-	-	-	52356	57400
Total Nagpur	-	98	-	-	98	228991	237800
Total Maharashtra State	93452	52906	211210	112713	470481	2413645	2478800
Estimates of Directorate of Agriculture	23000	25000	152100	72600	272700	2478800	

Source : 1) Directorate of Agriculture (unpublished data).

2) Districtwise Agriculture Statistical Information of Maharashtra Part II (1993-94 and 1994-95) Commissionerate of Agriculture, Pune.

Appendix A2.3 : Area and Yield of Paw Cotton (District-wise,  
Variety-wise and by Irrigation Status) (1993-94)

HYBRID

District	H4				H6			
	Irri.	Un- irri.	Irri.	Un- irri.	Irri.	Un- irri.	Irri.	Un- irri.
1. Nashik	-	-	-	-	-	-	-	-
2. Dhule	640	55	811.5	341.3	7000	15	755.8	-
3. Jalgaon	26	34	-	458.0	9750	11910	925.0	582.7
Total Nashik	666	89	811.5	799.3	16750	11925	1680.8	582.7
4. Pune	-	-	-	-	-	-	-	-
5. Solapur	40	-	-	-	10	-	-	-
6. Ahmednagar	72	-	-	-	-	-	-	-
Total Pune	112	-	-	-	10	-	-	-
7. Sangli	13	-	-	-	-	-	-	-
8. Satara	7	-	-	-	-	-	-	-
9. Kolhapur	53	30	-	-	-	-	-	-
Total Kolhapur	73	30	-	-	-	-	-	-
10. Aurangabad	3	2	540	-	1	-	-	541.9
11. Jalna	-	-	775	513	-	-	-	-
12. Beed	-	-	-	-	-	-	-	-
Total Aurangabad	3	2	1315	513	1	-	-	541.9
13. Latur	-	-	-	-	-	-	-	-
14. Perbhani	400	600	-	596.5	-	-	-	-
15. Nanded	172	-	-	324.3	-	-	-	-
Total Latur	572	600	-	920.8	-	-	-	-
16. Buldhana	85	4155	-	596.8	350	11500	-	495.3
17. Akola	-	3382	-	557.8	-	785	-	635.0
18. Amravati	-	512	-	703.8	-	1120	-	833.4
19. Yeotmal	224	9409	-	614.7	110	4820	-	551.4
Total Amravati	309	17458	-	2473.1	460	18225	-	2515.1
20. Wardha	80	1440	-	558.1	2014	10106	-	644.6
21. Nagpur	214	53	-	382.4	12014	3003	-	522.5
22. Chandrapur	-	497	-	716.9	-	4668	-	428.7
Total Nagpur	294	1990	-	1657.4	14028	17777	-	1595.8

...contd.

## Appendix A2.3 (contd.)

District	Varalaxmi		PKV2 (AHH-468)	
	Area	Yield	Area	Yield
1. Nashik	-	-	-	-
2. Dhule	-	-	518	-
3. Jalgaon	-	-	2970	3600
Total Nashik	-	-	3488	3600
4. Pune	-	-	-	-
5. Solapur	124	647.3	-	-
6. Ahmednagar	165	-	-	-
Total Pune	289	647.3	-	-
7. Sangli	-	-	-	-
8. Satara	78	851.7	-	-
9. Kolhapur	-	-	-	-
Total Kolhapur	78	851.7	-	-
10. Aurangabad	-	-	40	30
11. Jalna	-	-	-	306
12. Beed	-	-	-	640
Total Aurangabad	-	-	40	976
13. Latur	-	-	-	-
14. Perbhani	-	-	2000	38000
15. Nanded	-	-	-	40558
Total Latur	-	-	2000	78558
16. Buldhana	-	-	571	19965
17. Akola	-	-	-	26590
18. Amravati	-	-	-	12488
19. Yeotmal	-	-	1490	28380
Total Amravati	-	-	2061	87423
20. Wardha	-	-	-	2560
21. Nagpur	-	-	5326	1331
22. Chandrapur	-	-	-	1836
Total Nagpur	-	-	5326	5727

... (contd.)



Appendix A2.3 (contd.)

District	Area		DCH-32		Yield	
	Irr.	Unirri.	Irr.	Unirri.	Irr.	Unirri.
1. Nashik	-	-	-	-	-	912.5
2. Dhule	65	-	-	-	-	-
3. Jalgaon	1000	1340	-	-	-	-
Total Nashik	1065	1340	-	-	-	912.5
4. Pune	-	-	-	-	-	-
5. Solapur	-	-	-	-	-	-
6. Ahmednagar	37	-	-	-	-	-
Total Pune	37	-	-	-	-	-
7. Sangli	8	-	-	-	-	-
8. Satara	-	-	-	-	-	-
9. Kolhapur	-	47	-	-	-	-
Total Kolhapur	8	47	-	-	-	-
10. Aurangabad	575	425	914.8	-	260.0	-
11. Jalna	-	458	-	-	-	-
12. Beed	185	-	-	-	-	-
Total Aurangabad	760	883	914.8	-	260.0	-
13. Latur	-	-	-	-	-	-
14. Perbhani	-	-	-	-	-	-
15. Nanded	-	32	-	-	-	-
Total Latur	-	32	-	-	-	-
16. Buldhana	-	350	-	-	-	570
17. Akola	-	52	-	-	-	-
18. Amravati	-	-	-	-	-	-
19. Yeotmal	24	833	-	-	-	599.4
Total Amravati	24	1235	-	-	-	1169.4
20. Wardha	-	-	-	-	-	-
21. Nagpur	2	-	-	-	-	-
22. Chandrapur	-	4085	-	-	-	-
Total Nagpur	2	4085	-	-	-	-

## Appendix A2.3 contd.

District	NHH-44				JK-Hy-1			
	Area		Yield		Area		Yield	
	Irr.	Un-	Irr.	Un-	Irr.	Un-	Irr.	Un-
1. Nashik	-	-	-	818.8	-	-	-	-
2. Dhule	300	38	1040	-	838	-	-	
3. Jalgaon	1315	1675	380	-	1100	1440	-	
Total Nashik	1615	1713	1420	818.8	1938	1440	-	
4. Pune	-	-	-	-	-	-	-	
5. Solapur	-	-	-	-	-	-	-	
6. Ahmednagar	626	-	1474.2	-	-	-	-	
Total Pune	626	-	1474.2	-	-	-	-	
7. Sangli	-	-	-	-	-	-	-	
8. Satara	-	-	-	-	-	-	-	
9. Kolhapur	-	-	-	-	-	-	-	
Total Kolhapur	-	-	-	-	-	-	-	
10. Aurangabad	13825	16675	662.3	349.6	-	-	-	
11. Jalna	8900	26771	738.2	373.4	-	-	-	
12. Beed	19777	7226	575.8	451.2	-	-	-	
Total Aurangabad	425502	50672	1875.3	1175.2	-	-	-	
13. Latur	3000	1800	-	-	-	-	-	
14. Parbhani	20000	110000	-	636.9	-	-	-	
15. Nanded	1320	51749	-	349.1	-	-	-	
Total Latur	24320	163549	-	986	-	-	-	
16. Buldhana	690	17650	-	400.3	50	1450	-	
17. Akola	-	15945	-	750.1	-	112	-	
18. Amravati	-	14700	-	519	-	50	-	
19. Yeotmal	1594	90265	-	532.5	179	1635	-	
Total Amravati	2284	138560	-	2201.9	229	3247	-	
20. Wardha	2159	27441	-	590	-	3	-	
21. Nagpur	9312	2328	-	301	230	58	-	
22. Chandrapur	-	10792	-	523.7	-	-	-	
Total Nagpur	11471	40561	-	1414.7	230	61	-	
Total Maharashtra State	82818	395055	915.9	508.1	2397	4748	-	
Irr. + un-irri.	477873				7145			

...contd.

