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**IMPACT OF THE NATIONAL PULSES DEVELOPMENT
PROGRAMME ON SMALL CULTIVATORS
IN MAHARASHTRA**

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FOREWORD

The present study was undertaken in the Agro-Economic Research Centre of the Institute. It examines the impact of the National Pulses Development Programme, launched in the mid-eighties, on small and marginal farmers who were to be given preference in receiving benefits under its various components. It covers two districts, namely, Parbhani and Latur growing major pulse crops of tur (arhar) and gram.

It is hoped that the study will be found useful by the policy makers and researchers.

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1. THE PROBLEM OF PULSES

Between the thirty year period of 1961 and 1991 the population of the country nearly doubled from 431 million to 844 million. The rising food requirements over the years were met by the green revolution in crops like wheat, maize, rice, jowar and bajra, barring the difficulties in the mid-sixties. The main feature of this green revolution is the introduction of hybrid and high-yielding varieties. These varieties being fertilizer responsive, irrigation and chemical fertilizer are the other two unseperable features of the new technology.

But growth in supplementary items of food like protein-rich pulses and oilseeds was rather lagging. Growth of incomes was another reason for the shortages that were felt as pulses and oilseeds have much higher income-elasticities than those for cereals.

1.2 The growth of cereals and pulses is indicated in Table 1.1 by the index numbers of production for the country. From this table one can see that from 1966-67, cereals production has a consistent upward trend and from 1970-71 this trend is quite notable and any dips are momentary. Even the dips leave the production well above those achieved five or six years before and the overall buoyancy is clear. Pulses production has indices below 100 mark (index numbers with base as average of triennium ending 1969-70) often in the early seventies. Although these go upto 120, they are nowhere

Table 1.1 : Index Numbers of Production for Cereals, Pulses in India

(Base : Triennium Ending 1969-70 = 100)

Year	Cereals	Pulses	Year	Cereals	Pulses
Whights (Out of 100)	(60.5)	(8.07)			
1960-61	82.6	112.3	1975-76	128.8	115.3
1961-62	84.6	103.0	1976-77	117.8	100.3
1962-63	81.4	101.8	1977-78	137.3	105.8
1963-64	84.8	89.0	1978-79	143.6	107.5
1964-65	92.3	109.5	1979-80	119.9	76.6
1965-66	74.2	88.0	1980-81	143.1	95.8
1966-67	77.5	73.7	1981-82	145.5	103.7
1967-68	97.7	106.7	1982-83	139.8	106.4
1968-69	98.2	90.2	1983-84	167.1	116.5
1969-70	104.1	103.1	1984-85	160.5	108.4
1970-71	114.1	104.4	1985-86	167.5	120.1*
1971-72	113.2	97.9	1986-87	160.4	105.7*
1972-73	104.3	87.6	1987-88	156.5	99.5*
1973-74	113.2	88.5	1988-89	190.6	123.9
1974-75	106.4	88.8			

Source : Area and Production of Principal Crops in India. Directorate of Economics and Statistics, Ministry of Agriculture.

* These indices should be 117.49, 103.29 and 97.13 by our calculations. In fact, after 1980-81 indices for 'Other Pulses' category are all over-estimated in this publication, causing higher indices for pulses as a whole.

comparable to the dizzy heights of over 160 reached by cereals. By and large, pulses show a stagnant-mildly increasing trend.

In Table 1.2 various compound growth rates for the sixties, seventies, eighties and for the entire period are presented. It is immediately obvious that population growth rates of 2.11 to 2.44 per cent per annum are surpassed by the cereals but pulses show a discouraging rate of below half a per cent per annum.

1.3 Details for major pulses of gram and tur alongwith 'other pulses' are incorporated in Table 1.3. As observed in the case of index numbers, the total production of pulses is an up-and-down affair. Major pulse of gram shows complete stagnancy - if anything, there is a ^{mild} decreasing tendency. Tur, on the other hand shows output of over 2 million tonnes from 1980 onwards indicating a somewhat rising trend. The productivity of tur and gram is in the range 5½ to 7½ quintals per hectare but gives a fluctuating appearance. 'Other Pulses' category shows a lower productivity around 4 quintals/ ha. In Table 1.4 growth rates of area, production and productivity are presented for the three decades and looking at the last column of 'overall', one sees that gram has lost in production on account of area, productivity being stagnant while tur shows better production rates mainly on account of area and partly on account of productivity. Share of gram among total pulses has reduced from 47 to 39 percent over the

Table 1.2 : Compound Growth Rates For Cereals, Pulses in India

(Index Nos. based on Triennium ending
1969-70 = 100)

Item	Production Index Numbers For Trienniums Centred on				Growth Rates For % (p.a.)			
	1962-63	1968-69	1977-78	1986-87	Sixties	Seventies	Eighties	Overall
1 Cereals	83.60	100.00	132.90	161.47	3.03	3.21	2.19	2.78
2 Pulses	97.93	100.00	104.53	108.43*	0.35	0.49	0.41*	0.43*
3 Population (Decennial Census of 1961, 1971, 1981 and 1991 in Million)	439	548	685	844	2.24	2.26	2.11	2.20

* Triennium Index average should be 105.97 by our calculations giving eighties and overall rates of 0.15 and 0.33 (% p.a.) respectively, which are quite close to those based on actual outputs, presented in table 1.4

Table 1.3 : Production and Productivities of Major Pulses in India

(Prod.in '000 tonnes, Yield per ha. in wtl.)

Year	All Pulses		Gram		Tur		Other Pulses	
	Production	Yield	Production	Yield	Production	Yield	Production	Yield
1960-61	12704	5.39	6250	6.74	2066	8.49	4388	3.70
1961-62	11775	4.85	5785	6.05	1367	5.59	4603	3.76
1962-63	11528	4.75	5362	5.83	1582	6.45	4584	3.63
1963-64	10073	4.16	4502	4.81	1380	5.48	4191	3.40
1964-65	12417	5.20	5777	6.51	1890	7.33	4750	3.82
1965-66	9944	4.38	4224	5.27	1733	6.78	3987	3.28
1966-67	8347	3.77	3622	4.53	1130	4.48	3595	3.10
1967-68	12102	5.34	5971	7.23	1741	6.53	4390	3.74
1968-69	10418	4.90	4309	6.06	1816	7.18	4293	3.69
1969-70	11691	5.31	5546	7.16	1842	6.90	4303	3.71
1970-71	11818	5.24	5199	6.63	1883	7.09	4736	3.93
1971-72	11094	5.01	5081	6.42	1683	7.19	4330	3.64
1972-73	9907	4.74	4537	6.51	1928	7.95	3442	2.99
1973-74	10008	4.27	4099	5.28	1408	5.32	4500	3.46
1974-75	10014	4.55	4015	5.70	1834	7.25	4165	3.34
1975-76	13039	5.33	5880	7.07	2099	7.86	5061	3.76
1976-77	11351	4.94	5424	6.80	1725	6.72	4212	3.39
1977-78	11973	5.10	5410	6.78	1930	7.35	4633	3.59
1978-79	12183	5.15	5739	7.45	1837	7.16	4557	3.42
1979-80	8572	3.85	3356	4.80	1757	6.43	3458	2.76
1980-81	10627	4.73	4323	6.57	1958	6.89	4341	3.33
1981-82	11507	4.83	4642	5.90	2237	7.45	4629	3.57
1982-83	11857	5.19	5290	7.15	1989	6.80	4578	3.66
1983-84	12893	5.48	4751	6.63	2576	8.00	5566	4.23
1984-85	11963	5.26	4562	6.61	2585	8.19	4816	3.80
1985-86	13361	5.47	5788	7.42	2441	7.67	5132	3.82
1986-87	11707	5.06	4532	6.49	2271	7.21	4904	3.77
1987-88	11040	5.12	3622	6.24	2234	6.79	5184	4.16
1988-89	13702	5.89	5062	7.35	2666	7.56	5975	4.65

Table 1.4 : Changes and Growth Rates of Major Pulses in India

(Area in Lakh ha., Production in Lakh tonnes, Yield qtl/ha.)

		Trienniums Centered on				Growth Rates (% p.a.)			
		1962-63	1963-69	1977-78	1986-87	Sixties	Seventies	Eighties	Overall
Gram	Area	94 (38.67)	77 (35.05)	79 (33.73)	69 (29.79)	-3.21	0.26	-1.53	-1.29
	Production	52 (46.91)	53 (46.26)	52 (44.13)	46 (38.61)	0.19	-0.11	-1.29	-0.48
	Yield/ha	5.57	6.85	6.62	6.77	3.50	-0.38	0.25	0.82
Tur	Area	25 (10.20)	26 (11.93)	26 (11.16)	32 (13.92)	0.98	-0.05	2.32	1.09
	Production	14 (12.98)	18 (15.98)	18 (15.60)	23 (19.24)	3.75	0.29	2.54	1.99
	Yield/ha	5.84	6.87	7.08	7.22	2.74	0.34	0.22	0.89
Other Pulses	Area	124 (51.12)	117 (53.02)	129 (55.11)	130 (56.29)	-1.01	1.12	0.07	0.19
	Production	45 (40.11)	43 (37.96)	48 (40.27)	51 (42.15)	-0.49	1.08	0.69	0.54
	Yield/ha	3.60	3.71	3.70	3.91	0.50	-0.03	0.61	0.34
Total Pulses	Area	242 (100.00)	219 (100.00)	234 (100.00)	230 (100.00)	-1.61	0.69	-0.16	-0.21
	Production	111 (100.00)	114 (100.00)	118 (100.00)	120 (100.00)	0.42	0.42	0.18	0.33
	Yield/ha	4.59	5.19	5.06	5.22	2.07	-0.28	0.35	0.54

years while that of tur has increased from 13 to over 19 per cent. 'Other pulses' have a more or less steady share around 40 per cent.

The stagnancy in pulses could be attributed to the fact that the major task of feeding the increasing population assuming paramount importance, concentration naturally got focussed on cereals over the years. Further, in the case of pulses nothing like hybrid-high yielding varieties seed development took place where the varieties are fertilizer-responsive, of short duration, and sturdy. Besides, pulses are traditionally taken under rain-fed conditions and are often preferred as a mixed crop. Lack of irrigation coupled with the belief that being nitrogen-fixing, pulses do not need fertilizers, accounts for the fact that even the moderate doses of fertilizers are not given. In this, the fact that for their own growth, they need fertilizers is overlooked. Another reason for the lack of more intensive treatment for these crops is their relatively higher susceptibility to diseases.

1.4 How did the resultant shortages reflect in the prices of pulses, can be seen from Table 1.5 where all-India wholesale price index numbers of some of the categories are presented for the thirty year period. Wholesale price indices have had a change of base period three times with bases 1961-62, 1970-71 and 1981-82. We have spliced these different

Table 1.5 : Index Number of Some of the Categories of Wholesale Prices in India

(Base Year 1970-71 = 100)

Year (Weights)	Cereals (107.43)	Pulses (21.79)	Foodgrains (129.22)	All Commodities (1000.00)
1961	-	-	-	-
1962	57.70	49.32	52.13	58.73
1963	-	-	-	60.93
1964	-	-	-	67.31
1965	-	-	-	72.84
1966	82.76	102.99	85.17	81.52
1967	-	-	-	93.77
1968	100.34	104.88	101.11	93.26
1969	100.09	94.79	99.19	95.24
1970	102.42	102.11	102.37	101.11
1971	100.90	108.10	102.11	105.00
1972	111.40	130.20	114.57	113.00
1973	123.30	166.00	135.07	131.60
1974	178.10	211.10	183.67	169.20
1975	185.70	193.40	187.00	175.80
1976	151.60	144.10	150.34	172.40
1977	161.20	197.20	167.27	185.40
1978	158.10	247.90	173.24	185.00
1979	167.00	242.80	179.78	185.90
1980	189.50	295.40	207.35	248.10
1981	213.10	349.40	236.09	278.40
1982	229.40	307.30	242.56	285.30
1983	259.80	322.40	270.35	308.50
1984	247.00	415.70	275.45	334.00
1985	255.50	457.10	289.50	353.30
1986	274.00	424.50	299.38	372.20
1987	289.30	463.40	318.66	395.70
1988	325.50	627.80	376.47	423.30
1989	338.84	667.76	394.30	444.50

Source : Office of Economic Advisor, Ministry of Industry. Indices with base 1960-61 and 1981-82 are spliced with 1970-71 base to form a continuous series by us.

base series to form a consistent series with base 1970-71. The year 1970 does not have a value of 100 probably due to some 'statistical' reason that weights perhaps refer to financial (or agricultural) year while the index appears to be for the calendar year. But this should not affect our examination of trend in prices. Here we see that beginning with 1971, pulses index is always above that for cereals but the margin really widens from 1980 onwards and in 1988 and 1989 the respective index numbers are 325, 339 (cereals) and 623, 668 (pulses). This behaviour is summarized in Table 1.6 where one can see that after a nearly 10 per cent per annum growth rate in the sixties for both cereals and pulses, pulses rate remains near 10 per cent but the rate for cereals is lower, near 7 per cent per annum.

