Study No. 80

IDENTIFICATION OF FACTORS RESPONSIBLE FOR DECLINING STATUS OF SOYBEAN IN MADHYA PRADESH

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CONTENTS

LIST OF TABLES

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PREFACE

The present study on " Identification of factors responsible for declining status of soybean in Madhya Pradesh" was taken up by this Centre at the instance of Dr. Panjab Singh the then Vice Chancellor and Chairman of the Advisory Body of the AERC, Jabalpur. During the previous month to the meeting of the Advisory Body there was discussion in Bhopal and a concern was expressed with respect to declining area, production and yield of soybean in M.P. It was therefore suggested that AERC Jabalpur should take up the study and find out the reasons for this phenomenon.

The Ministry of Agriculture agreed to the suggestion and the study was included in the programme of work of the AERC, Jabalpur.

The objective of the study was to assess the extent of decline in area, production and yield of soybean in the state, selected districts and selected farms and to note the reasons for the phenomenon and suggest remedial measures.

It was noted that there was a decline in area, production and yield of soybean in the state, selected districts and villages, of varying degrees.

Among the factors responsible for the declining status of soybean, lowering of prices was the foremost important. Due to decline in the demand of deoiled cakes in the foreign markets there was a decline in demand of soybean and, therefore, prices in India. It is suggested that the declining prices should be contained by state government intervention and institution like OILFED. Another factor was adverse climatic conditions. For consecutive three years there were unseasonal rains immediately after sowing and also after the harvesting of the crop and stocking it on the threshing floors. Suitable soil drainage measures and supply of tarpaulin or other cover for threshing floors at subsidised rate are the remedial measures suggested.

Sterility mosaic, girdle beetle and root rot diseases were other factors. Entomologists and plan pathologists should take up systematic IPM research projects on these, as the losses due to these are enormous.

Other factors for declining status and remedial measures thereof are discussed elsewhere in the report.

At the initial stage of the study the Director of Agriculture and Additional Director of Agriculture at Bhopal were consulted. The selection of districts was approved by them. At the district level the Deputy Directors of Agriculture of Bilaspur, Narsinghpur and Dewas alongwith other staff members helped the study team in the collection of secondary and primary data. I am grateful to all of them.

I would like to express my gratefulness to the sample farmers for responding patiently to the queries of the field staff.

Mr. S.C. Jain drafted the report. He was ably assisted by Mr. Sita Ram at all the stages of the study. Mr. Shrikant Upadhye and Mr. Chandrakant Mishra did the computational work. All of them deserve appreciation.

Like other studies this is a product of joint efforts of all the staff members. The draft report was typed by Mr. S.K. Sharma. The Computer typing was ably done Mr. Sikandar Khan.

I express my grateful thanks to Dr. Rajendra Singh, Research Officer, AERC, Allahabad which happens to be the designated centre for AERC, Jabalpur for his useful and constructive comments.

I am thankful to all of them.

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CHAPTER I

INTRODUCTION

1.1 Background

In the meeting of the Advisory Body of the Agro-Economic Research Centre, Jabalpur, held on 9.9.1999, Vice Chancellor and Chairman expressed that during the earlier month there was quite some discussion at Bhopal expressing anxiety w.r.t. decreasing area, production and yield of soybean in the state. It was added that farmers were losing interest in growing soybean due to many reasons like attacks by pests and diseases, lowering of prices, etc. He directed that A.E.R. Centre, Jabalpur should take up a study on "Reasons of setback to soybean cultivation".

In persuance of above direction a study titled "Identification of factors responsible for declining status of soybean in Madhya Pradesh" was proposed to the Ministry of Agriculture for inclusion in the programme of work of the Centre. Accordingly the Ministry's approval was received and study was taken up in the programme of the Centre for the year 1999-2000.

1.2 Objectives of the study

Objectives of the study are :

1. To assess the decline in area, production and yield of soybean in the state, selected districts and selected farms in recent years.

2. To note the reasons in the decline in area, production and yield of soybean by discussing and consulting the state level and selected districts level officials, knowledgeable persons and selected farmers.

3. To seek the opinions and suggestions of the state level and district level officials and knowledgeable persons and selected farmers to remedy the reverse trend.

1.3 Methodology

For evolving a methodology for the study a committee of scientists in the J.N.K.V.V., Jabalpur as given below was constituted.

1. Dr. B.L. Mishra, Director of Extension Services.

2. Dr. C.B. Singh, Dean, College of Agriculture, Jabalpur.

3. Dr. A.K. Choudhary, Professor & Head, Department of Agricultural Economics and Farm Management, College of Agriculture, Jabalpur.

4. Mr. M. C. Athavale, Professor & Head, Agro-Economic Research Centre, College of Agriculture, Jabalpur.

5. Dr. Prem Singh, A.D.R. (H.Q.), Directorate of Research Services, J.N.K.V.V., Jabalpur.

Several meetings of the committee were held and details of study were finalised as given below.

1.3.1. Selection of Districts

Study was conducted in 3 agro-climatic zones of the state represented by a district each where the area, production and yield of soybean showed a declining trend during the last three years. The districts selected in 3 agro-climatic zones are :

S.No.	Agro-Climatic Zone	District Selected
1.	Eastern Plateau & Hills Region	Bilaspur
2.	Central Plateau & Hills Region	Narsinghpur
3.	Western Plateau & Hills Region	Dewas

1.3.2 Sampling Design

From each of the 3 selected districts 30 farmers were selected from a cluster of villages where farmers showed disinterest in soybean cultivation since last 3 years. Lists of farmers for each of the villages in such clusters were prepared in the ascending order of operated area and divided into three groups. For grouping, farms of a cluster of villages were listed in ascending order of operational holdings. Simultaneously, cumulative total of the operated area was noted. The cumulative total was divided into 3 groups, so that each group had equal cumulative area. The selection of farmers from different size groups (I, II & III) was in proportion to number of farms falling in each group. Thus, the total number of farms in each district was 30 making a total sample of 90 farmers in three districts.