## Appendix A2.3 (contd.)

District	Other Hybrid				Total Hybrid			
	Area		Yield		Area		Yield	
	Irri.	Un-irri.	Irri.	Un-irri.	Irri.	Un-irri.	Irri.	Un-irri.
1. Nashik	-	-	-	-	-	-	-	-
2. Dhule	11615	-	575	-	20976	108	-	-
3. Jalgaon	19619	24651	1679	501	35780	44650	-	-
Total Nashik	31234	24651	2254	501	56756	44758	-	-
4. Pune	-	-	-	-	-	-	-	-
5. Solapur	695	-	319.5	-	869	-	-	-
6. Ahmednagar	389	-	-	-	1289	-	-	-
Total pune	1081	-	319.5	-	2158	-	-	-
7. Sangli	-	-	-	-	21	-	-	-
8. Satara	-	-	-	-	85	-	-	-
9. Kolhapur	-	-	-	-	53	77	-	-
Total Kolhapur	-	-	-	-	159	77	-	-
Aurangabad	3907	4963	-	386.7	18351	22095	-	-
Jalna	224	32141	-	464.7	9124	59676	-	-
Seed	2445	-	702	474.5	22411	7866	-	-
Aurangabad	6580	37104	702	1325.9	49886	89637	-	-
Latur	832	399	-	-	3832	2199	-	-
Parbhani	1600	10400	-	333.5	24000	159000	-	-
Nanded	890	44772	-	229.9	2382	137111	-	-
Total Latur	3322	55571	-	563.4	30214	298310	-	-
Buldhana	315	66465	-	483.1	2061	121535	-	-
Akola	-	11050	-	806.3	-	57916	-	-
Amravati	-	10385	-	812.6	-	39255	-	-
Yeotmal	2113	53842	-	483.3	5734	189184	-	-
Total Amravati	2428	141742	-	2590.3	7795	407809	-	-
Wardha	48	16866	-	480.5	4301	58416	-	-
Nagpur	5102	1271	-	298.8	32200	8050	-	-
Chandrapur	-	10440	-	405.1	-	32318	-	-
Total Nagpur	5150	28583	-	1184.4	36501	98784	-	-
Total Mahara- shtra State	49795	287651	1183.6	417.3	183469	939456	-	-
Irri. + unirri.	337446			1122925				

...contd.

## Appendix A2.3 (contd.)

District	DHY 286			
	Area		Yield	
	Irri.	Unirri.	Irri.	Unirri.
1. Nashik	-	-	-	-
2. Dhule	-	-	-	-
3. Jalgaon	-	-	-	-
Total Nashik	-	-	-	-
4. Pune	-	-	-	-
5. Solapur	-	-	-	-
6. Ahmednagar	-	-	-	-
Total Pune	-	-	-	-
7. Sangli	-	-	-	-
8. Satara	-	-	-	-
9. Kolhapur	-	-	-	-
Total Kolhapur	-	-	-	-
10. Aurangabad	-	-	-	-
11. Jalna	-	-	-	-
12. Beed	-	-	-	-
Total Aurangabad	-	-	-	-
13. Latur	-	-	-	-
14. Parbhani	-	-	-	445.6
15. Nanded	-	3940	-	339.2
Total Latur	-	3940	-	784.8
16. Buldhana	-	2750	-	-
17. Akola	-	27389	-	716.2
18. Amravati	-	28390	-	-
19. Yavatmal	-	24761	-	450.5
Total Amravati	-	83290	-	1166.7
20. Wardha	-	1610	-	-
21. Nagpur	-	168	-	-
22. Chandrapur	-	2100	-	-
Total Nagpur	-	3878	-	-
Total Maharashtra State	-	91108	-	649.8
Irri. + Unirri.		91108		

## Appendix A2.3 (contd.)

District	B-1007				L-147			
	Area		Yield		Area		Yield	
	Irrig.	Unirrig.	Irrig.	Unirrig.	Irrig.	Unirrig.	Irrig.	Unirrig.
1. Nashik	-	-	-	-	-	-	-	-
2. Dhule	-	-	-	-	-	-	-	-
3. Jalgaon	-	-	-	-	-	-	-	-
Total Nashik	-	-	-	-	-	-	-	-
4. Pune	-	-	-	-	-	-	-	-
5. Solapur	-	-	-	-	-	-	-	-
6. Ahmednagar	-	-	-	-	-	-	-	-
Total Pune	-	-	-	-	-	-	-	-
7. Sangli	-	-	-	-	-	-	-	-
8. Satara	-	-	-	-	-	-	-	-
9. Kolhapur	-	-	-	-	-	-	-	-
Total Kolhapur	-	-	-	-	-	-	-	-
10. Aurangabad	-	-	-	-	-	-	-	-
11. Jalna	-	-	-	-	-	-	-	-
12. Beed	-	-	-	-	-	-	-	-
Total Aurangabad	-	-	-	-	-	-	-	-
13. Latur	-	-	-	-	-	-	-	-
14. Parbhani	-	-	-	375	-	-	-	-
15. Nanded	-	-	-	-	-	-	-	-
Total Latur	-	-	-	375	-	-	-	-
16. Buldhana	-	1525	-	-	-	1000	-	-
17. Akola	-	35	-	780.4	-	-	-	-
18. Amravati	-	-	-	525	-	-	-	-
19. Yavatmal	-	3689	-	-	-	675	-	-
Total Amravati	-	5249	-	1305.4	-	1675	-	-
20. Wardha	-	-	-	-	-	-	-	-
21. Nagpur	-	1530	-	227.1	-	325	-	-
22. Chandrapur	-	1926	-	-	-	-	-	-
Total Nagpur	-	3456	-	227.1	-	325	-	-
Total Maharashtra State		8705	-	470.5	-	2000	-	-
Irrig. + Unirrig.		8705				2000		

... contd.