1.5 We have already alluded to the higher income elasticity of demand for pulses, relative to cereals. These are concretized in Table 1.7 where income elasticities for cereals and pulses for India and Maharashtra are presented. These elasticities are based on NSS data for 1968-69 (23rd round) and 1987-88 (43rd round). These elasticities were obtained by first calculating Gini's coefficients of concentration and then using their relation with elasticities under the assumption of log-normality of distribution of households over income-groups, following N. Sreenivasa Iyengar (Sankhya, Vol. 22, Parts 3 and 4, 1960). Here we see that for rural India and Maharashtra income elasticity for pulses is higher than cereals.

Table 1.6 : Compound Growth Rates Prices of Major Commodities Based on Wholesale Price Index Numbers for India

(Index Numbers base 1970-71 = 100)

	W. Price Index Numbers at				Growth Rates (% p.a.)			
	1962	1969*	1978*	1987*	Sixties	Seventies	Eighties	Overall
1 Cereals (107.43)	52.70	100.95	162.10	296.27	9.73	5.40	6.93	7.15
2 Pulses (21.79)	49.32	100.68	229.30	505.23	10.73	9.58	9.17	9.75
3 Foodgrains (129.22)	52.13	100.39	173.43	331.50	9.89	6.20	7.46	7.68
4 All Commo- dities (1000.00)	58.73	96.54	185.43	398.90	7.36	7.52	8.88	7.96

* There are triennium averages centered on the years mentioned.

Table 1.7 : Income Elasticities for Cereals and Pulses
for India and Maharashtra State for 1968-69
and 1987-88

	Rural		Urban	
	India	Maharashtra	India	Maharashtra
<u>1968-69</u>				
Cereals	0.5290	0.6047	0.2587	0.1223
Pulses	0.8291	0.8374	0.5512	0.4347
<u>1987-88</u>				
Cereals	0.2929	0.3100	0.1732	0.2698
Pulses	0.6940	0.4738	0.5247	0.4120

These estimates are based on NSS 23rd round for 1968-69 whereas 1987-88 constitutes fourth quinquennial survey, of 43rd round. The elasticities are Gini's coefficient based. For more detailed discussion and results for more categories and states see Author's "Pulses and Oil-seeds Scene in Maharashtra (1994), Gokhale Institute Mimeograph Series No.39, Agro-Economic Research Centre, Gokhale Institute of Politics and Economics (Deemed to be a University), Ch.2.

elasticity by 0.30 in both the periods, although elasticities for cereals and pulses are lower in 1987-88 (around 0.30 for cereals, between 0.50 and 0.70 for pulses) than in 1963-69 (around 0.55 for cereals, close to 0.83 for pulses). Urban elasticities in both the periods are lower but the margin remains. Thus we see that like other agricultural commodities of oilseeds and sugar, pulses have a higher income elasticity of demand than that for cereals. So apart from increasing population, increasing incomes also exert pressures for demand for pulses.

1.6 Now we turn to the scenario in Maharashtra. Index numbers of production for major crop-groups are presented in Table 1.3 and the base is same as the one for all-India production index in Table 1.1. Comparing the two we realize that for cereals there is a clear upward trend over the years for all-India barring 1965-66 and 1966-67, but for Maharashtra sixties represent stagnancy followed by three consecutive bad years, index reaching just 47.3 in the last of those years, i.e. in 1972-73 and then follows recovery from mid-seventies. This is true for pulses and agricultural production as a whole categories also. But during eighties there are dips in the Maharashtra series and the growth is not as steady as in all-India index for cereals. But unlike all-India, pulses show growth rather than stagnancy after mid-seventies, albeit with occasional dips. But then for a state with low and uncertain rainfall and poor irrigation (around 14 per cent compared to

Table 1.8 : Index Numbers of Production of Major Crop-Groups in Maharashtra

(Base : Triennium ending
1969-70 = 100)

Year	Cereals (45.05)	Pulses (10.44)	Agricultural Production* (100)
1960-61	113.7	123.3	109.8
1961-62	97.0	105.1	95.5
1962-63	101.2	100.5	97.4
1963-64	99.0	104.9	99.0
1964-65	101.2	105.4	99.8
1965-66	69.1	79.7	75.0
1966-67	88.5	93.9	84.9
1967-68	99.8	97.7	95.9
1968-69	102.0	102.0	103.2
1969-70	98.2	100.3	100.9
1970-71	87.1	82.8	88.3
1971-72	76.8	73.2	83.6
1972-73	47.3	51.7	62.1
1973-74	110.0	105.4	104.0
1974-75	119.7	133.1	123.8
1975-76	144.6	141.0	134.1
1976-77	150.8	122.8	136.9
1977-78	165.7	127.4	149.2
1978-79	157.8	126.3	142.8
1979-80	162.4	127.4	142.5
1980-81	158.1	103.5	141.1
1981-82	158.7	128.3	160.8
1982-83	143.7	118.7	151.2
1983-84	173.7	154.0	160.4
1984-85	150.4	138.8	150.0
1985-86	132.8	142.2	138.1
1986-87	103.1	118.6	113.0
1987-88	163.5	172.5	158.4
1988-89	163.0	211.2	169.7
1989-90	198.7	214.8	201.2

* Including non-foodgrains commodities.
Figures in brackets are weights.

all-India 30 per cent of cropped area) such dips in upward trend are somewhat expected. The fact remains that pulses show good growth unlike stagnancy at the all-India level. This fact is further brought out by growth rates in Table 1.9, and we see that production growth rates for pulses are high (higher than population growth rates) not only in seventies, but also in the eighties. Cereals on the other hand show only mild growth in the eighties after high growth in the seventies. The farm harvest prices data indicates in Table 1.10 relatively higher prices for tur dal and gram since mid-seventies and especially so in the eighties. The growth rates of farm harvest prices for these pulses is relatively higher and thus pulses (especially tur) which are taken in vast rainfed areas of the state, appear to have responded in supply to some extent as barring kharif jowar, there was little competition from kharif rainfed crops which are generally unaffected by the green revolution.

1.7 The production-productivity series for 30 years is available for comparison in Table 1.11. Here we see upto mid-seventies productivity of cereals is around $5\frac{1}{2}$ quintals per hectare but thereafter it is more or less consistently above 7 quintals, reaching over 10 quintals per hectare by the end of eighties. Pulses, on the other hand, have a lower productivity between 3 and $3\frac{1}{2}$ quintals per hectare (barring the bad years) upto mid-seventies and thereafter it is consistently over $3\frac{1}{2}$ quintals, reaching over 5 quintals

Table 1.9 : Growth Rates of Important Categories of Agricultural Production based on Production Index Numbers (Base Triennium Ending 1969-70 = 100) and Population Growth Rates in Maharashtra

	Average of Trienniums Centered at			Average* 87-88 & 88-89	Growth Rates (% p.a.)			
	1962-63	1968-69	1978-79		Sixties	Seven- ties	Eighties	Overall
1 Cereals (45.05)*	99.07	100.00	161.97	165.75	0.16	4.94	0.24	2.04
2 Pulses (10.44)	102.50	100.00	127.03	191.85	-0.57	2.42	4.44	2.45
3 Foodgrains cereals and pulses together (55.49)	99.90	100.00	155.43	170.65	0.02	4.51	0.99	2.12
4 All Agri. Commodities (100.00)	97.30	100.00	144.43	154.05	0.46	3.74	1.35	2.07
5 Population (Million) census figures of 1951, 71, 81 and 91	39.55	50.41	62.78	78.75	2.46	2.22	2.29	2.32

* Figures in brackets are weights, indicating relative strength of the crop groups.

Table 1.10 : Changes in Farm Harvest Prices of Different Crops Over the Decades in Maharashtra

(Price Rs/Qtl.)

Crops	Average Price for Triennium Centnered on			Average 1987-88 1988-89	Compound Growth Rates (%p.a.)			
	1962-63	1968-69	1978-79		Sixties	Seven- ties	Eighties	Overall
1 Rice (Paddy)	42.43	77.90	111.45	207.09	10.66	3.65	6.74	6.41
2 Wheat	58.13	115.53	150.11	255.94	11.21	2.65	5.78	5.99
3 Jowar	40.84	62.08	112.84	169.32	7.23	6.16	4.36	5.74
4 Bajri	45.93	84.36	113.60	171.59	10.66	3.02	4.44	5.30
5 <u>Turdal</u>	66.76	137.64	396.25	579.92	<u>12.82</u>	<u>11.15</u>	<u>4.09</u>	<u>8.85</u>
6 <u>Gram</u>	47.04	118.38	214.24	413.70	<u>16.63</u>	<u>6.11</u>	<u>7.17</u>	<u>8.90</u>
7 Cotton (Raw)	109.65	119.88	359.92	501.93	1.50	11.93	3.26	6.15
8 Sugar (Gur)	63.20	140.63	194.39	349.37	14.27	3.29	6.37	6.94
9 Groundnut (Pods)	63.36	136.00	268.73	508.77	13.58	7.05	6.95	8.51

Table 1.11 : Production and Productivity of Cereals and Pulses for Maharashtra

(Production in '00 tonnes, Productivity in Qtls/ha.)

Year	Cereals		Pulses	
	Production	Productivity	Production	Productivity
1960-61	67549	6.37	9839	4.21
1961-62	56034	5.32	3547	3.52
1962-63	53739	5.60	8279	3.52
1963-64	57837	5.48	8506	3.57
1964-65	58370	5.59	8581	3.57
1965-66	40373	3.84	6574	2.82
1966-67	51346	4.82	7672	3.13
1967-68	53291	5.48	8050	3.22
1968-69	59132	5.51	8441	3.21
1969-70	56523	5.50	8357	3.00
1970-71	47367	4.59	6770	2.64
1971-72	42632	4.22	5932	2.60
1972-73	26840	2.88	4202	1.98
1973-74	61759	5.57	8682	3.14
1974-75	67901	6.38	11098	3.89
1975-76	78637	7.20	11675	4.01
1976-77	85717	7.72	10433	3.59
1977-78	93539	8.42	10044	3.56
1978-79	88935	8.02	10492	3.75
1979-80	92113	8.22	10683	3.83
1980-81	86465	7.33	8252	3.04
1981-82	93364	8.28	9997	3.67
1982-83	82527	7.48	9629	3.74
1983-84	96941	8.36	12577	4.25
1984-85	86215	7.62	11143	3.93
1985-86	76149	6.78	11641	4.07
1986-87	61691	5.70	9750	3.70
1987-88	95504	8.70	14140	4.66
1988-89	93475	8.42	17297	5.19
1989-90	115070	10.32	17350	5.28

per hectare by the end of the eighties. It can also be seen that the state productivity for pulses is lower than the all-India productivity which is consistently over 4 quintals and often near $5\frac{1}{2}$ quintals per hectare as witnessed in Table 1.3. The break-up of pulses into major components of tur and gram alongwith 'other pulses' is incorporated in Table 1.12. Here we see that tur production is nearly three times the gram production, whereas at the all-India level, the situation is reverse, in favour of gram. Productivity of tur in the state ranges from 4 to 6 quintals per hectare but that of gram is below 4 quintals and this is somewhat surprising as tur is nearly entirely rainfed whereas gram has nearly 20 per cent area with irrigation. The explanation may lie in the fact that gram is a rabi crop and the irrigation it receives may be of the protective type. Tur, essentially kharif, receives rainfall and further, duration of tur is much longer than that of gram, its harvesting being done mid-way through rabi season. This longer duration on the field must also be adding to its productivity. The category of 'other pulses' has an average productivity ranging from 2 to 4 quintals per hectare and consists of udid, mung, horsegram and other sundry pulses. Table 1.13 further throws light on the production at different time points and the compound growth rates based on these. First of all we notice that though tur and gram are major pulses, 'other pulses' mentioned above contribute half the pulses production and the growth rates

Table 1.12 : Production and Productivity of Tur, Gram and Other Pulses in Maharashtra

(Production in '00 tonnes, Productivity in qtls/ha)

Year	Tur		Gram		Other Pulses	
	Production	Productivity	Production	Productivity	Production	Productivity
1960-61	4583	8.84	1341	3.33	3855	2.72
1961-62	3440	6.12	1364	3.38	3743	2.56
1962-63	3076	5.65	1440	3.27	3763	2.63
1963-64	3604	6.37	1149	3.06	3753	2.61
1964-65	3516	6.02	1213	3.33	3852	2.64
1965-66	2479	4.39	789	2.53	3306	2.27
1966-67	3075	5.11	1052	3.12	3545	2.34
1967-68	3040	5.03	950	2.76	4070	2.61
1968-69	3015	4.91	1183	3.33	4243	2.55
1969-70	2923	4.65	951	2.74	4483	2.47
1970-71	2711	3.95	866	2.79	3193	1.96
1971-72	2277	4.52	1320	3.04	2385	1.74
1972-73	1802	3.60	486	1.88	1914	1.40
1973-74	3223	5.17	1287	3.67	4172	2.33
1974-75	3772	6.14	1436	3.52	5890	3.21
1975-76	4073	6.04	1805	4.04	5792	3.23
1976-77	2940	4.61	1317	3.13	6176	3.34
1977-78	3320	5.15	1311	3.09	5413	3.09
1978-79	3894	5.87	1482	3.46	5116	2.99
1979-80	4067	6.03	1662	3.84	4954	2.95
1980-81	3184	4.95	1372	3.35	3690	2.22
1981-82	3927	5.99	1571	3.73	4499	2.73
1982-83	3989	5.86	1479	3.39	4161	2.88
1983-84	4870	6.66	2118	4.23	5539	3.22
1984-85	4852	6.40	2017	3.96	4274	2.73
1985-86	4513	5.97	1756	2.95	5372	3.42
1986-87	3724	4.90	1294	2.68	4732	2.97
1987-88	5346	6.86	2285	4.08	6509	3.84
1988-89	5974	6.66	4077	6.11	7246	4.00
1989-90	7120	7.48	3350	5.34	6830	4.02