## Appendix A2.3 (contd.)

District	SRT 1				0-81			
	Area		Yield		Area		Yield	
	Irrig.	Un-irrig.	Irrig.	Un-irrig.	Irrig.	Un-irrig.	Irrig.	Un-irrig.
1. Nashik	-	-	-	495.0	-	-	-	-
2. Dhule	30	-	-	-	-	-	-	-
3. Jalgaon	-	-	-	-	-	-	-	-
Total Nashik	30	-	-	495.0	-	-	-	-
4. Pune	-	-	-	-	-	-	-	-
5. Solapur	-	-	-	-	-	-	-	-
6. Ahmednagar	-	-	-	-	-	-	-	-
Total Pune	-	-	-	-	-	-	-	-
7. Sangli	-	-	-	-	-	-	-	-
8. Satara	-	-	-	-	-	-	-	-
9. Kolhapur	-	-	-	-	-	-	-	-
Total Kolhapur	-	-	-	-	-	-	-	-
10. Aurangabad	-	-	-	-	-	-	-	-
11. Jalna	-	-	-	-	-	-	-	-
12. Beed	-	-	-	-	-	-	-	-
Total Aurangabad	-	-	-	-	-	-	-	-
Latur	-	-	-	-	-	-	-	-
Parbhani	-	-	-	-	-	-	-	-
Nanded	-	-	-	349.3	-	-	-	-
Total Latur	-	-	-	349.3	-	-	-	-
Buldhana	-	500	-	-	-	975	-	-
Akola	-	240	-	-	-	1163	-	-
Amravati	-	-	-	678.1	-	5600	-	-
Yavatmal	-	1645	-	-	-	1342	-	-
Total Amravati	-	2385	-	678.1	-	9080	-	-
20. Wardha	-	-	-	-	-	-	-	-
21. Nagpur	-	509	-	-	-	-	-	-
22. Chandrapur	-	7700	-	-	-	-	-	-
Total Nagpur	-	8209	-	396.9	-	-	-	-
Total Maharashtra State	30	10594	-	507.1	-	9080	-	-
Irrig. + Unirrig.		106241				9080		

...contd.

## Appendix A2.3 (contd.)

District	Area		Yield	
	Irrig.	Unirrig.	Irrig.	Unirrig.
1. Nashik	-	-	-	-
2. Dhule	-	2045	-	564.2
3. Jalgaon	500	31530	1015.6	548.6
Total Nashik	500	33575	1015.6	1112.8
4. Pune	-	-	-	-
5. Solapur	-	-	704.5	-
6. Ahmednagar	-	-	-	-
Total Pune	-	-	704.5	-
7. Sangli	595	150	-	-
8. Satara	-	-	1181.1	-
9. Kolhapur	-	-	-	-
Total Kolhapur	595	150	1181.1	-
10. Aurangabad	73	-	-	400.3
11. Jalna	-	1373	-	362.1
12. Beed	400	-	-	500
Total Aurangabad	473	1373	-	1268.4
13. Latur	430	230	-	-
14. Parbhani	-	26000	-	693.7
15. Nanded	-	29066	-	366
Total Latur	430	55296	-	1059.7
16. Buldhana	-	21000	-	503.8
17. Akola	-	107863	-	674.8
18. Amravati	-	130450	-	561.3
19. Yavatmal	-	104048	-	524
Total Amravati	-	363361	-	2263.9
20. Wardha	-	66375	-	504.6
21. Nagpur	-	3040	-	568
22. Chandrapur	-	8300	-	328.4
Total Nagpur	-	77715	-	1396
Total Maharashtra State	1998	531470	846.8	532.7
Irrig. + Unirrig.	533468			

Res.

## Appendix 42.3 (contd.)

District	MCU-5				Other American			
	Area		Yield		Area		Yield	
	Irri.	Un-irri.	Irri.	Un-irri.	Irri.	Un-irri.	Irri.	Un-irri.
1. Nashik	-	-	-	-	-	400	-	-
2. Dhule	-	-	-	365.0	-	1825	-	-
3. Jalgaon	-	-	-	-	-	-	-	-
Total Nashik	-	-	-	365	-	2225	-	-
4. Pune	-	-	-	-	-	-	-	-
5. Solapur	-	-	-	-	-	-	-	-
6. Ahmednagar	-	-	-	-	-	-	-	-
Total Pune	-	-	-	-	-	-	-	-
7. Sangli	-	-	-	-	-	-	-	-
8. Satara	-	-	-	-	-	-	-	-
9. Kolhapur	-	-	-	-	-	-	-	-
Total Kolhapur	-	-	-	-	-	-	-	-
Aurangabad	-	-	-	-	-	-	-	-
Jalna	-	-	-	-	-	-	-	-
Beed	-	-	-	-	-	-	-	-
Total Aurangabad	-	-	-	-	-	-	-	-
10. Latur	-	-	-	-	34	12	-	-
14. Parbhani	-	-	-	-	-	-	-	-
15. Nanded	-	-	-	-	-	-	-	-
Total Latur	-	-	-	-	34	12	-	-
16. Buldhana	-	1900	-	-	-	4270	-	-
17. Akola	-	988	-	-	-	4485	-	-
18. Amravati	-	-	-	-	-	104215	-	-
19. Yavatmal	-	-	-	-	-	47100	-	-
Total Amravati	-	2888	-	-	-	160070	-	-
20. Wardha	-	-	-	-	-	-	-	-
21. Nagpur	-	-	-	-	-	13	-	-
22. Chandrapur	-	-	-	732.8	-	12	-	-
Total Nagpur	-	-	-	732.8	-	25	-	-
Maharashtra State	-	2888	-	437.6	34	162332	-	-
Irrigated	-	-	-	-	-	-	-	-
+Unirrigated	-	2888	-	-	-	162366	-	-

(Continued)



## Appendix A2.3 (contd.)

District	Total American				AKH-405			
	Area		Yield		Area		Yield	
	Irri.	Un-irri.	Irri.	Un-irri.	Irri.	Un-irri.	Irri.	Un-irri.
1. Nashik	-	400	-	495	-	-	-	-
2. Dhule	-	3900	-	-	-	-	-	-
3. Jalgaon	500	31530	-	-	-	625	-	-
Total Nashik	500	35830	-	-	-	625	-	-
4. Pune	-	-	-	-	-	-	-	-
5. Solapur	-	-	-	-	-	-	-	-
6. Ahmednagar	-	-	-	-	-	-	-	-
Total Pune	-	-	-	-	-	-	-	-
7. Sangli	595	150	-	-	-	-	-	-
8. Satara	-	-	-	-	-	-	-	-
9. Kolhapur	-	-	-	-	-	-	-	-
Total Kolhapur	595	150	-	-	-	-	-	-
10. Aurangabad	73	-	-	-	-	-	-	-
11. Jalna	-	1373	-	-	-	474	-	-
12. Beed	400	-	-	-	-	808	-	650
Total Aurangabad	473	1373	-	-	-	1282	-	650
13. Latur	464	242	-	-	-	-	-	-
14. Parbhani	-	26000	-	-	-	10200	-	-
15. Nanded	-	33006	-	-	-	15857	-	-
Total Latur	464	59248	-	-	-	26057	-	-
16. Buldhana	-	33920	-	-	-	31725	-	431.
17. Akola	-	142163	-	-	-	17609	-	586.
18. Amravati	-	268655	-	-	-	8390	-	750.
19. Yavatmal	-	183260	-	-	-	7764	-	637.
Total Amravati	-	627998	-	-	-	65488	-	2406.
20. Wardha	-	67985	-	-	-	-	-	-
21. Nagpur	-	5585	-	-	-	-	-	-
22. Chandrapur	-	20038	-	-	-	-	-	-
Total Nagpur	-	93608	-	-	-	-	-	-
Maharashtra State	2032	818207	-	-	-	93452	-	541
Irrigated + Unirrigated		820239				93452		

(Continued)

## Appendix A2.3 (contd.)

District	AKA-8401			
	Area		Yield	
	Irri.	Unirri.	Irri.	Unirri.
1. Nashik	-	-	-	-
2. Dhule	-	1168	-	-
3. Jalgaon	-	3080	-	-
Total Nashik	-	4248	-	-
4. Pune	-	-	-	-
5. Solapur	-	-	-	-
6. Ahmednagar	-	-	-	-
Total Pune	-	-	-	-
7. Sangli	-	-	-	-
8. Satara	-	-	-	-
9. Kolhapur	-	-	-	-
Total Kolhapur	-	-	-	-
10. Aurangabad	-	-	-	-
11. Jalna	-	-	-	-
12. Beed	-	-	-	-
Total Aurangabad	-	-	-	-
13. Latur	-	-	-	-
14. Parbhani	-	-	-	-
15. Nanded	-	71	-	-
Total Latur	-	71	-	-
16. Buldhana	-	25010	-	-
17. Akola	-	13337	-	-
18. Amravati	-	5200	-	-
19. Yavatmal	-	4942	-	-
Total Amravati	-	48489	-	-
20. Wardha	-	98	-	-
21. Nagpur	-	-	-	-
22. Chandrapur	-	-	-	-
Total Nagpur	-	98	-	-
Maharashtra State	-	52906	-	-
Irrigated + Unirrigated	-	52906	-	-

## Appendix A2.3 (contd.)

District	Y <sub>1</sub>			
	Area		Yield	
	Irrigated	Un-irrigated	Irrigated	Un-irrigated
1. Nashik	-	-	-	-
2. Dhule	-	41083	-	376
3. Jalgaon	-	111000	-	542.8
Total Nashik	-	152083	-	918.8
4. Pune	-	-	-	-
5. Solapur	-	-	-	-
6. Ahmednagar	-	-	-	-
Total Pune	-	-	-	-
7. Sangli	-	-	-	-
8. Satara	-	-	-	-
9. Kolhapur	-	-	-	-
Total Kolhapur	-	-	-	-
10. Aurangabad	-	17631	-	312.6
11. Jalna	-	11333	-	301.7
12. Beed	-	9570	-	383.5
Total Aurangabad	-	38534	-	997.8
13. Latur	-	266	-	-
14. Parbhani	-	9000	-	-
15. Nanded	-	7661	-	-
Total Latur	-	16927	-	-
16. Buldhana	-	535	-	449.9
17. Akola	-	3006	-	-
18. Amravati	-	35	-	-
19. Yavatmal	-	90	-	-
Total Amravati	-	3666	-	449.9
20. Wardha	-	-	-	-
21. Nagpur	-	-	-	-
22. Chandrapur	-	-	-	-
Total Nagpur	-	-	-	-
Maharashtra State	-	211210	-	442.7
Irrigated	-	-	-	-
Unirrigated	-	211210	-	-

## Appendix A2.3 (contd.)

District	Other Deshi			
	Area		Yield	
	Irrigated	Un-irrigated	Irrigated	Un-irrigated
1. Nashik	-	100	-	-
2. Dhule	-	-	-	-
3. Jalgaon	-	544	-	-
Total Nashik	-	644	-	-
4. Pune	-	-	-	-
5. Solapur	-	-	-	-
6. Ahmednagar	-	-	-	-
Total Pune	-	-	-	-
7. Sangli	-	-	-	-
8. Satara	-	-	-	-
9. Kolhapur	-	-	-	-
Total Kolhapur	-	-	-	-
10. Aurangabad	-	70	-	-
11. Jalna	-	30819	-	-
12. Beed	-	145	-	-
Total Aurangabad	-	31034	-	-
13. Latur	-	18397	-	-
14. Parbhani	-	37652	-	-
15. Nanded	-	17212	-	-
Total Latur	-	-	-	-
16. Buldhana	-	3114	-	-
17. Akola	-	2980	-	-
18. Amravati	-	1680	-	-
19. Yavatmal	-	-	-	-
Total Amravati	-	7774	-	-
20. Wardha	-	-	-	-
21. Nagpur	-	-	-	-
22. Chandrapur	-	-	-	-
Total Nagpur	-	-	-	-
Maharashtra State	-	112713	-	-
Irrigated + Unirrigated		112713		

## Appendix 42.3 (contd.)

District	Total Deshi	
	Area	
	Irrigated	Un-irrigated
	Yield	
	Irrigated	Un-irrigated
1. Nashik	-	100
2. Dhule	-	42251
3. Jalgaon	-	115249
Total Nashik	-	157600
4. Pune	-	-
5. Solapur	-	-
6. Ahmednagar	-	-
Total Pune	-	-
7. Sangli	-	-
8. Satara	-	-
9. Kolhapur	-	-
Total Kolhapur	-	-
10. Aurangabad	-	17701
11. Jalna	-	42626
12. Beed	-	10523
Total Aurangabad	-	70850
13. Latur	-	18663
14. Parbhani	-	56852
15. Nanded	-	40801
Total Latur	-	116316
16. Buldhana	-	60384
17. Akola	-	36932
18. Amravati	-	15305
19. Yavatmal	-	12796
Total Amravati	-	125417
20. Wardha	-	98
21. Nagpur	-	-
22. Chandrapur	-	-
Total Nagpur	-	98
Maharashtra State		470481
Irrigated		
+ Unirrigated		

## Appendix 42.3 (contd.)

District	Total Area					
	Total Hybrid		Total American		Total Deshi	
	Irrigated	Un-irrigated	Irrigated	Un-irrigated	Irrigated	Un-irrigated
1. Nashik	-	-	-	400	-	300
2. Dhule	20976	108	-	3900	-	42251
3. Jalgaon	35780	44650	500	31530	-	115249
Total Nashik	56756	44758	500	35830	-	157800
4. Pune	-	-	-	-	-	-
5. Solapur	869	-	-	-	-	-
6. Ahmednagar	1289	-	-	-	-	-
Total Pune	2158	-	-	-	-	-
7. Sangli	21	-	595	150	-	-
8. Satara	85	-	-	-	-	-
9. Kolhapur	53	77	-	-	-	-
Total Kolhapur	1159	77	595	150	-	-
10. Aurangabad	18351	22095	73	-	-	17701
11. Jalna	9124	59676	-	1373	-	42626
12. Beed	22411	7866	400	-	-	10523
Total Aurangabad	49886	89637	473	1373	-	70850
13. Latur	3832	2199	464	242	-	18663
14. Parbhani	24000	159000	-	26000	-	56852
15. Nanded	2382	137111	-	33006	-	40801
Total Latur	30214	298310	464	59248	-	116316
16. Buldhana	2061	121535	-	33920	-	60384
17. Akola	-	57916	-	142163	-	36932
18. Amravati	-	39255	-	268655	-	15305
19. Yavatmal	5734	189184	-	183260	-	12796
Total Amravati	7795	407890	-	627998	-	125417
20. Wardha	4301	58416	-	67985	-	98
21. Nagpur	32200	8050	-	5585	-	-
22. Chandrapur	-	32318	-	20038	-	-
Total Nagpur	36501	98784	-	93608	-	98
Maharashtra State	183469	939456	2032	818207	-	470481
Irrigated						
+ Unirrigated	1122925		820239		470481	