Table 1.13 : Production and Growth Rates of Pulses in Maharashtra

(Production in '00 tonnes)

	Triennium Production Centered on			1937-88 and 1988-89	Per Year Rates (in '00 tonnes) and Growth Rates (% p.a.)			
	1962-63	1968-69	1973-79		Sixties	Seventies	Eighties	Overall
1 All cereals	57553	57982	91529	94990	71.40 0.12	3354.70 4.67	364.30 0.39	1458.10 1.98
2 Tur	3373 (39.94)	2993 (36.12)	3760 (35.13)	5660 (35.01)	-63.40 -1.98	75.80 2.31	200.00 4.40	89.70 2.05
3 Gram	1318 (15.61)	1028 (12.41)	1485 (14.27)	3181 (20.24)	-48.30 -4.05	45.70 3.75	178.50 8.35	73.20 3.52
4 Other Pulses	3753 (44.45)	4265 (51.47)	5161 (49.60)	6878 (43.76)	85.40 2.16	89.60 1.92	180.70 3.07	122.50 2.40
5 All Pulses	8444 (100)	8286 (100)	10406 (100)	15719 (100)	-26.30 -0.31	212.00 2.30	559.20 4.44	285.30 2.47

of this category are on par with growth rates of tur and gram. Pulses have fared better in eighties with growth rates of $4\frac{1}{2}$ per cent (tur and 'other pulses') and over 8 per cent (gram), unlike the stagnancy at the all-India level in ~~x~~ all the decades. Pulses have thus supplemented cereals production rather well, barring the uniformly bad sixties for cereals as well as pulses. With this national and state scenario of pulses we conclude this chapter.

2. THE SAMPLE AND IMPACT ANALYSIS

It became obvious in early eighties that production of pulses needed an impetus. National Pulse Development Programme (NPDP) was thus introduced with this objective in mind. In Maharashtra the programme consisted of six major components of demonstration on farmers' plots, certified seed production, bacterial seed treatment, chemical plant protection, biological plant protection and introduction of hand operated dal-chakki, i.e., pulse dehusker. In addition, greater availability of crop-loans, encouragement to crop insurance, etc., were its other features. In the implementation of the programme, preference was to be given to small and marginal farmers, although the NPDP scheme was to cover all farmers. At least 15 per cent of the budget for subsidies was to be spent on this class of farmers. We shall mainly concentrate on the six features mentioned. A survey of the beneficiaries was conducted between October 1989 to April 1990, with the reference year 1988-89.

2.2 The NPDP Scheme was implemented in 11 districts of the state for two pulses of gram and tur. Six of these districts were covered for two pulses of gram and tur (arhar) while five districts were covered by the scheme for pulse of tur only as follows :

<u>District</u>	<u>NFDP Implemented for</u>	
1. Solapur	Gram	Tur
2. Aurangabad	Gram	Tur
3. Parbhani	Gram	Tur
4. Beed	Gram	Tur
5. Osmanabad	Gram	Tur
6. Latur	Gram	Tur
7. Akola	-	Tur
8. Amravati	-	Tur
9. Yeotmal	-	Tur
10. Nagpur	-	Tur
11. Buldana	-	Tur

It was decided to concentrate on districts covered for both gram and tur. Two districts out of the first six were chosen for survey of beneficiaries. Area and production data for tur, gram, 'other pulses' and total pulses of these six districts and the state are presented in Tables 2.1 and 2.2 respectively. These tables indicate Parbhani and Latur districts as the two obvious choices with their relative high concentration of pulses area and production, considering the data for 1984-85 and 1985-86. While Parbhani has over 8½ per cent state pulse area and 8 to 9 per cent of state pulse production, Latur has 5 to 5½ per cent state area and 4½ to 5½ per cent pulse production. Osmanabad district is somewhat close to Latur in area but not in production.

Table 2.1 : Area Under Pulses in the NPD Districts* of Maharashtra

(Area in '00 ha.)

No.	District	Tur		Gram		Other Pulses		Total Pulses	
		84-85	85-86	84-85	85-86	84-85	85-86	84-85	85-86
1	Solapur	284 (3.75)	220 (2.91)	336 (6.60)	309 (5.79)	525 (3.35)	278 (1.77)	1145 (4.04)	807 (2.82)
2	Aurangabad	274 (3.61)	279 (3.69)	298 (5.85)	331 (6.20)	802 (5.12)	811 (5.17)	1374 (4.85)	1421 (4.97)
3	Parbhani	524 (6.91)	558 (7.38)	384 (7.54)	405 (7.59)	1521 (9.71)	1538 (9.80)	2429 (8.57)	2501 (8.75)
4	Beed	343 (4.59)	380 (5.02)	292 (5.73)	273 (5.11)	379 (2.42)	559 (3.63)	1019 (3.60)	1222 (4.27)
5	Osmanabad	550 (7.25)	524 (6.93)	440 (8.64)	434 (8.13)	419 (2.68)	502 (3.20)	1490 (5.26)	1460 (5.11)
6	<u>Latur</u>	544 (7.18)	546 (7.22)	275 (5.40)	252 (4.72)	584 (3.73)	720 (4.59)	1403 (4.96)	1518 (5.31)
State (including other districts)		7531 (100)	7564 (100)	5093 (100)	5338 (100)	15660 (100)	15695 (100)	23334 (100)	28597 (100)

(Figures in brackets are percentages to state area)

* Excluding other five districts which were covered purely for 'tur' and hence not considered for selection by us.

Table 2.2 : Production of Pulses in NFDP Districts* of Maharashtra

(Production in '00 tonnes)

S. No.	District	Tur		Gram		Other Pulses		Total Pulses	
		84-85	85-86	84-85	85-86	84-85	85-86	84-85	85-86
1	Solapur	103 (2.23)	35 (0.78)	92 (4.56)	52 (2.96)	133 (3.11)	57 (1.06)	333 (2.99)	144 (1.24)
2	Aurangabad	111 (2.29)	33 (0.73)	69 (3.42)	97 (5.52)	231 (5.40)	179 (3.33)	411 (3.69)	309 (2.65)
3	<u>Parbhani</u>	365 (7.52)	410 (9.08)	120 (5.95)	147 (8.37)	394 (9.22)	485 (9.03)	879 (7.89)	1042 (8.95)
4	Beed	138 (2.84)	138 (3.06)	85 (4.21)	78 (4.44)	103 (2.41)	172 (3.20)	326 (2.93)	388 (3.33)
5	Osmanabad	261 (5.40)	130 (2.88)	174 (8.63)	125 (7.12)	100 (2.34)	140 (2.61)	535 (4.80)	395 (3.39)
6	<u>Latur</u>	337 (6.95)	230 (5.10)	103 (5.11)	87 (4.95)	139 (3.25)	217 (4.04)	579 (5.20)	534 (4.59)
	State (including other districts)	4852 (100)	4513 (100)	2017 (100)	1756 (100)	4274 (100)	5372 (100)	11143 (100)	11641 (100)

(Figures in brackets are percentages to State Production)

* Excluding other five districts which were covered purely for 'tur' and hence not considered for selection by us.

In fact Latur and Osmanabad became separate districts in 1982, till which time the two together consisted the 'Osmanabad' district. The productivity data for pulses for these two years are presented in Table 2.3 where Parbhani and Latur districts show relatively high productivities for tur as well as gram and this also justifies somewhat our choice of these two districts for survey.

2.3 From each district two blocks were to be chosen and from each block, three villages. This comes to six villages and from each village fifteen small (and marginal) cultivators were to be selected, making 90 cultivators from each district, 180 farmers in all. (The terms 'Cultivators, farmers and farms' are used as synonyms in the present analysis). But as will be clear later, we in fact contacted 201 farmers in all, 103 from Parbhani and 98 from Latur. But first let us look at the cropping and production patterns of the two selected districts viz., Parbhani and Latur.

In Table 2.4 area under different crops is presented for the state and Parbhani and Latur districts. As mentioned in the section above, Latur was formed in 1982 and the official data for the district of Latur is given in the Season and Crops Report of the Directorate of Agriculture in 1981-82. In this publication, complete breakup of gross cropped area into various cereals, pulses (including separate heads for minor pulses) followed by data on area of not only major crops

Table 2.3 : Productivity of Pulses in WDP Districts* of Maharashtra

(Productivity in Quintals/ha)

S. No.	District	Tur		Gram		Other Pulses		Total Pulses	
		84-85	85-86	84-85	85-86	84-85	85-86	84-85	85-86
1	Solapur	3.80	1.59	2.74	1.68	2.53	2.05	2.91	1.78
2	Aurangabad	4.05	1.18	2.32	2.93	2.88	2.21	2.99	2.17
3	<u>Parbhani</u>	6.96	7.35	3.13	3.63	2.59	3.15	3.62	2.40
4	Beed	3.97	3.63	2.91	2.86	2.72	3.02	3.20	3.18
5	Osmanabad	4.75	2.48	3.95	2.88	2.39	2.79	3.59	2.71
6	<u>Latur</u>	6.19	4.21	3.75	3.45	2.38	3.01	4.13	3.52
	State	6.40	5.97	3.96	3.29	2.73	3.42	3.93	4.07

* Excluding other five districts which were covered purely for 'tur' and hence not considered for selection by us.

Table 2.4 : Area Under Various Crops in the Selected Districts of Latur and Parbhani Alongwith State Area for 1984-85, 1985-86

(Area in '00' ha.)

S. No.	Crop	Maharashtra		Parbhani		Latur	
		84-85	85-86	84-85	85-86	84-85	85-86
1	Rice	15197	15406	233	239	264	273
2	Wheat	9886	8315	605	516	260	236
3	K. Jowar	23702	23304	1800	1865	2112	2134
4	R. Jowar	36916	37452	1767	1813	457	473
5	Bajra	17613	17028	99	99	142	130
6	Other Cereals	4796	4810	20	35	96	85
7	Total Cereals	113110	112315	4524	4567	3331	3331
8	Tur	7581	7564	524	558	544	546
9	Gram	5093	5338	384	405	275	252
10	Other Pulses	15660	15695	1521	1368	584	720
11	Total Pulses	28334	28597	2429	2331	1403	1518
12	Total Foodgrains	141444	140912	6953	6898	4734	4849
13	Sugarcane	3544	3191	59	59	74	66
14	Cotton	26845	27530	2304	2386	241	260
15	Groundnut	7371	6635	175	96	365	353
16	Safflower	6105	6190	628	677	182	196
17	Sunflower	3249	3248	223	213	693	651
18	Total Oilseeds (Including other oilseeds)	22844	22423	1377	1341	1640	1602
19	Other crops	10023	8599	670	227	271	275
20	Gross Cropped Area 12+13+14+15+19	204700	202660	11363	10951	6960*	7052*

like sugarcane, cotton and groundnut but including vegetables, various fruits, area under fodder crops etc., are available. Irrigated area is also available in great detail. But 1982 onwards the Directorate publishes Epitome of Agriculture with Part I version giving mainly state level and only some district level data under major crop groups. Part II of Epitome entitled 'Districtwise General Statistical Information of Agriculture Department' gives more detailed districtwise information but comes out a little later than Part I. This Part II districtwise information covers many aspects of agriculture, more than those available in Season and Crop Reports but information on cropping, irrigation, etc., is for major crops only. For example, for pulses, irrigated area is available for gram only, the pulse receiving relatively much higher irrigation as mentioned above. A further difficulty is especially for Latur district, for which gross cropped area is available only for erstwhile Osmanabad which incorporated Latur district also. This creates some problems. Even in 1989-90 Epitome (Part I) net cropped area, gross cropped area and gross irrigated area, etc., are not separately available for Latur. Epitome (Part I) has the advantage (over Season and Crop Reports) that it comes out much quicker. Thus detailed presentation of districtwise cropping, production and irrigation is somewhat an involved affair, due to the change in the data format and for Latur district in particular there are difficulties as it came into being in 1982 and details for initial years are not separately available.

Returning to Table 2.4 dealing with areas under various crops for 1984-85 and 1985-86 based on Epitome Part II - Districtwise Information (1986-87) we see that the gross cropped area (GCA) for Latur is estimated, although details are available of foodgrains, sugarcane, cotton and oilseeds. Proportion to GCA of area similarly covered in the 1981-82 Season and Crop Reports was used for this estimation. Proportions of areas under crops are incorporated in Table 2.5 and looking at pulses, we see that for Parbhani and Latur, area under pulses is around 21 per cent whereas similar percentage for state is 14 per cent. Percentage area under tur is around 5 per cent for Parbhani and close to 8 per cent for Latur whereas state has less than 4 per cent area under tur. Similarly area under gram is between $3\frac{1}{2}$ to 4 per cent for Parbhani and Latur but less than 3 per cent for the state. For 'Other Pulses' also percentage area in selected districts is higher. Thus the two districts have concentration of pulses in its major categories.