Appendix Table A2.4: Variety-wise Ginning-out-turn (1993-94)

Variety	Ginning-out-turn
H-4	34.5
H-6	31.2
Varalaxmi	34.5
PKV <sub>2</sub> AHH-468	34.5
DCH-32	34.5
NHH-44	34.5
LRA-5166	34.5
Laxmi	35
Y-1	37.3
SRT-1	34.1
AKH 4 & 5	35.3
Buri 1007 & L-147	33.4
DHY-286	34.3
G-6	34.1

Source: Directorate of Agriculture, Krishi Bhavan, Pune  
(Unpublished data)

### Chapter III

#### Inter State Flow of Cotton

A detailed study on estimates of cotton production in Maharashtra in Chapter II revealed that area estimates should be checked for more reliability in production estimates. The crop-cutting surveys conducted to estimate the yield of the crop variety-wise, do not seem to pose any major problem for arriving at production estimate.

A further feature related to production of cotton in Maharashtra was the decision of the Maharashtra State Government to enter the cotton market in the state through its agency as a monopolist banning private trade and fixing the price of cotton to be paid to the producers. Thus a scheme of Monopoly Marketing of Cotton was introduced in Maharashtra and according to the Maharashtra Raw Cotton (Procurement, Processing and Marketing) Act, 1971 the State Government was authorised to purchase the entire raw cotton produced within the state through its chief agent namely, the Maharashtra State Co-operative Cotton Growers Marketing Federation. Further, as per the provisions of the Maharashtra Raw Cotton Act, movement of cotton out of the state and inflow into the state is prohibited. Green cards are required to be maintained at the village level and are normally issued by the Primary Co-operative Credit Society of the village. The purpose of maintaining a green card is that the information about the cotton grown by the cultivator i.e. his landholdings, acreage under cotton, variety of cotton-grown, expected yield is readily available. At the time of procurement of raw cotton by the Federation, it is expected that the information contained in the green card will serve as a guide for the quantum/variety of kapas to be procured at the centre.

The cotton growers normally tender kapas i.e. raw cotton



to the Federation and after weighing and grading, the kapas is ginned and pressed into bales by the private as well as co-operative ginning and pressing mills. Since the provisions of the Monopoly Procurement Scheme prohibit inflow and outflow of cotton into and out of the state, theoretically it is expected that the cotton produced in the state must be equal to the cotton procured by the Federation except in exceptional cases where there have been major fire accidents in the procurement centres.

However, despite the provisions laid in the Maharashtra Raw Cotton Act, banning inflow and outflow of cotton, there appears to be indirect evidence that inter-state flow of cotton, particularly in border areas does seem to exist. This surreptitious movement of cotton could either boost up the availability of cotton in the state if there is an inflow or reduce the availability of cotton in case cotton moves to other states. In this case, the estimated production of cotton will naturally diverge from the quantity of raw cotton procured by the Federation and further ginned and pressed into bales. The cause for movement of cotton across the border is mainly that farmers want to take advantage of any price differentials that exist between Maharashtra and border states and in some cases also to avoid re-paying co-operative dues. This, however, is not the theme of our study and our main focus is to study the difference in quantity procured from centres in border districts with that produced in the centre. This would give us the magnitude of divergence, if any, between the estimates of cotton production by the Directorate of Agriculture and the raw cotton procured by the Federation and ginned and pressed by the Federation and ginned and pressed into bales.

### 3.1 Estimated Production of Cotton In Maharashtra and Procurement Under Monopoly Procurement Scheme

For administrative convenience, the cotton growing

districts in Maharashtra are divided into eleven zones. The distribution of cotton growing districts in each zone is given below :

<u>Name of the Zone</u>	<u>Name of the Districts in the Zone</u>
1. Nagpur	(1) Nagpur (2) Wardha
2. Yeotmal	(1) Yeotmal (2) Chandrapur
3. Amravati	(1) Amravati
4. Akola	(1) Akola
5. Khamgaon	(1) Buldhana
6. Jalgaon	(1) Jalgaon
7. Dhule	(1) Dhule (2) Nasik
8. Aurangabad	(1) Aurangabad (2) Jalna (3) Beed (part)
9. Parbhani	(1) Parbhani (2) Beed
10. Nanded	(1) Nanded (2) Latur
11. Phaltan	(1) Pune (2) Satara (3) Kolhapur (4) Sangli (5) Solapur (6) Ahmednagar

As explained earlier, there is tendency for cotton to move from Maharashtra to other states and vice-versa which is against the spirit of the Maharashtra Raw Cotton Act, 1971. This tendency has been observed in several years and especially when price differentials between Maharashtra and border areas are large.

In Table 3.1 we have presented zone-wise the procurement of cotton lint by the Maharashtra Federation and compared it with the production in that zone. In Table 3.2 we have compared variety-wise production of cotton in the state with that procured by the Federation.

It can be observed from Table 3.1 that the estimated production of cotton for 1993-94 was 26.25 lakh bales but the Maharashtra Federation procured only 13.25 lakh bales which means that the Federation procured only 50 percent of

the state's production and 50 per cent was possibly illegally moved to border areas barring a few fire accidents and damages due to unseasonal rains.

In Dhule zone only 2 per cent of the total production was procured by the Federation while in Nanded zone which borders Andhra Pradesh only 11 percent was procured. In Jalgaon zone which borders Madhya Pradesh, 33 per cent of the total production was procured. It was observed that only in Nagpur and Parbhani zone, virtually the entire production was procured by the Federation while in Aurangabad zone the procurement was greater than the production ! Apparently cotton moved from other centres into Aurangabad zone.

A close observation at Table 3.2 reveals that only 8.8 per cent of H-4 variety, 12.8 per cent of DCH-32 and barely 24.5 per cent of the other hybrid varieties grown was procured by the Federation. Even in case of American and Deshi varieties large outflows were observed. Mills which are located largely in Bombay have demand for specific varieties of cotton depending on the quality of yarn and cloth they want to spin. Mills are also aware of the variety-wise production of cotton in the state and in case their demand arises for varieties that are moved out of the state, it could upset their production planning as cotton may have to be transported from longer distances back to Bombay. Since there is concentration of textile industry in Bombay for which cotton is the main raw material and Maharashtra is one of the major producers of cotton in India, large outflows of cotton is not in the interest of the textile industry. Further, movement of cotton outside Maharashtra may also affect the smooth working of the Monopoly Procurement scheme but again that is not the base of our study.

**Table 3.1 : Zone-wise Production and Procurement Figures of Cotton Lint (1993-94)**

(Production & Procurement in bales of 170 kg. each)

Zone	Estimated Production by Directorate of Agriculture	Procurement by Maharashtra Federation	(2)-(3)	(3) as a percentage of (2)
(1)	(2)	(3)	(4)	(5)
1. Jalgaon	255300	85465	169835	33
2. Dhule	64300	1332	62968	2.07
3. Khamgaon	212200	87634	124566	41.3
4. Akola	379600	194784	184816	51.3
5. Amravati	376400	144330	232070	38.3
6. Yeotmal	469500	158024	311476	33.6
7. Nagpur	188800	170430	18370	90
8. Nanded	186200	20957	165243	11.2
9. Parbhani	323650	270725	52925	83.6
10. Aurangabad	162150	188976	(-)26826	-
11. Phaltan	7309	2553	4747	35
<b>Total Maharashtra</b>	<b>2625400</b>	<b>1325210</b>	<b>1300190</b>	<b>50.4</b>

**Source :** (1) District-wise Statistical Information of Maharashtra, Part II (1993-94 & 1994-95), Commissionerate of Agriculture, Pune.

(2) Maharashtra State Co-operative Cotton Growers Marketing Federation, Bombay.

**Table 3.2 : Variety-wise Estimated Production and Procurement of Cotton Lint (1993-94)**

(in bales of 170 kg. each)

Variety (1)	Estimated Production (2)	Procurement by Federation (3)	(2)-(3) (4)
H-4	26400	2317	24083
H-6	103700	82548	21152
Varalaxmi	600	-	600
PKV.2/AHH-468	209200	71176	138024
NHH-44	360200	491007	(-)130807
DCH-32	14000	1801	12199
JKHY-1	4800	N.A.	-
Other Hybrid	414700	101800	312900
DHY-286	122600	64123	58477
S-1007	7900	5752	2184
L-147	1800	N.A.	-
SRT-1	10700	N.A.	-
O-81	9600	1884	7716
LRA-5166	835100	392039	443061
MCY-5	44600	188	44412
AKH-4	25700	49568	(-)23868
AKH-5	27900	1547	26353
Y-1	143100	51638	91462
Others	-	7822	
<b>Total</b>	<b>2625400</b>	<b>1325210</b>	

**Source:** (1) Directorate of Agriculture, Pune (Unpublished data).

(2) Maharashtra State Co-operative Cotton Growers Marketing Federation, Bombay.

### 3.2 Estimated Production and Procurement of Cotton in Border Areas

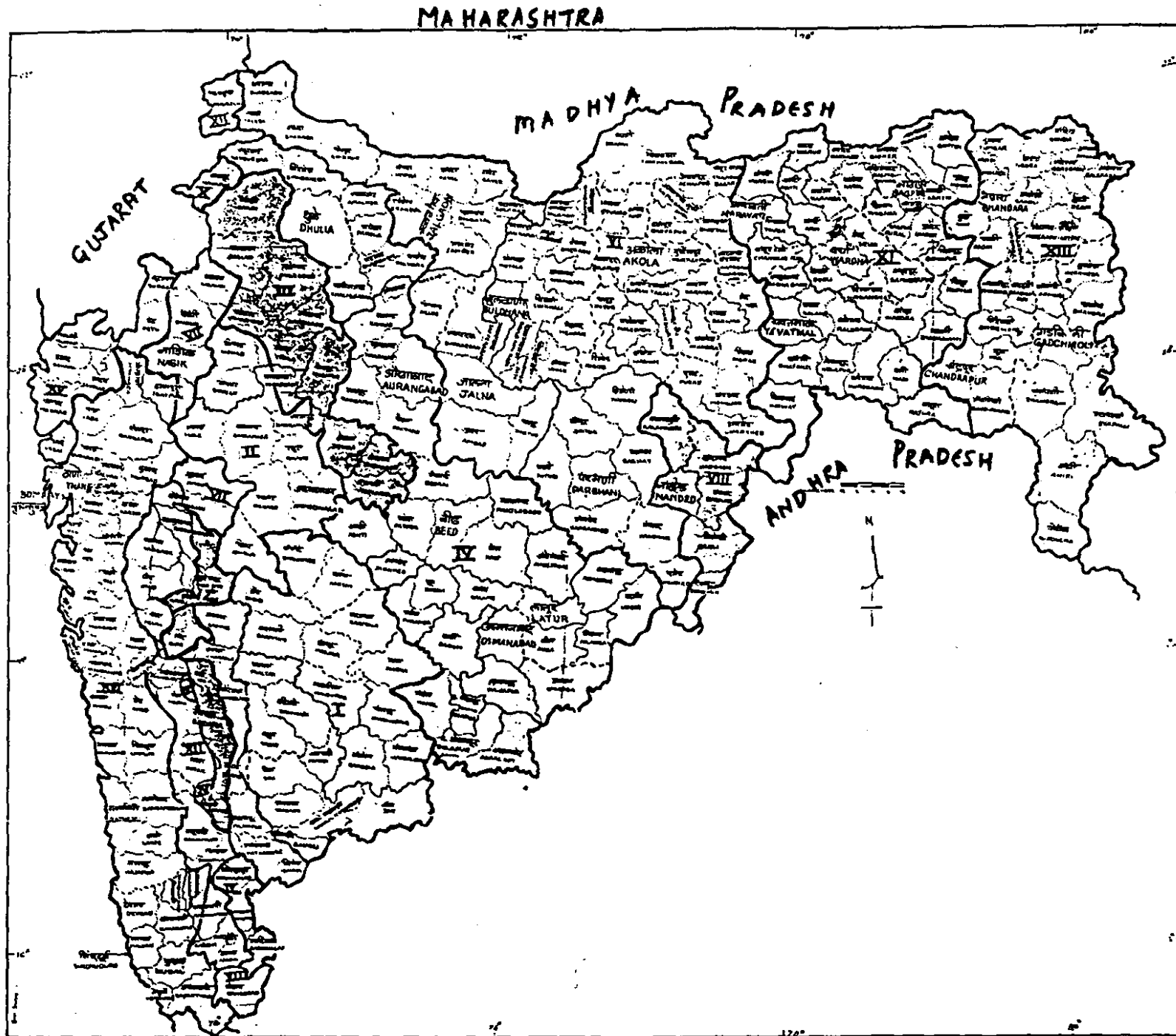
After looking at the production and procurement at the district and zone-level an attempt has been made to study the issue at the taluka level. For this purpose we have selected a few talukas which border Gujarat, Madhya Pradesh and Andhra Pradesh. In these selected centres we have compared the cotton produced in the taluka with that procured by the Federation.

In order to arrive at the production of cotton in the taluka, data was collected from the Directorate of Agriculture on total area under cotton. The average yield of raw cotton was derived from the crop cutting experiments conducted in the taluka concerned. Thus, taking into consideration the area under cotton in the taluka and its yield, the approximate production of cotton was estimated. The quantities procured by the Maharashtra Federation in the selected talukas was noted from their records.

Table 3.3 indicates the cotton procured and estimated cotton production in selected border talukas. Further the map of Maharashtra indicates the markets that are close to the border areas. A number of markets are barely 15 to 20 kms away from the border and hence movement of cotton outside the state is possible.