Although Parbhani and Latur districts resemble in the concentration pulses, there are differences too. Parbhani has Kharif jowar as well as rabi jowar area, each around 15 per cent of its GCA whereas Latur has 30 per cent area under Kharif jowar and just $6\frac{1}{2}$ per cent area under rabi jowar. Parbhani has 21 per cent area under cotton to Latur's less than 4 per cent. Regarding irrigation, gross irrigated to gross cropped percentage in 1988-89 (Epitome Part I, 1990-91)

Table 2.5 : Proportion of Area Under Different Crops for the Selected Districts and the State for 1984-85, 1985-86

(Percentages to Gross Cropped Area)

S. No.	Crop	Maharashtra		Parbhani		Latur	
		84-85	85-86	84-85	85-86	84-85	85-86
1	Rice	7.42	7.60	2.05	2.13	3.79	3.87
2	Wheat	4.83	4.35	5.32	4.71	3.74	3.35
3	K. Jowar	14.02	14.21	15.84	17.03	30.34	30.26
4	R. Jowar	18.03	18.48	15.55	16.56	6.57	6.71
5	Bajra	8.60	8.40	0.87	0.90	2.04	1.84
6	Other Cereals	2.34	2.37	0.18	0.32	1.38	1.20
7	Total Cereals	55.26	55.42	39.81	41.70	47.86	47.23
8	Tur	3.70	3.73	4.61	5.10	7.82	7.74
9	Gram	2.49	2.63	3.38	3.70	3.95	3.57
10	Other Pulses	7.65	7.74	13.38	12.49	8.39	10.20
11	Total Pulses	13.84	14.11	21.38	21.29	20.15	21.53
12	Total Foodgrains	69.10	69.53	61.19	62.99	63.02	68.76
13	Sugarcane	1.73	1.57	0.52	0.54	1.06	0.93
14	Cotton	13.11	13.58	20.23	21.79	3.46	3.69
15	Groundnut	3.60	3.27	1.54	0.88	5.24	5.01
16	Safflower	2.98	3.05	5.53	6.18	2.61	2.78
17	Sunflower	1.59	1.60	1.96	1.95	9.96	9.23
18	Total Oilseeds (including other Oil seeds)	11.16	11.07	12.12	12.24	23.56	22.72
19	Other Crops	4.90	4.24	5.90	2.07	3.89	3.90
20	Gross Cropped Area	100	100	100	100	100	100

comes to 9.45 per cent for Parbhani and 7.75 per cent for Latur compared to similar state percentage of 14.38 per cent. Thus the two districts have a much lower irrigation but at the same time it should be admitted that the two districts come under the assured rainfall zone. For one of the two years presented in the table, i.e., for 1984-85, one sees Parbhani with 2900 ha. and Latur with 4200 ha. under irrigated gram which would come to 7.55 per cent for Parbhani and 15.27 per cent for Latur. For other categories of Pulses, as mentioned above, irrigation data are not available. Just to complete the picture, we include at the end of the present chapter Tables II.1 and II.2 which give detailed cropping and irrigation data for state, Parbhani and Latur for 1981-82 based on Season and crop Reports. From Table II.1 we see that in that year also compared to 13 per cent (of GCA) area under pulses, Parbhani and Latur have 19 and 26 per cent area under pulses respectively. The irrigation proportions in Table II.2 reveals that irrigation percentage for 'all pulses' is as low as 1.28 and 1.81 per cent for Parbhani and Latur, percentage for gram being higher at 6.62 and 11.28 respectively. The state-level irrigation percentage for pulses as a whole and gram are higher at 3.95 and 20.71 per cent respectively.

We have noted area shares of pulses in Parbhani and Latur relative to similar shares at the state-level in Table 2.4 and 2.5 for the years 1984-85 and 1985-86. For

output shares, we can compare contribution of pulses in the production of foodgrains. The production data of various crops for 1984-85 and 1985-86 are presented in Table 2.6. Contributions of various cereals and pulses to foodgrains is incorporated in Table 2.7. Here again we see that for the state, pulses contribute around 12 per cent to foodgrains whereas similar shares for Parbhani and Latur are around 23 and 18 per cent respectively. Dominance of kharif and rabi jowar for Parbhani and of only kharif jowar for Latur is also apparent here.

2.4 We now return to the sample. As pointed out at the beginning of the preceding section, from each district two blocks were selected and from each block 3 villages to cover a sample of 90 farmers from the district. At the district headquarters, however, we realized that not all the components are covered in the reference year, viz., 1988-89. Demonstrations on farmers' plots and biological plant protection components were implemented only in 1987-88 while dal-chakkis were introduced in 1988-89, the reference year, but on a very low scale. It was thus difficult to select villages which would cover all the components and still restrict the number of villages to six. In Parbhani district the sample ranged over ten villages over three blocks. Then again, biological plant-protection was not a very popular measure of controlling tur pod borers and hence only bigger farmers responded. In case of dal-chakkies, small and marginal farmers were not really keen to have them even with nearly half the cost.

Table 2.6 : Production of Crops in Selected Districts of Latur and Parbhani Alongwith State Production for 1984-85 and 1985-86

(Production in '00' tonnes)

S. No.	Crop	Maharashtra		Parbhani		Latur	
		84-85	85-86	84-85	85-86	84-85	85-86
1	Rice	19362	21818	125	162	132	99
2	Wheat	8565	6444	533	346	173	160
3	K.Jowar	29666	26522	1651	1393	2257	1562
4	R.Jowar	18358	12705	1128	816	329	253
5	Bajra	5662	4198	30	28	45	24
6	Other Cereals	4602	4462	17	26	55	52
7	Total Cereals	86215	76149	3484	2771	2991	2155
8	Tur	4852	4513	365	410	337	230
9	Gram	2017	1756	120	147	103	187
10	Other Pulses	4274	5372	394	485	139	217
11	Total Pulses	11143	11641	879	1042	579	534
12	Total Foodgrains	97358	87790	4363	3813	3570	2689
13	Sugarcane(Gur)	28108	25450	235	253	378	284
14	Cotton*	14669	19899	1472	2121	170	165
15	Groundnut(Pods)	7307	4687	157	78	224	132
16	Safflower	3641	2487	488	412	119	61
17	Sunflower	1700	1355	95	68	409	252
18	Total Oilseeds (including other oil seeds)	14166	9984	834	644	849	524

* Production of cotton is in terms of '00 bales of 170 kg. each.

(Rs. 1750 to be exact) being subsidized for small farmers. What meagre number of chakkis that was actually purchased, ended up with the bigger farmers. Thus inclusion of bigger farmers became inevitable if response to these abovementioned two components was to be known. Thus sample was not only extended to include more villages than planned, but some of the bigger cultivators had to be included in the sample.

With these problems it was decided to cover only participants (or beneficiaries) in the programme and in some villages with nearly all small farmers being already covered, bigger cultivators were also included in the analysis. This happened especially in case of Parbhani district, where out of 103 selected farmers, 34 were bigger (more than 2 ha. area) cultivators. Thus actual number of small and marginal farmers in the total sample of 201 is 159. As the NPD Scheme recommended inclusion of scheduled castes and scheduled tribes, we would easily incorporate 34 farmers from this category. Also nearly all selected farmers being beneficiaries, it was decided to treat farmers not covered under a given component but covered in some of the other components, as 'control' and reaction of such 'non-participants in a given component' is generally sought in the enquiry to assess indirect effect of each component. (We have just 15 farmers as 'non-participants' in any of the components).

2.5 Total sample of 201 farmers is then divided into five size groups to know cropping patterns of marginal farmers and

other ranges within small farmers and the frequency distribution under various components for these size-groups is presented in Table 2.8, for the two districts together. Here we see that our sample is well-spread even over the limited area of upto 2 hectares. We also note the componentwise number of beneficiaries as follows :

Demonstration on plots	71
Certified Seed Production	47
Bacterial Seed Treatment	50
Chemical plant protection	110
Biological plant protection	12
Dal-chakki	5
Total	295

Thus 136 farmers appear as beneficiaries in 295 cases. So some of the farmers have been obviously covered under more than one component. In fact the ratio of beneficiaries to number of farmers comes to 1.59 and for small and marginal farmer upto 2 hectares the ratio ranges from 1.38 to 1.65. Similar information for Parbhani and Latur districts is separately available in Table 2.9 and Table 2.10 respectively. Per farmer ratio for Parbhani is somewhat higher because in Latur packets of bacterial seed treatment were not distributed at all, either in the reference year 1988-89 or in the previous year. The officials explained that as these packets were distributed under the Mini-kit programme, this component was

Table 2.8 : Number of Sample Beneficiaries under Various Components of NPDP for Parbhani and Latur District Together

Size Group	Non-Participants	Participants	Components						Total	Components per Participant
			Demonstration on Plots	Certified Production	Bacterial Treatment	Chemical Plant Protection	Biological Plant Protection	Dal Chakki		
Upto 1 ha.	5	34	17	6	13	20	-	-	56	1.65
1.01-1.40	4	39	12	12	4	24	1	1	54	1.38
1.41-1.80	0	31	9	9	6	21	1	-	46	1.48
1.81-2.00	2	44	21	9	12	26	2	-	70	1.59
Above 2 ha.	4	38	12	11	15	19	8	4	69	1.82
Overall	15	186	71	47	50	110	12	5	295	1.59

Table 2.9 : Number of Sample Beneficiaries Under Various Components of NFDP in Parbhani District

Size Group	Non-Participants	Participants	Components						Total	Components per Participant
			Demonstration on Plots	Certified Production	Bacterial Seed Treatment	Chemical Plant Protection	Biological Plant Protection	Dal Chakki		
Upto 1. ha.	5	16	9	2	13	10	-	-	34	2.12
1.01-1.40	4	10	4	2	4	4	1	-	15	1.50
1.41-1.80	-	10	5	1	6	6	1	-	19	1.90
1.81-2.00	2	22	10	2	12	11	2	-	37	1.68
Above 2 ha.	4	30	10	7	15	14	6	4	56	1.87
Overall	15	88	38	14	50	45	10	4	161	1.83

Table 2.10 : Number of Sample Beneficiaries Under Various Components of NFDP in Latur District

Size Group	Parti- cipants*	Components						Total	Per Participant
		Demon- stra- tion: Plots	Certi- fied Seed Produ- ction	Bacte- rial Seed Treat- ment	Chemi- cal Plant Protec- tion	Biolo- gical Plant Protec- tion	Dal Chakki		
Upto 1 ha.	18	8	4	-	10	-	0	22	1.22
1.01-1.40	29	8	10	-	20	-	1	39	1.34
1.41-1.80	21	4	8	-	15	-	-	27	1.28
1.81-2.00	22	11	7	-	15	-	-	33	1.50
Above 2 ha.	8	2	4	-	5	2	-	13	1.62
Overall	98	33	33	-	65	2	1	134	1.37

* No non-participants were selected in this district.

not covered under NPDP. There was thus between districts variations in coverages too. It may be further observed that in Parbhani a farmer is a beneficiary in at most 3 components (19 out of 88, with 11 below 2 ha.) while 34 farmers are beneficiaries with two components, while in Latur 35 farmers were covered under maximum of 2 components, above 2 hectare farmers being just 4. Thus inclusion of bigger cultivators has not really affected this distribution.

2.6 For the selected farmers, details of owned area, cultivated area, irrigated area, etc., are presented in Tables 2.11 and 2.12 for Parbhani and Latur respectively. Per farm cultivated area for small (and marginal, below 2 ha.) farmers is 1.55 ha., 1.43 ha. being owned area, with 31 per cent area (net level) under irrigation, for Parbhani. For Latur similar figures are 1.47 ha. and 1.45 ha. for cultivated and owned area respectively whereas irrigated ^{percentage} is 16. Thus relatively higher-than-district irrigation percentages are obtained. The cropping pattern with actual areas and percentages to gross cropped areas are incorporated in Tables 2.13 and 2.14 for Parbhani district and in Tables 2.15 and 2.16 for Latur. From these tables one can calculate per farm pulses area for small farmers as follows :

District	Pulses Area	No. of farms	(Area in ha.) Per farm pulse area
Parbhani	28.31	69	0.41
Latur	75.81	90	0.84

Table 2.11 : Size Groupwise Details of Area, Irrigated Area, No. of Workers for Selected Cultivators in Parbhani District

(Area in ha.)

Size Group	No. of farms	No. of Workers	Owned Area	Cultivated Area	Irrigated Area	% Irrigated Area	Gross Cropped Area
Upto 1 ha. Per farm	21	54 2.57	17.28 0.82	19.68 0.94	7.06 0.34	(35.87)	26.24 (1.33)*
1.01 - 1.40 Per farm	14	57 4.07	17.27 1.23	13.47 1.32	6.07 0.43	(32.86)	22.17 (1.20)
1.41 - 1.80 Per farm	10	38 3.80	16.46 1.65	19.01 1.90	7.55 0.76	(39.72)	22.09 (1.16)
1.81 - 2.00 Per farm	24	87 3.63	47.90 2.00	49.50 2.06	12.60 0.52	(25.45)	56.40 (1.14)
Total (Small) Per farm	69	236 3.42	93.91 1.43	106.66 1.55	33.28 0.48	(31.20)	126.90 (1.19)
Above 2 ha. Per farm	34	142 4.13	163.22 4.80	166.82 4.91	49.20 1.45	(29.49)	196.82 (1.18)
Overall Per farm	103	378 3.67	262.13 2.54	273.48 2.66	82.43 0.80	(30.16)	323.72 (1.13)

* The figures in this column in brackets show cropping intensity on ratio of gross cropped area to cultivated area.