From the table it can be observed that in case of Shahada in Dhulia district which is only 15 kms from the border, the Maharashtra Federation procured a mere one quintal of kapas and possibly the entire production was moved out to border areas. Similarly in Shirpur in Dhulia district the Federation procured only 2 per cent of the production and there could be a possible outflow in case of the rest of the production.

In Deglur, in Nanded district which is just 5 kms. away from Andhra Pradesh border only 1.1 per cent of the quantity produced was procured by the Federation very small quantities



**Table 3.3: Production and Procurements of Cotton in Selected Talukas (1993-94)**

District/Taluka	Production (Bales of 170 kg.each) (1)	Procurement (Bales of 170 kgs. each) (2)	(2) as a percentage of (1) (3)
<u>Amravati</u>			
Achalapur	33657.6	7484	22
Morshi	4829.6	4438	91
Warud	20814	2361	11
<u>Dhule</u>			
Shirpur	649	135.8	2.1
Shahada	16806	.2	1.2
<u>Wanded</u>			
Doglur	11608	124	1.1
Bokar	20222	3800	18.8
Kinwat	29339	60	.20
Jadgaon	29240	396	1.3
<u>Jalgaon</u>			
Chopda	32109	405	1.3
Etlabad	6569	491	7.5
Yawal	10017	4988	50
<u>Nagpur</u>			
Saoner	6057	2234	37
Katol	3082	740	24

Source: (1) Directorate of Agriculture (Krishi Bhawan), Pune.

(2) Maharashtra State Co-operative Cotton Growers' Marketing Federation.



of procurement was also observed in Chopda and Edlabad centres of Jalgaon district which border Madhya Pradesh.

The data presented in Table 3.3 clearly indicate clandestine movement of cotton across the border and times the procurement in these centres was abnormally low. This outflow often brings in large variations between cotton produced in the state and that procured by the Federation. It also reduces the availability of cotton in Maharashtra which is detrimental not only to the proper functioning of the scheme but at times also to the mills if they decide to increase their stocks of cotton which may not be readily available due to outflow to other states.

## Chapter IV

### Summary and Conclusions

The importance of the textile industry on the national scene needs no emphasis and the state of Maharashtra has a substantial share in the textile industry of the country. Although in the recent past the use of man-made fibres in the textile industry has risen sharply, cotton continues to be the industry's pre-dominant raw material.

Further, with the introduction of High Yielding Varieties such as H-4, H-6, Varalaxmi, MCU-5, Suvin, etc., since the late 1970's, the production of cotton was greatly enhanced. These varieties as their name suggests were naturally high yielding and hence returns to the cotton growers were much higher. Moreover, in view of their higher intrinsic spinning quality the per unit price fetched by these varieties was substantially higher. In view of this, the cotton growers went in a big way to cultivate these varieties wherever possible. At times, it was possible that this increased production could find an export outlet as domestic requirements did not always keep pace with increased production. Thus cotton also emerged as a source of foreign exchange earnings for the country. Export of cotton yarn and textiles was yet another source of foreign exchange earnings. All these factors naturally highlight the importance of cotton to the Indian economy, both to the agricultural as well as the industrial sector.

Maharashtra has a substantial share in the textile industry of the country and the textile mills are highly dependent on the production of cotton for their survival. It is, therefore, important that the estimates of cotton production should be reliable.

In Maharashtra, estimates of cotton production are made by the Directorate of Agriculture on the basis of crop cutting

experiments. The data relating to area under cotton are collected under a scheme namely "Timely Reporting of Agricultural Intelligence". The ratio method is used for estimating area. For yield estimation another survey viz., "Crop Estimation Survey on Cotton" is conducted every year. The sampling design adopted for the survey is the multi-stage stratified random sampling design with tehsil as stratum, village as a primary unit of sampling and plot size of .02 hectares as the ultimate unit of sampling. A detailed questionnaire is addressed to the farmers of the sample plot and accordingly the yield on the sample plot is estimated. In the state of Maharashtra a total of 2973 crop cutting experiments were conducted during the season 1993-94 out of which 416 experiments were conducted on irrigated area while 2557 experiments were conducted on un-irrigated area. Two fields per village are randomly and one plot per field is randomly located for recording crop yield. In each taluka, a simple arithmetic mean of net yield of the sample plots are obtained. The average yield in each taluka is multiplied by its area in order to arrive at its production. The production estimates of all talukas in the district are combined together and divided by the total area under cotton in the district in order to arrive at the district average yield which is thus weighted by area. The state average is obtained by combining the district average yield in proportion to the net area under cotton in the districts. The Directorate of Agriculture estimates the yield on the basis of crop cutting experiments in two groups. In the first group yield is estimated for High Yielding Varieties and Traditional Varieties whereas in the second group it is estimated for irrigated and unirrigated varieties.

While the above method of estimating production of cotton in Maharashtra is supposed to reveal a more or less precise

estimate, it is possible that these production estimates are at variance with the actual amount of cotton ginned and pressed into bales by the mills. The two estimates should more or less be equal, all the more because cotton is a commercial crop and personal household consumption is negligible, most of the cotton being marketed to the nearest market yards. Further, in the state of Maharashtra, the Monopoly Procurement Scheme of cotton which came into existence from the 1972-73 cotton season banned all private trading in cotton and the cotton growers had no option but to sell their cotton to the agent of the state Government. Thus, since the Maharashtra State Co-operative Cotton Growers Marketing Federation was the sole agency in the purchase of raw cotton, it was naturally expected that the estimated cotton production in the state should theoretically more or less match the procurement of cotton by the Federation. The sale of cotton outside Maharashtra to the border areas and vice-versa was against the provisions of the Maharashtra Raw Cotton Act, 1971. However, comparison of production estimates with that of procurement by the Maharashtra Federation do show evidence of inter-state flow of cotton as the two figures often diverge from each other. Outflow of cotton can reduce its availability in the state and also upset the production planning of the mills.

Arising out of this, a study on variations of estimates of cotton production was undertaken, with 1993-94 as the reference year in order to investigate the reliability of cotton production estimates and the plausible reasons in case of any divergence.

In order to check the precision of cotton production estimates as published by the Directorate of Agriculture, an attempt was made by us to estimate production, with the help of data obtained from crop cutting experiments. Using the data

on average yield, area and ginning out-turn we have estimated the production of cotton lint district-wise, variety-wise and by irrigation status and aggregated it to arrive at the overall production of cotton in Maharashtra. This aggregated production has also been classified into two-groups i.e. (1) High Yielding Varieties and Traditional (2) Irrigated and Unirrigated so that our production estimates can be made comparable with that of the Directorate.

While attempting to estimate production, the district-wise data on area at a disaggregated level was used i.e. area under each variety and by irrigation status in each district was used. However, it was observed that when this disaggregated data (variety-wise and by irrigation status) was aggregated to arrive at area under cotton in each district, this aggregated figure did not match with the figures published by the Directorate of Agriculture. While the total area under cotton cultivation in Maharashtra as a whole, between the Directorate's published figures and the disaggregated data when aggregated did not show much variation, the difference was sometimes marked with respect to certain varieties and certain districts. While our estimates on cotton production were based on district-wise data at a very disaggregated level (since we calculated the production district-wise, variety-wise and by irrigation status), the Directorate's estimate as mentioned earlier were only at two levels i.e.

(1) High Yielding Varieties and Traditional (2) Irrigated and Unirrigated. The disaggregated data related to area for each district (variety-wise and by irrigation status) to estimate production by us when aggregated varied from the figures related to area used by the Directorate to estimate production. Hence, an enquiry was made with the officials of the Directorate of Agriculture regarding major discrepancies in area between their published estimates and that of the disaggregated data when

aggregated. The officials stated that their estimates relating to cotton area were collected under the scheme named "Timely Reporting of Agricultural Intelligence" where a sample of 20 per cent of the total villages in each taluka is selected every year and the concerned talatis report the area under the crop for the current year as well as for the previous year. On the basis of this data, ratio method is used for estimating area. In the first instance, ratio of actual area under cotton in the sample villages selected for conducting the experiments on cotton to that in the preceding year in the same villages is worked at the tehsil level. This ratio is multiplied by the actual total area under cotton in the tehsil during the preceding year to obtain tehsil-wise sample estimates of area for the current year. The tehsil-wise estimates of area are subsequently pooled to get district-wise estimates of area under cotton which in turn are pooled together to get area under cotton in the state.

Thus the Directorate's estimate on area are based on sampling procedure but the disaggregated data for each district, variety-wise and by irrigation status is obtained from the records of the Agricultural Development Officers. Since the source of data is different, there is every possibility that both the sources show variations with each other, which at times is marked.

Thus while going into the main theme of our study i.e. comparing our estimates on cotton production with that of the Directorate, we have to keep in mind that differences in area in each district are sometimes quite large and this will naturally result in different production estimates as area is vital in determining production. Thus, at times comparison between the two estimates may be meaningless.

However, despite the difference in district-wise area estimates, the study showed that for the state as a whole the

disaggregated data when aggregated does more or less match with the area estimated by the Directorate on the basis of the ratio method. The same was observed with respect to production. While production estimated by us was 25.82 lakh bales, the Directorate's estimate was 26.25 lakh bales which is negligibly more than our estimate. The district-wise study showed that in certain districts such as Yeotmal, Amravati and Buldhana the difference in production estimates were negligible. A contrasting feature was, however, observed in case of Jalgaon where a difference in production of 58566 bales between our estimates and that of the Directorate was observed. This difference in production estimate is attributed to difference in area used for estimating production. In fact almost any difference in the two estimates for any district can be largely attributed to differences in area.

Besides area, yield which is the other vital factor determining production is estimated by conducting crop cutting experiments. A close observation at the sampling procedure related to crop cutting experiments revealed that while experiments have been conducted with respect to most varieties in most districts, in case of certain varieties as such as JKHY-1 which has approximately 7000 hectares under cultivation, no experiments have been conducted. Further, in case of certain varieties and certain districts, very few experiments have been conducted and hence in such cases the sample may not be representative of the population. The reliability of yield on the sample plot also depends on the number of pickings that are taken into consideration while estimating the yield. It is well known that cotton is picked during the harvesting period four to six times as all the bolls in the field do not mature at the same time and even the bolls on the same plant open at different times. It is therefore important that all pickings must be taken into consideration while estimating yield on the sample plot because if all

pickings are not taken into consideration, there is a possibility that yield estimates could be inaccurate.

However, a close look at the data on crop cutting experiments, with respect to all districts and all varieties, seemed to indicate that all pickings have been taken into consideration for estimating the yield on the sample plot. At times, in case of certain varieties as many as eight pickings were observed.

Other than estimating production through crop cutting surveys in order that the textile mills are average about the availability of cotton which is their main raw material, it is also expected that the entire cotton produced in the state is procured by the Maharashtra Federation which is the sole buying agency of the Government for the purchase of raw cotton.

A close observation at the figures related to estimated production of cotton and the cotton procured by the Federation revealed indirect evidence that there is a surreptitious movement of cotton to border areas. The estimated production of cotton for 1993-94 was 26.25 lakh bales but the Maharashtra Federation procured only 13.25 lakh bales which means that the Federation procured only 50 per cent of the state's production. The rest of the production was apparently illegally moved out barring fire accidents and other damages to the crop.

In Dhule zone for example, only 2 per cent of the total production was procured by the Federation and in case of Shahada taluka in Dhule district which is only 15 kms from the border, the Maharashtra Federation procured a mere 1 quintal of kapas. Similarly in Shirpur in Dhulia district the Federation procured only 2 per cent of the production and possibly there was an outflow of the rest of the production to border areas.

In Nanded zone which borders Andhra Pradesh, only 11 per cent was procured. In Deglur taluka in Nanded district which is just 5 kms. from Andhra Pradesh only 1.1 per cent of the



quantity produced was procured by the Federation. In fact, very low procurement was observed in a number of centres in the border areas. This outflow often brings in large variations between cotton produced in the state and that procured by the Federation.

The overall conclusion that emerges from our study is that area estimates more than yield estimates must be checked into while arriving at production estimates. The sampling procedure devised to estimate area under cotton often diverges from the area estimates as noted in the records of the Agricultural Development Officers in each district. However, the official estimates on area are based purely on sampling procedure.

It was also observed that in case of certain varieties such as JKHY, no experiments have been conducted and in case of NHH-44 negligible experiments have been conducted. The crop estimation surveys on cotton in Maharashtra are planned on the basis of (i) irrigated crop sown mostly during pre-monsoon period in the five districts of Ahmednagar, Pune, Solapur, Satara and Nasik. (The area under unirrigated cotton in these districts is negligible) (ii) irrigated and unirrigated crop separately in 9 districts viz., Dhule, Jalgaon, Aurangabad, Jalna, Parbhani, Bhir, Buldhana, Amravati and Yeotmal districts and (iii) composite plan of sampling (i.e. irrigated and unirrigated together) in Nanded, Osmanabad, Latur, Akola, Wardha, Nagpur and Chandrapur districts. The sampling procedure is thus not variety-wise and hence certain varieties did not feature in the Crop Estimation Survey of the Directorate of Agriculture.

Further, outflow of cotton to border areas and vice-versa is against the provisions of the Maharashtra Raw Cotton Act, 1971. The data for the year 1993-94 which is the reference year of the study was indicative of large outflows of cotton to border areas, which is not in the interest of the textile industry chiefly concentrated in Bombay. Large inflows and outflows of cotton across borders which are mainly determined by price differentials have defeated the very purpose of operating a Monopoly Scheme. Further, the scheme was implemented so that the mills which are the main consumers of cotton could be assured of quality cotton through

proper ginning, pressing and grading by the Federation. As mentioned earlier, Bombay is the largest terminal market of the country with respect to cotton and the maximum number of transactions relating to sales of full pressed bales are carried out in Bombay. It is therefore important that the mills are aware of the availability of cotton and large outflows from the state could increase their transport cost. It is therefore important that the management of the scheme should be toned up; the police at the check posts must be more vigilant and reduce the scope for malpractices. This is in the interest of both the cotton growers as well as the textile industry.