Table 2.12 : Size Groupwise Details of Area, Irrigated Area, No. of Workers for Selected Cultivators in Latur District

(Area in ha.)

Size Group	No. of farms	No. of workers	Owned Area	Cultivated Area	Irrigated Area	% Irrigated Area	Gross Cropped Area
Upto 1 ha. Per farm	18	70 3.89	15.45 0.86	15.45 0.86	1.00 0.05	(6.47)	20.33 (1.31)*
1.01 - 1.40 Per farm	29	105 3.62	35.12 1.24	39.83 1.37	1.80 0.06	(4.52)	57.15 (1.43)
1.41 - 1.80 Per farm	21	81 3.86	35.69 1.70	33.49 1.59	6.22 0.30	(18.57)	42.91 (1.28)
1.81 - 2.00 Per farm	22	97 4.41	43.64 1.98	43.59 1.98	11.98 0.54	(27.48)	56.95 (1.31)
Total (Small) Per farm	90	353 3.92	130.90 1.45	132.36 1.47	21.00 0.23	(15.87)	177.34 (1.34)
Above 2 ha. Per farm	8	31 3.88	28.10 3.51	26.90 3.36	11.20 1.40	(41.64)	29.10 (1.08)
Overall Per farm	98	384 3.92	159.00 1.62	159.26 1.63	32.20 0.33	(20.22)	206.44 (1.30)

* The figures in this column in brackets show cropping intensity as ratio of gross cropped area to cultivated area.

Table 2.13 : Area under Different Crops for the Selected Cultivators in Parbhani District

(Area in ha.)

Crop	Less than 1 ha.	1.01-1.40	1.41-1.80	1.81-2.00	Total (Small)	Above 2 ha.	Overall
	I	II	III	IV		V	
1 Rice	0.20	0.40	0.00	0.40	1.00	0.60	1.60
2 Wheat	2.76	1.20	1.20	2.60	7.76	10.50	18.26
3 K. Jowar	3.06	3.60	3.91	11.80	22.37	13.80	36.17
4 R. Jowar	1.40	0.40	1.40	4.20	7.40	31.50	38.90
5 Bajra	0.30	0.40	2.00	1.60	4.30	10.60	14.90
6 Maize	0.20	0.00	0.00	0.00	0.20	0.00	0.20
7 Other Cereals	0.00	0.00	0.05	0.06	0.11	3.30	3.41
8 Total Cereals	7.92	6.00	8.56	20.66	43.14	70.30	113.44
9 Tur	2.96	2.45	2.80	4.85	13.06	24.82	37.88
10 Gram	1.00	0.10	0.00	1.90	3.00	3.10	6.10
11 Mung	1.80	2.00	1.75	5.50	11.05	17.00	28.05
12 Udid	0.70	0.20	0.20	0.10	1.20	2.20	3.40
13 Horse Gram	-	-	-	-	-	2.20	2.20
14 Other Pulses	-	-	-	-	-	-	-
15 Total Pulses	6.46	4.75	4.75	12.35	28.31	49.32	77.63
16 Total Foodgrains	14.38	10.75	13.31	33.01	71.45	119.62	191.07
17 Sugar Cane	0.50	0.00	0.50	0.80	1.80	0.80	2.60
18 Cotton	8.76	8.62	6.40	19.29	43.07	64.20	107.27
19 Groundnut	2.20	0.60	0.83	1.60	5.28	1.60	6.83
20 Sunflower	-	-	-	-	-	3.40	3.40
21 Horticultural Crops	-	0.20	-	-	0.20	0.40	0.60
22 Vegetables	-	0.40	0.60	0.60	1.60	2.30	3.90
23 Other Crops	0.40	1.60	0.40	1.10	3.50	4.50	8.00
24 Total Non-Foodgrains	11.86	11.42	8.78	23.39	55.45	77.20	132.65
25 Gross Cropped Area	26.24	22.17	22.09	56.40	126.90	196.82	323.72
No. of cultivators	21	14	10	14	69	34	103

Table 2.15 : Area under Different Crops for the Selected Cultivators in Latur District

(Area in ha.)

Crop	Upto	1.01-	1.41-	1.81-	Total	Above	Total
	1 ha.	1.40	1.80	2.00		2 ha.	
	I	II	III	IV		V	
1 Rice	0.40	0.00	0.30	1.40	2.10	0.40	2.50
2 Wheat	0.00	0.26	0.62	1.00	1.88	0.40	2.28
3 K. Jowar	5.17	12.65	11.65	11.70	41.17	6.79	47.87
4 R. Jowar	2.97	8.72	4.35	5.50	22.04	2.80	24.84
5 Bajra	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6 Maize	0.00	0.00	0.00	0.40	0.40	0.20	0.60
7 Other Cereals	0.00	2.80	2.09	0.40	5.29	0.20	5.49
8 Total Cereals	8.54	24.43	19.51	20.40	72.88	10.70	83.58
9 Tur	4.40	9.40	11.40	9.70	34.90	7.80	42.70
10 Gram	0.80	5.70	0.80	3.10	10.40	1.20	11.60
11 Mung	2.02	4.40	1.40	3.41	11.23	2.40	13.63
12 Udid	1.96	7.32	2.40	7.60	19.28	2.40	21.68
13 Horsegram	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14 Other Pulses	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15 Total Pulses	9.18	26.82	16.00	23.81	75.81	13.80	89.61
16 Total Food grains	17.72	51.25	35.51	44.21	148.69	24.50	173.19
17 Sugarcane	1.00	0.00	1.80	4.13	6.93	2.20	9.13
18 Cotton	0.00	0.00	0.80	0.00	0.80	0.00	0.80
19 Groundnut	0.20	0.20	2.40	1.80	4.60	0.20	4.80
20 Sunflower	0.70	3.40	1.60	4.30	10.50	1.80	12.30
21 Horticultural Crops	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22 Vegetables	0.00	0.00	0.20	0.10	0.30	0.00	0.30
23 Other Crops	0.71	2.30	0.60	1.91	5.52	0.40	5.92
24 Total Non-foodgrains	2.61	5.90	7.40	12.74	28.65	4.60	33.25
25 Gross Cropped Area	20.33	57.15	42.91	56.95	177.34	29.10	206.44
No. of Cultivators	18	29	21	22	90	8	98

For Latur per farm pulses area is indeed high. In fact, for Latur cereals area for 90 farms is slightly smaller, at 72.88 ha. (Table 2.15) but for Parbhani it is higher at 43 ha. (compared to 28.31 ha. in the above statement). For the entire sample including over 2 ha. farmers, per farm pulses area for Parbhani increases to 0.75 while for Latur is nearly same (0.91 ha.) as over 2 ha. farmers are only 8 in number in that district.

It is tempting to compare the cropping patterns for the two districts as a whole in Table 2.5 (for 1984-85 and 1985-86) with the patterns in the sample in Table 2.14 and 2.16, but we shall dwell only briefly on them. We saw in Table 2.5 that for Parbhani, kharif and rabi jowars dominate food-grains with each covering about 16 per cent of GCA while in the sample, the percentages for small farmers are 17 and 6 respectively, so that rabi jowar has a much lower percentage in the sample. However, pulses area is 22 per cent in the district as a whole and a very close 21 per cent in the sample. For Latur, kharif jowar has 30 per cent area coverage and only 6 per cent rabi jowar for the district as a whole but the sample has 23 and 12 per cent coverage. Pulses cover 21 per cent of GCA in the district but in the sample it is double, at 42 per cent.

2.7 Now we come to the various components and their effect on the selected farmers. As pointed out earlier, sample covers mainly the beneficiaries and our concentration

is on assessing beneficiaries' reaction to various components and there is no comparison with any 'control' farmers. The reason is that each component can augment the production in a small way and to have 'control' farmers, one needs to ensure that they are not only non-participants in the NPDP scheme but they have not used the specific input. Even with these conditions satisfied, components like 'bacterial seed treatment' improve the initial growth of the plant and between a user and non-user there could be many other factors that can affect production. It is really sufficient if the farmer uses it and observes the better germination and initial growth. A beneficiary's favourable impression should indicate success of the use of a component. In an experiment involving 'controls', apart from ensuring similarities in other factors, performers of the experiment are generally the same. Here not only 'other factors' are only vaguely similar but performers are also different. Such use of 'control' farmers can be effective only if the resource introduced can affect the production in a big way. For example if irrigation is introduced where none existed, farmers receiving this resource can be effectively compared with 'control' farmers who did not receive irrigation.

Regarding preference to small (including marginal) farmers, in both the districts we found that on the lists of beneficiaries, small and marginal farmers were carefully marked alongwith those belonging to S.C. and S.T. categories and further, when villages and beneficiaries were actually visited, the resource had in fact reached them. One of the

basic requirements of success of any such programme is thus fulfilled.

2.8 Demonstration on Farmers' Plots

As mentioned before, this component was implemented in 1987-88, year previous to our reference year, viz. 1988-89. So our coverage refers to that year. High placed officials explained to us that this component was discontinued as farmers' eagerness to be included as a beneficiary under the component was so overwhelming that it created tensions in the area bordering on the law and order problem. The positive aspect of this is that it indicates farmers' faith in the new technology involving modern inputs.

Demonstrations were arranged on plots of 20 area area for gram for selected farmers. The sample covered following numbers from Parbhani and Latur.

	<u>Small</u>	<u>Big</u>	<u>Total</u>
Parbhani district	28	10	38
Latur district	31	2	33

Apart from the inputs subsidized to the extent of Rs.189 per farmer, some of the beneficiaries also incurred additional expenditure on items like fertilizers, insecticides, labour and 'other items'. From Parbhani 19 out of 28 small cultivators felt output was better than usual, 2 felt ^{no} difference while 2 said output was lower. From 10 bigger cultivators, 7 felt output was better, 2 felt it is same while one reported

lower output. For Latur, 17 out of 31 felt output was better, 2 felt it was same but 12 felt it was lower. The response appeared as follows : (small farmers only)

	Output in relation to usual or normal output					Total
	Less by 5%	Same	More by 5%	More by 10%	More than 15%	
Parbhani	5	4	14	2	3	28
Latur	12	2	8	9	-	31

Thus farmers had a favourable impression about modern inputs. Thirtysix out of 59 farmers (i.e., 61 per cent) felt output was higher by 5 per cent, for the two districts together. But interestingly enough, just 16 out of these 36 farmers answered affirmatively to the question whether they made any change in their method of cultivation in the next two years, i.e., in 1938-89 and 1989-90. Thus really 16 out of 59 small beneficiaries were really enthusiastic about the modern package even after the demonstration year. We cannot of course, over look the possibility that at least some of those who did not make any change were already adopting modern inputs.

What about the non-participants? In Parbhani and Latur, out of 65 non-participants in demonstration in each district, 45 in Parbhani and 25 in Latur did not know that such demonstrations were taking place. In Parbhani, out of 20 who knew, only 7 actually visited these and all agreed that the crop was much better. In Latur, out of 40 who knew about demonstration, 25 visited them and 22 of them felt crop there

was better and 3 felt it was the same. If we restrict to small farmers only, this information may be put as follows :

	Did know about demonstration	Did not know	Total Non-participant small farmers
	-----	-----	-----
Parbhani	13	28	41
Latur	35	24	59
Total	48	52	100

	Visited	Did not visit	Total Non-participants who knew
	-----	-----	-----
Parbhani	6	7	13
Latur	23	12	35
Total	29	19	48

Out of 29 small farmers who visited demonstrations, 26 felt crop was better and only 3 felt it was same. Thus one can see layers of responses from eagerness in participation to showing enough interest to visit a demonstration, among non-participants. If we neglect from non-participants those who did not know about demonstrations (50 per cent), then of those who knew, 60 per cent undertook a visit, among small farmers. For sample as a whole (including above 2 ha. farmers), things are not much different. Thus by and large, demonstrations took the message of new technology to small farmers, as well as to farmers as a whole.

2.9 Certified Seeds Production

For this component, the analysis covers (a) participants (47), (b) non-participants but respondents in seed-villages (29), and (c) non-participants outside seed villages (125). Our focus is of course on the participants, reactions of others being supplementary. In our sample we had certified seed production of tur and udid both in Parbhani and Latur districts. Small farmers had an area ranging from .40 to over 1 ha. while bigger farmers with 1 to 3 ha. area occur in the sample. This is another component (apart from components of biological plant protection and dal-chakki as remarked earlier and to be elaborated later) where (to keep purity of seeds) continuous areas are required and inevitably big farms dominate in the selected villages and with limitations on number of selected villages, big farmers get included in the sample. We prefer to present data in table form so that most of the facts are easily noticed. In Table 2.17 information about 47 participants is presented, 36 of these being small farmers. For these 36 small farmers 34.62 ha. area was under seed production with tur area dominating with 20.40 ha. Total production (tur and udid together) for small farmers comes to 194.50 quintals, production per hectare working out to 5.40 quintals. Average area under these pulses is 0.96 ha. per farm. For big cultivators such average is 1.50 ha. Per hectare production for big cultivators is high at 8.46 quintals and this is understandable as they have better irrigated lands and better resource position. Parbhani data are for 1987-88

Table 2.17 : Details of Participants in the Certified Seeds Production Component

	<u>Parbhani</u>					<u>Latur</u>					<u>Total</u>				
	Cases	Crop	Area (ha.)	Produ- ction (Qtl.)	Value (Rs.)	Cases	Crop	Area (ha.)	Produ- ction (Qtl.)	Value (Rs.)	Cases	Crop	Area (ha.)	Prod- uction (Qtl.)	Value (Rs.)
Small	7	Tur	1.00	10.00	5670	29	Tur	19.40	119.50	70147	36	Tur	20.40	129.50	75317
		Udid	6.00	23.00	14674		Udid	8.22	42.00	34986		Udid	14.22	65.00	49660
Big	7	Tur	8.60	80.00	45360	4	Tur	6.00	48.00	28176	11	Tur	14.60	128.00	73536
		Udid	1.00	4.00	2552		Udid	-	-	-		Udid	1.00	4.00	2552
Total	14	Tur	9.60	90.00	51030	33	Tur	25.40	167.50	98323	47	Tur	35.00	257.50	149353
		Udid	7.00	27.00	17226		Udid	8.22	42.00	34986		Udid	15.22	69.00	52212

(Participants from Parbhani from 1987-88 and 1988-89. From Latur only 1988-89).

and 1988-89 whereas for Latur all coverage is of 1988-89, the reference year. It is interesting to note that not all farmers sold output to seed corporation. Out of 47 (36 small) participants, 27 (20 small) sold output to seed corporation, thus just over half (55 per cent) of the farmers sold their output to seed corporation. All such farmers confirmed that they got Rs. 150/- quintal as additional rate. Some of the farmers thus turned to traders possibly due to less stringent grading and some saving in transport costs.

In Table 2.18 details of responses of non-participating farmers who however belonged to seed villages, are presented. There were 29 respondents (24 small). Item 2 of this table reveals that 8 (7 small) of them felt supply of seeds improved but 16 (13 small) felt it did not increase while 5 (4 small) said they cannot say either way. When asked for suggestions for this component, 19 (16 small) farmers said seed should be better and cheaper while 6 (5 small) felt more farmers and more villages should be included in the certification scheme. Responses of non-participants from villages outside the seed-villages are incorporated in Table 2.19. From this table we see that out of 125 (99 small) such farmers, 108 (84 small) did not know about the scheme of certified seeds production. Of the 17 who knew, 13 came to know about it from other farmers and 4 from village level worker and village extension (T and V) worker. Half of these 17 farmers were also aware that an additional amount of Rs. 150 per quintal was being offered by the seed corporation under the scheme.

Table 2.18 : Responses of Non-participants in Certified Seed Production from Seed Villages

Item	Farbhani		Latur		Total	
	Total	Of which* Small	Total	Of which Small	Total	Of which Small
1 No. of farmers	13	(10)	16	(14)	29	(24)
2 Did the Supply of seeds increase						
Yes	4	(3)	4	(4)	8	(7)
No	5	(4)	11	(9)	16	(13)
Can't say	4	(3)	1	(1)	5	(4)
3 Suggestions						
Include more farms/villages	-	-	6	(5)	6	(5)
Seeds should be better and cheap	9	(7)	10	(9)	19	(16)
Other	4	(3)	-	-	4	(3)

*Small farmer's frequency is bracketed only to increase readability.

Table 2.19 : Response of Non-participants in Seed Production from Non-Seed-Villages

Item	Parbhani		Latur		Total	
	Total	Of Which Small	Total	Of Which Small	Total	Of Which Small
1 No. of Farmers	76	(52)	49	(47)	125	(99)
2 Knowledge of Certified Seed Component						
a) Did not know	72	(50)	36	(34)	108	(84)
b) Knew about the component	4	(2)	13	(13)	17	(15)
From whom did they come to know in (b) above						
i) Village worker	2	(0)	-	-	2	(0)
ii) V. Exten. worker	-	-	2	(2)	2	(2)
iii) Other officials	-	-	-	-	-	-
iv) Other farmers	2	(2)	11	(11)	13	(13)
c) For 2(b) Contd.						
Knew above additional rate paid	1	(1)	7	(7)	8	(8)
Did not know	3	(1)	6	(6)	9	(7)
d) For 2(b) Contd.						
Think seed supply increased	2	(1)	7	(7)	9	(8)
Did not increase	1	(0)	6	(6)	7	(6)
Can't say	1	(1)	-	-	1	(1)

* Frequency for small farmers put in brackets to improve readability

2.10 Bacterial Seed Treatment

This component was implemented in Parbhani district only (see the comment at the end of Section 2.5) in the year 1937-38, year previous to the reference year. Packets were distributed free, cost of each being Rs. 4.60. In the Parbhani sample of 103 farmers, there are 50 (35 small) recipients. Responses of recipients as well as non-recipients were recorded.

In Table 2.20 responses of recipients are set out. Farmers received upto seven packets but 33 (24 small) received two or less. From the frequency distribution incorporated in the table, one can see that per farm number of packets comes to 2.36 (2.17 for small). This easy-to-implement component, thus has highest number of beneficiaries (in Parbhani). Table further reveals that most, i.e., 46 (32 small) received instructions on how to use, only four did not receive instructions. More than half received these instructions through T and V worker (as expected) and one-third from other agricultural officials.

More than half, 27 (16 small), recipients noticed better growth and of the remaining, nearly, two-thirds could not say either way but remaining one-third felt it was same. When asked to specify extent of improvement or (otherwise), most of those who noticed growth, thought it was about 10 per cent more. Three (1 small) felt it was more by 15 per cent. The category of 'can't say' is prominent among the remaining with 20 (16 small) farmers, according to item of 5 of the table. But the

Table 2.20 : Responses of Farmers to Bacterial Seed Treatment Packets*

Item	No. of Farmers	
	Total	Small
1. How many packets received -	50	(35)
One packet	20	(16)
Two packets	13	(8)
Three packets	5	(4)
Four packets	5	(3)
Five packets	6	(4)
Seven packets	1	(0)
2. Received instructions		
Yes	46	(32)
No	4	(3)
3. Instructions received from		
Village worker	5	(3)
Village extension worker(T & V)	26	(18)
Other officials	14	(10)
Other farmers	1	(1)
Total	46	(32)
4. Noticed better growth		
Yes	27	(16)
No	9	(8)
Can't say	14	(11)
5. Farmer's assessment of extent of additional output		
Can't say	20	(16)
Less by 10%	2	(2)
Same as before	2	(2)
10% more	23	(14)
15% more	3	(1)
Total	50	(35)
6. In the following year (1988-89) purchased packets for treatment?		
Yes	3	(1)
No	47	(34)

* Packets distribution was undertaken only in Parbhani (in 1987-88) and not in Latur. Data for small farmers put into brackets to improve readability.

success here is somewhat clouded by item 6. As this component was implemented in 1987-88, they were asked if they procured packets on their own for treatment in the next year, i.e. in 1988-89, and 47 out of 50 had not done so. Perhaps they expected free distribution and hopefully, they may use this rather simple and inexpensive method in subsequent years.

In Table 2.21 responses of non-recipients (53, 34 small) are presented. Out of these ^{non} recipients 18 (14 small) had other farmers in their villages who had received such packets but only 4 (3 small) were aware that there is better growth. Other fourteen did not know - or find out. But when asked if they would like to use such packets, more than half said yes while from the remaining, two-thirds showed indifference and one-third replied in the negative. Again the success of effect on others is clouded by the fact that when asked whether they procured such packets on their own in the subsequent year (1988-89), none of them replied affirmatively. When further query about reasons for not doing so was made, majority pointed to technical and financial difficulties which were not very convincing and remaining pleaded ignorance. From all this, one has to conclude that demonstration effect on other farmers in the same village was not very strong in respect of this component.

2.11 Chemical Plant Protection

For chemical plant protection, 50 per cent subsidy was offered to all the farmers (small and big) for pulse crops.

Table 2.21 : Responses of Non-recipients of Bacterial Seed Treatment Packets

Item	No. of Farmers	
	Total	Small
1. Non-recipients	53	(34)
2. Were there others in your village who received packets		
Can't say	12	(9)
Yes	18	(14)
No	23	(11)
3. How was the growth (refers to 'yes' in 2)		
Good growth	4	(3)
Don't know	14	(11)
4. Would you like to use this treatment		
Yes	26	(20)
No	9	(6)
Indifferent	18	(8)
5. Did you use them last year (i.e. 1988-89)		
Yes	0	(0)
No	53	(34)
6. Why not		
Did not know	10	(5)
Financial reasons	15	(11)
Technical difficulties	28	(18)

(See the footnote to Table 2.20)

This protection generally consisted of endosulphan spray. Per hectare endosulphan of one litre with cost of Rs. 84 was subsidized to the extent of Rs. 40. In a few cases BHC dusting was also subsidized. There were cases of farmers who undertook endosulphon spray or BHC dusting on their own. So the basic break-up of farmers is in three groups : subsidized insecticide users-beneficiaries, insecticide users without subsidy and the group of non-users. For the two selected districts the break-up for 1988-39 is as follows : (Total frequency with that of small farmers in brackets)

	<u>Parbhani district</u>	<u>Latur district</u>	<u>Total</u>
Subsidized insecticide users	44 (29)	65 (63)	109 (92)
Non-subsidized insecticide users	28 (17)	7 (4)	35 (21)
Non-users	31 (23)	26 (23)	57 (46)
Overall	<u>103 (69)</u>	<u>98 (90)</u>	<u>201 (159)</u>

This is a component for which farmers have shown considerable enthusiasm and it is also easy to implement. Thus more than half the selected farmers had received this component and small and marginal farmers are quite prominent in this. Then again, 35 farmers undertook spray or dusting without waiting for subsidy and as many as 21 of these are small farmers. This underlines the fact that farmers have understood the importance of chemical plant protection.

The component was for control of incidence of tur borer caterpillar but there are instances in which this was used also for udid, mung and in just four cases, for gram. Details of use by the beneficiaries is presented in Table 2.22. In this table, apart from number of farmers, 'number of cases' are also mentioned. These cases exceed number of farmers as some of the farmers received subsidy for two pulse crops. Here we see that about 155 litres of endosulfan (120 litres for small) and 27 kg. (14 for small) of BHC was used by 109 (92 small) beneficiaries. This works out to protection to 1.42 ha. per farm (1.30 ha. for small). Details of items in the table are self-explanatory and we need not comment further beyond mentioning that per farm subsidy comes to Rs. 57 (Rs. 52 small), per farm insecticides in value comes to about twice this amount as expected, at Rs. 119 (Rs. 109 small).

To complete the picture, in Table 2.23 we also give details of users of chemical insecticides without subsidy. The information here is presented not because it is very illuminating but because it underlines the fact that farmers do attach importance to insecticides as mentioned just above. We note that per farm amount spent comes to Rs. 128.22 (Rs. 78 for small).

Now we come to the remaining 57 farms (46 small) and here no chemical insecticide was used with or without subsidy. In Parbhani 31 farmers (22 small) did not undertake

Table 2.22 : Details of Beneficiaries of Crop Protection by Chemical Insecticides

	Parbhani Dist.		Latur Dist.		Both Districts together	
	Total	Of Which Small	Total	Of Which Small	Total	Of Which Small
1 Farmers	44	(29)	65	(63)	109	(92)
2 Crop Cases						
Tur	43	(23)	57	(52)	100	(80)
Gram	-	-	4	(4)	4	(4)
Mung	4	(4)	3	(3)	7	(7)
Udid	1	(1)	9	(9)	10	(10)
3 Insecticides						
a) Endosulfan						
Case	45	(32)	72	(67)	117	(99)
Quantity (Litres)	56.3	(27.5)	93.5	(92.5)	154.8	(120.0)
Cost (Rs.)	4725	(2310)	8190	(7686)	12915	(9996)
Subsidy	2233	(1072)	3940	(3700)	6173	(4772)
b) BHC						
Cases	3	(1)	1	(1)	4	(2)
Quantity(kg.)	22	(9)	5	(5)	27	(14)
Cost (Rs.)	51	(22)	11	(11)	62	(33)
Subsidy	25	(11)	6	(6)	31	(17)

* Data for small farmers put into brackets to improve readability)

Table 2.23 : Details of Farmers Using Chemical Insecticides Without Subsidy

	Parbhani Dist.		Latur Dist.		Both Districts Together	
	Total	Of Which Small	Total	Of Which Small	Total	Of Which Small
1 Farmers	28	(17)	7	(4)	35	(21)
2 Crop Cases						
Tur	28	(17)	8	(4)	36	(21)
Gram	1	(1)	1	(1)	2	(2)
Mung	2	(0)	-	-	2	(0)
Udid	1	(1)	-	-	1	(1)
3 Insecticides						
a) Endosulfan						
Cases	25	(15)	7	(4)	32	(19)
Quantity (Litres)	27.1	(12.8)	12.0	(4.0)	39.1	(16.8)
Cost (RS.)	2309	(1102)	1020	(342)	3329	(1444)
b) Cases	1	(0)	1	(1)	2	(1)
Quantity (kg.)	5.0	(0)	1.5	(1.5)	6.5	(1.5)
Cost (RS.)	10	(0)	4	(4)	14	(4)
c) Others						
Cases	6	(4)	1	(0)	7	(4)
Quantity (kg.Lts.)	4.1	(2.1)	4.0	(0)	8.1	(2.1)
Cost	569	(194)	576	(0)	1145	(194)

Data for Small farmers put into brackets to improve readability.

spray with 21 (14 small) of them knowing that subsidy was available; When asked to specify reason within categories (i) did not know the technical information, (ii) insecticides were costly, (iii) waited for subsidized insecticide and (iv) 'others', majority 17 (12 small) chose 'others'. Insecticides being 'costly' or 'waited for subsidized insecticides but did not receive' accounted together for 11 (8 small). Thus out of farmers who knew about subsidy, half seemed to claim that they waited for it but did not receive but the other half and 'other reasons'. In Latur things are not different. Out of 26 such farmers (23 small), 13 (16 small) knew about subsidy and more than half 11 (9 small) claimed 'insecticide was not made available to them' and 11 (all small) had 'other reasons'. It is difficult to draw firm conclusion from this category of 'non-users'. But 'users without subsidy' category described in Table 2.23 reveals farmer's faith in chemical insecticides. Here one may also point out the fact that target for this component was found to be always achieved, unlike some of the other components.

2.12 Biological Plant Protection Measures

Against the background of success of chemical plant protection in the form of endosulfan spray, this measure which was to control incidence of tur and gram pod borers (*Heliothis*) was not much of a success. Liquid containing the biological parasites was provided under the component.

Requirement of such liquid 'Heliokil' insecticide is 500 ml/ha and this liquid was to be mixed with 500 litres of water and sprayed on one hectare after mixing white yolk of eggs and indigo blue colour (neel). The spray was to be undertaken after the crop flowers and there is some incidence of this borer. After 8-10 days the dead borers were to be collected, sealed in bottle and handed over to the laboratory via extension worker for recycling and second spray to be undertaken in 15 days. If such second spray cannot be undertaken, a chemical spray may be undertaken, according to a hand-out of Marathwada Agricultural University, Parbhani. For small farmers, generally area covered per farm was 0.10 ha.

The obvious purpose was to introduce farmers to this somewhat unusual measure which leaves no ill-effects like chemical insecticides which cause harm to humans, environment and more specifically to natural enemies of insect pests. This is a somewhat futuristic measure and its development is still in laboratory stage. This component was provided in 1987-88, year prior to the reference year and neither in the reference year nor in the year of survey i.e. 1988-1989 was this implemented again. Even in 1987-88, just 24 per cent of the targeted area of 350 ha. in Parbhani was actually covered. (as against the total coverage of target of 12,500 ha. for chemical protection in 1988-89). In the two blocks selected we had to struggle to get even a few beneficiaries under the scheme in our sample. Farmers were also not very keen on this unfamiliar measure. Collection of dead borers and sealing

them in bottle was the most difficult measure and according to agricultural officials, even paid labour was reluctant to undertake this task as these dead insects carried an obnoxious smell. After extending sample to an additional block and additional villages, 4 small and 6 big farmers were contacted. In Latur in selected blocks only two could be contacted, thus a sample of 12 farmers. In most cases covered in the sample, 0.10 ha. pulse area of a farm was thus treated. Using 50 ml. liquid of parasites to be turned into 50 litres of 'solution' by adding that much water (alongwith white , yolk of 5 to 10 eggs and indigo blue colour).

When we asked these 12 farmers why was this treatment being tried when chemical insecticides are available, only two of them said that chemical insecticides are poisonous but these biological parasites are not. Rest of them said they did not know. So the basic intention is only modestly fulfilled. But none of them said chemical insecticides also kill parasites and predators that kill insect pests. Perhaps it is too much to expect in this sort of a programme. On the other hand chemical insecticides are tried and tested, well-packaged and well advertized and their success is also often immediate and spectacular and the two measures should not be compared at all. Added to this, second spray was either chemical (only in few cases) but often not undertaken at all by these selected farmers because of the tedious procedure mentioned above. They were reasonably convinced that parasites kill borers but some of them also said chemical insecticides are

better. For any large-scale coverage of biological pest-control many commercial aspects like standardizing, packaging, advertizing and other commercial inputs are needed. This needs to be complemented by a campaign to educate farmers about the damage caused by the chemical insecticides. Clearly, such a large-scale coverage appears distant at present.

2.13 Hand-operated Dal Chakki

This is also a component sparsely implemented and our sample has just five cases, 4 from Parbhani and one from Latur. Under the scheme, on certain approved hand-operated dal chakkis (pulse dehuskers) costing Rs. 4000/-, a subsidy of Rs. 1750 was offered to small farmers in 1988-89. As against a target of 87 chakkis in Parbhani, a list could be compiled of just 11 and it was difficult to contact such dispersed respondents. For Latur similar figures were 40 and 5.

Four farmers covered in Parbhani had received chakkis in April to June 1989 and as our survey was being conducted there in October 1989, only two had used it for tur from the crop of 1987-88 of just 20 and 35 kg. respectively while the other two had not used it at all, although they had a demonstration from the suppliers Maharashtra Agro Industries Corporation, from nearby Nanded district. All these four belonged to above 2 ha. category but two were below 3 ha. so one can call them medium farmers. In all cases, subsidy was paid and then chakkis were transferred to these farmers so their response was recorded. In Latur however the farmer

belonged to small farmers group.

None of these were very happy with this chakki. They complained about plates being too thick (so adjustment is difficult) and also that replacement of any damaged plate cost RS.400/-. Apparently, this component was not successful and in 1989-90 (year of survey, reference year being 1988-89) although subsidy was raised to RS.2,000/- no actual distribution of chakkis had taken place. In fact there was some talk of demonstrations of power-operated ones, where the dal was expected to be more uniform, less broken. But interestingly, we were intrigued by a remark of a relatively high-placed agricultural official that he was perplexed why the chakkis are designed so that they have to be operated mainly by the left hand. We had earlier referred to 'Central Food Technical Research Institute' (CFTRI), Nagpur for information about chakkis as theirs was an approved one, and they sent us CFTRI Mysore's News letter. This Newsletter showed a person operating the chakki with right hand.

On reflection, it was realized that the design of this chakki is such that the funnel releasing the dehusked dal is exactly on the opposite side of the handle to be manually rotated. Now if one person operates it (as it appeared to be the case), he cannot reach the dal on the other side to check on its quality. If one stands in 'front' so to say, he can do it but then he has to operate the chakki with left hand, and this is what the official probably meant. But with

so few respondents and such a small quantity actually dehusked, more cannot be said on this. In any case, this component must be rated as 'not successful'.

2.14 Crop loans, crop insurance and support prices are other three measures by which pulse production can be increased and formed part of NFDP. Information regarding crop loans and crop insurance is rather sketchy but this is presented in a tabular form in Table 2.24. From this we see that just over one-fourth of farmers availed of crop loans. These were mainly for tur with only five cases for urid and gram. Cooperative society is nearly the only source. Per loanee the amount comes to 1350 to 1400 rupees. If we include all selected farms, just Rs. 400 per farm came from loans. Nearly three-fourth of farmers did not avail of pulse crop loan. One-third of them admitted they were defaulters and not eligible but one-half gave 'other reasons' or responded by 'cannot say' and we suspect that the reason is again default in previous loan. Regarding crop-insurance, only one-third were aware that cooperative society loans come with crop insurance but in Parbhani district only one-sixth of them were aware of this fact. One need not comment on the subsidy to small farmers/by crop loans. Regarding the support prices, overwhelming majority - nearly all - felt that these were too low. Considering the overall shortage of pulses production and consequent high prices, this is not surprising.

2.15 The respondents were also asked about the difficulties

Table 2.24 : Information of Selected Farmers about Crop Loans and Crop Insurance

Item	Parbhani Dist.		Latur Dist		Overall	
	Total	Of which Small	Total	Of which Small	Total	Of which Small
A. Crop Loan.						
1 No. of Farmers	103	(69)	98	(90)	201	(159)
2 Availed of Pulse Crop Loan	28	(21)	26	(25)	54	(46)
a) Crops						
- Tur	26	(19)	23	(22)	49	(41)
- Udid	1	(1)	2	(2)	3	(3)
- Gram	1	(1)	1	(1)	2	(2)
b) Source						
- Co-op Society	25	(18)	26	(26)	51	(44)
- Commercial Bank (Tur)	3	(3)	-	-	3	(3)
c) Amount of Loan (₹)						
- Tur	41275	(33075)	26450	(25750)	67725	(58325)
- Udid	400	(400)	1500	(1500)	1900	(1900)
- Gram	570	(570)	3000	(3000)	3570	(3570)
Total	42245	(34045)	30950	(30250)	73195	(64295)
- Per Farm (Loanee)	1509	(1621)	1190	(1210)	1355	(1398)
- Per Farm (All Farms)	410	(493)	316	(336)	364	(404)
3 Farms not availing Loan Reasons	75	(48)	72	(65)	147	(113)
- Because defaulter	14	(9)	39	(37)	53	(46)
- No need	15	(11)	1	(0)	16	(11)
- Other reasons	33	(16)	27	(24)	60	(40)
- Cannot Say	14	(12)	5	(4)	19	(16)
B. Crop Insurance						
For Co-op. Society Loan						
Crop Insurance is Automatic						
- Did know	17	(8)	57	(50)	74	(58)
- Did not know	86	(61)	41	(40)	127	(101)
Total	103	(69)	98	(90)	201	(159)

(Information on small farmers is put into brackets to improve readability of the table.)

in extending pulse crop area (although in Maharashtra as a whole, area contribution to increase in pulses production is more important than that of productivity, as seen in the first chapter) most common response was that even with small area, cereals must be raised in any case so area under pulses cannot be increased. Second in importance was the reason that good seeds are not available which acts as a disincentive to area extension under pulses. Regarding the NPDP scheme as a whole, respondents could not react because many did not ^{know} the scheme in its entirety and nor could village extension worker inform them about all components as not all components are implemented everywhere and some components are not implemented at all in some years. But regarding the components implemented, most of the farmers responded by saying that village extension worker gave them necessary instructions.

Table II.1 : Cropping Pattern for the State and Parbhani and Latur Districts 1981-82

(Area in '00 ha)

Crop	Maharashtra % to GCA	Parbhani % to GCA	Latur % to GCA			
1 Rice	14854	7.42	223	2.29	197	3.13
2 Wheat	10016	5.01	565	5.67	254	4.04
3 K. Jowar	30364	15.18	1977	19.85	1974	31.39
4 R. Jowar	35665	17.83	1730	17.37	350	5.57
5 Bajra	17330	8.69	88	0.88	125	1.99
6 Other Cereals	4494	2.25	56	0.56	92	1.46
7 Total Cereals	112773	56.36	4644	46.63	2992	47.53
8 Tur	6551	3.27	396	3.98	505	8.03
9 Gram	4215	2.11	302	3.03	257	4.08
10 Mung	5335	2.69	815	8.13	212	3.37
11 Udid	4279	2.14	191	1.92	307	4.88
12 Other Pulses	6813	3.41	168	1.69	378	6.01
13 Total Pulses	27243	13.62	1872	13.80	1659	26.38
14 Total Foodgrains (7 + 13)	140016	69.98	6516	65.42	4651	73.95
15 Sugarcane	3665	1.83	85	0.85	72	1.14
16 Cotton	26028	13.01	2100	21.09	239	4.59
17 Groundnut	6730	3.36	150	1.51	303	4.82
18 Safflower	4943	2.47	555	5.57	124	1.97
19 Sunflower	506	0.25	4	0.04	206	3.23
20 Fruits	1397	0.70	42	0.42	4	0.06
21 Vegetables	1471	0.74	30	0.30	13	0.21
22 Other Crops	15321	7.66	477	4.79	627	9.97
23 Gross Cropped Area (GCA)	200077	100.00	9959	100.00	6239	100.00

Table II.2 : Proportion of Irrigated Area under Each Crop for the State and Parbhani and Latur Districts 1981-82

(Percentages)

Crop	Maharashtra	Parbhani	Latur
1 Rice	26.81	64.03	30.96
2 Wheat	52.03	45.84	57.87
3 K. Jowar	2.47	0.66	0.86
4 R. Jowar	11.08	0.63	16.86
5 Bajra	3.07	0.00	2.40
6 Other Cereals	7.21	17.36	4.35
7 Total Cereals	13.08	9.45	9.72
8 Tur	1.45	0.00	0.20
9 Gram	20.71	6.62	11.23
10 Mung	0.80	0.00	0.00
11 Udid	0.37	0.00	0.00
12 Other Pulses	0.70	0.00	0.00
13 Total Pulses	3.95	1.23	1.81
14 Total Foodgrains	11.30	7.10	6.90
15 Sugarcane	100.00	100.00	100.00
16 Cotton	4.23	2.19	0.35
17 Groundnut	11.41	43.33	0.66
18 Safflower	0.50	2.34	0.00
19 Sunflower	NA	NA	NA
20 Fruits	74.30	92.36	50.00
21 Vegetables	79.32	53.33	69.23
22 Other Crops	8.62	14.97	2.04
23 Gross Cropped Area	12.46	7.69	6.74

3. SUMMARY AND CONCLUSION

Between 1961 and 1991 population of the country has nearly doubled. Cereals production has kept up with the advent of the green revolution but production of pulses has been stagnant. Growth rate of pulses is less than half a per cent compared to the population growth rate of over 2.20 per cent per annum. Major pulse of gram with over 45 per cent share in pulses production has a negative (though mild) growth rate whereas mostly rainfed tur with 15 to 20 per cent share has a growth rate of about 2 per cent. Area factor has played an important role in production trend of these two major pulses. The shortages are also reflected in the wholesale price index numbers for the country with seven per cent growth rate for cereals but near 10 per cent growth rate for pulses. Income elasticity of demand for pulses on the other hand is much greater with the difference between the elasticities being around 0.30 over the years. There are also differences between magnitudes of elasticities for rural and urban areas but the margin is nearly always of the order mentioned. This reinforces pressure of demand for pulses (Sections 1.1 to 1.5).

3.2 If we compare the cereals and pulses scenario in the country with that in Maharashtra, we realize that in Maharashtra growth in cereals production really started in mid-seventies with stagnant sixties and very bad early seventies whereas the trend was more or less upward and much more steady for

the country as a whole barring 1965-66 and 1966-67. Pulses however, supplemented cereals production rather well in Maharashtra in the sixties and after that registered a reasonably good growth rate keeping up with or at times bettering the population growth rate. Farm harvest prices have also been higher than those for cereals. In Maharashtra tur production is nearly three times that of gram, a situation opposite to that for the country as a whole. Tur is rainfed with productivity between 4 to 6 quintals per hectare but gram is 20 per cent irrigated with productivity less than 4 quintals per hectare. 'Other pulses' consisting of udid, mung, horsegram etc. also play a role supplying half the pulse production with growth rates on par with tur and gram (Section 1.6 and 1.7).

3.3 It became obvious in early eighties that pulse production needed an impetus and the National Pulse Development Programme (NPDP) was introduced for the purpose. In Maharashtra it consisted of six major components : demonstration on farmers' plots, certified seed production by farmers in 'seed villages', bacterial seed treatment, chemical plant protection, biological plant protection and introduction of hand operated dal-chakki (pulse dehusker). Besides, greater availability of crop loans, encouragement to crop insurance and support prices etc., were its other features. In implementation, preference was to be given to small and marginal farmers and nearly 15 per cent subsidy was to be spent on them. The present survey was conducted between October 1989 to April 1990, with reference year 1988-89. Out

of the eleven districts in which the scheme was implemented in the state, for five districts it was implemented for tur as well as gram while for remaining six it was implemented for tur only. Concentrating on tur-gram districts, two districts with a concentration of pulse area and production viz. Parbhani and Latur, were selected for survey. These two districts have 21 per cent of their gross cropped area under pulses whereas the state has 14 per cent area under pulses. Tur and gram shares are also better in these districts than the shares of these crops in the state which are between 3 to 4 per cent each.

The differences between Parbhani and Latur districts are in rabi jowar and cotton coverage. In Parbhani kharif and rabi jowar each cover 15 per cent of cropped area with cotton area 21 per cent, in Latur kharif jowar is important, covering 30 per cent area but less than 6 per cent area each for rabi jowar and cotton. Regarding irrigation, while state has 14 per cent of area under irrigation, for Parbhani it is about 10 per cent and for Latur it is even lower at 8 per cent but both these districts come under the assured rainfall zone. Pulse crops do not receive much irrigation in the state with 'all pulses' receiving 4 per cent in terms of area and in Parbhani and Latur districts this percentage is even lower, below 2 per cent. Gram is better irrigated (20 per cent at state level) and in Parbhani and Latur about 7 and 11 per cent gram is irrigated. This means non-gram pulses receive hardly any irrigation. (Sections 2.1 to 2.3).

3.3 From each district, it was planned to select two blocks and from each block 3 villages. From each village 15 small farmers were to be selected. This means for each district six villages and 90 farmers, making a sample of 180 farmers in all. But because components were implemented over different years, with six villages in Parbhani district, components like biological plant protection and dal-chakki could not be easily covered and the sample had to be extended to 10 villages and to non-small farmers also, as the two components mentioned were not really suitable for small farmers. Thus the total sample consisted of 201 farmers, 159 of whom were small farmers. Among these were included 34 farmers from scheduled castes and scheduled tribes category. Inclusion of bigger farmers was thus inevitable but analysis of responses is presented for small as well as bigger farms so that bigger farms do not dominate (and thus vitiate) the results. The analysis shows that there was not much difference between the responses between these two categories so what stands for sample as a whole, stands for small and marginal farmers.

Initially 5 out of 15 farmers from each village were to be non-participants but as the dispersal of components over years and over villages was realized, it became obvious that inclusion of sufficient beneficiaries under each component was going to be a problem. Then again, the components are not such that they would change the output in a big way like

introduction of irrigation or of chemical fertilizers where none existed. Further it is also necessary to ensure that non-participants are also non-users of the specific resource. Besides, the scheme appears to be aiming at changing the attitude of the farmer towards pulse cultivation and this need not reflect immediately in the output of that year and the analysis would get cluttered with attempts at providing plausible explanations to some awkward results. So it was decided to choose a sample of participants only. The componentwise coverage is as follows : demonstration on plots (71), certified seed production (47) bacterial seed treatment (50), chemical plant protection (110), biological plant protection (12) and dal chakki (5). The last two components were not popular and sparsely implemented, hence their smaller coverage, as mentioned above. Thus 186 participants appear as 'beneficiaries' under 295 cases. So each selected farmer appeared as beneficiary in more than one component, the beneficiaries/farmers ratio being 1.59 for all farmers and between 1.38 to 1.65 for small farmers. Pulse area per farm for selected small farmers comes to 0.41 ha. in Parbhani and 0.84 ha. in Latur district. (Sections 2.4 to 2.6).

3.4 The NFDLP was to give preference to small farmers (including marginal farmers) and was also to include farmers belonging to scheduled caste and scheduled tribes. In the list of beneficiaries provided to us at the district and block levels small farmers were generally marked and mention of S.C.

and S.T. was also made. The selected farmers confirmed receipt of components under NPDP. Thus components had in fact reached the targeted farmers. In such schemes, this fulfills one of the basic requirements for its success. Componentwise analysis reveals that for demonstration on farmers' plots of 0.20 ha. per farm, out of 71 participants, 38 are from Parbhani and 33 from Latur. The component was implemented in 1987-88 (year previous to our reference year of 1988-89), but thereafter discontinued because according to officials, the enthusiasm shown by farmers to be included under the component created tension in the area. The positive aspect of this is that this reveals farmers' faith in modern of inputs. From 59 small farmers, 36 felt that output on demonstration plots was better, by 5 to 15 per cent over normal output. Thus 61 per cent of beneficiaries were impressed with the package. But when asked whether as a result, they made any changes in their method of cultivation, only 16 answered affirmatively. This is not very encouraging, even allowing for the possibility that some of them were adopting such packages already. We also assessed effect of demonstration on others by asking other respondents about these demonstrations. From such 100 small farmers, only half knew that such demonstrations were taking place and from this half, only 60 per cent actually took the trouble of visiting them and nearly all were impressed. Thus there are layers of responses from eagerness in participation, to undertaking a visit if one is not a participant. But on the whole, this

component is an obvious success.

In the component of certified seeds production, small farmers had an area of 0.40 ha to 1 ha. each and pulses covered were tur and udid. Bigger farmers had one to 3 ha. each. Thirty six small farmers had 34.62 ha. area of which 20.40 ha. was under tur. Production per hectare came to 5.40 quintals. More than half the farmers (small and big) sold their output to seed corporation and got Rs.150 per quintal as additional rate under the scheme. But apparently many chose traders to sell the produce possibly due to less stringent grading or due to saving in transport costs. Reactions of non-participant small farmers residing in seed villages were noted. One-third of them felt that seed supply has increased but half felt it had not. Remainder could not say either way. Out of 99 small non-participants outside seed villages, 84 did not know about the scheme (Section 2.7 to 2.9).

3.5 There were 50 farmers covered under bacterial seed treatment 35 of them being small. Under the component packets were distributed free, each costing Rs. 4.60 to treat seeds before sowing. On an average 2.17 packets per small farm were received, ranging from 1 to 7 packets. All of them reported that they received instructions on how to use them. Half the recipients noted better growth (10 per cent or more), two-thirds of the remaining could not say either way but one-third felt it was the same. Whatever success noticed here gets clouded by the fact that from the participant farmers

34 out of 35 small farmers and 13 out of 15 big had not used packets in the following year (1988-89) by purchasing them on their own. One hopes that the reason is the expectation that in 1988-89 also they expected free distribution which did not take place. There were 53 non-participants (data are for Parbhani district only, where it was implemented) of which 34 were small. Eighteen of these 34 had farmers in their village who received packets but only 4 said the growth there was better. Half of the 53 showed willingness to use packets but none of them had purchased any packets on their own in 1988-89. The primary effect on beneficiaries and secondary effect on non-beneficiaries appears rather weak.

Component of chemical plant protection was implemented in Parbhani as well as Latur. Farmers welcomed this component whole heartedly. For example, in Parbhani a high target of coverage of 12,500 ha. was achieved completely. Under the component, a hectare requiring 1 litre of endosulfan costing Rs. 84 was subsidized to the extent of Rs. 40. This component had highest coverage of 110 farmers in the sample, 92 of them being small farmers. Apart from these 110 farmers 35 farmers (21 small) spent on chemical spray on their own without waiting for subsidy. This shows farmers' faith in chemical insecticides. The component of chemical spray was to control tur pod borer. For the 35 small farmers, 120 litres of endosulfan was provided sufficient to give protection to 1.30 ha. each, with a cost of Rs. 109. Non-subsidized small farms spent Rs.78 per farm.

This component is a clear success (Sections 2.10 and 2.11).

3.6 The biological plant protection component was not much of a success. For small farmers, generally 0.10 ha. area of tur was sprayed using biological parasites. For 0.10 ha., liquid of 50 ml. containing the parasites. was provided to be mixed with 50 litres of water after adding white yolk of eggs and indigo blue colour, after initial incidence of pod borer. After 5 to 10 days dead borers were to be collected, sealed in a bottle and sent to laboratory to be recycled for second spray. Apart from the elaborate procedure, collection of dead borers was a difficult job because they carried an obnoxious smell and even paid labour was reluctant to do the job. We were hard pressed to contact even a few small cultivators and managed to interview four small and six big cultivators. When asked why this measure is being tried when chemical insecticides are available, most of them did not know but two said chemical insecticides are harmful. None could say that chemical insecticides besides being harmful to humans and environment, kill predators and natural enemies of insect pests. Most of them were convinced that biological parasites kill borers but none of them had undertaken a second spray due to difficulties mentioned. This is a futuristic measure and just cannot be compared with success of chemical insecticide (endosulfan) which is tried and tested, well packaged, advertized and easily available.

For the component of dal-chakki, small farmers were offered subsidy of Rs.1750 for the chakki costing Rs.4,000 but against planned 37 chakkis, list of 11 was available in one of the districts and again we could contact only a few. Of the five farmers that could be contracted three had not used them as chakkis were received between April and June 1989. Remaining two together had made just 55 kg. of dal and none of recipients were really enthusiastic. The design of dal-chakki also left something to be desired. In fact in 1933-39 the component was not implemented. It may also be mentioned that four of these farmers were bigger cultivators as the chakkis were transferred to them. This was just as well considering the lack of success of this component (Sections 2.12 and 2.13).

3.7 Components of crop loans, crop insurance (subsidy on premium) and support prices are such that they have an indirect bearing on farmers' attitude to pulse production and it is difficult to draw conclusions about their effectiveness or success. Less than one-fourth of selected farmers availed of loans from the co-operative society. Of those who did not avail of crop loan, one-third admitted they were defaulters but one-half gave 'other reasons' or chose 'cannot say' option and one suspects the reason is again default in previous loan. Per loanee loan amount was Rs.1350 to 1400 but per farmer (over all farmers) it comes to Rs.400. Most of the farmers felt that support prices were low and with the shortages prevailing, this comment is only to be expected. Farmers were

also asked about the difficulties in extending area under pulses. Most common response was that cereals production is unavoidable and with small area, this leaves little scope for extension of pulse area and another response was that extension can be thought of only if good seeds are made available. (Sections 2.14 and 2.15).

In conclusion it can be said that if the purpose of the NFDF was to change the attitude of the farmer towards pulse cultivation, then it was achieved because in such schemes, once we are convinced about the efficiency of various measures, success lies in ensuring that they reach the targeted entities. Effect of such changes in attitude is not immediate or spectacular but it is there and cannot be undervalued just because it gathers momentum slowly.