1.3.3 Reference Years

Data of the selected farms was collected in schedules specifically prepared for the study. The reference years were 1997-98, 1998-99 and 1999-2000.

The collection of data was done during April-May, 2000.

Data was analysed by using simple methods of totalling, averaging and percentages.

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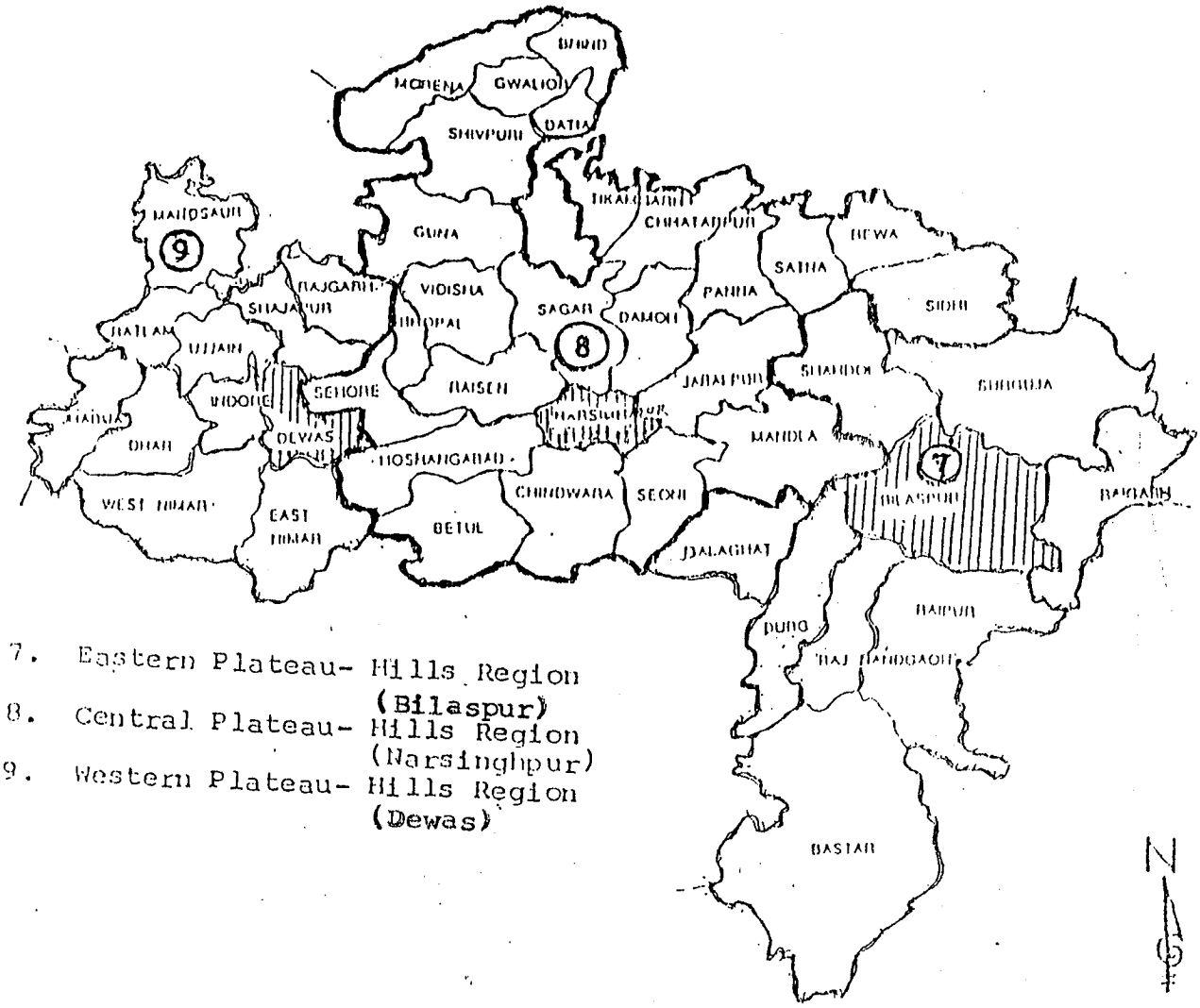
AGRO-CLIMATIC ZONES AND SELECTED DISTRICTS
OF MADHYA PRADESH



7. Eastern Plateau- Hills Region (Bilaspur)
8. Central Plateau- Hills Region (Narsinghpur)
9. Western Plateau- Hills Region (Dewas)

CHAPTER II

AREA, PRODUCTION AND YIELD OF SOYBEAN IN MADHYA PRADESH AND SELECTED DISTRICTS

2.1 Soybean in Madhya Pradesh

2.1.1 Area

The area of soybean in M.P. in 1998-99 (the year for which the data was available) was 4,420.0 thousand hectares. The area increased steadily from 2,149.4 thousand hectares in 1990-91. The fluctuation was such that it was 2,648.8 thousand hectares in 1991-92 and 3,054.0 thousand hectares in 1992-93 and 3,415.1 thousand hectares in 1993-94. However, it dipped suddenly to 3,225.2 thousand hectares in 1994-95. In subsequent three years it increased from year to year so that it was 3,849.2 thousand hectares in 1995-96, 3,947.1 thousand hectares in 1996-97 and 4,469.7 thousand hectares in 1997-98. However, in 1998-99 it decreased to 4,420.0 thousand hectares and the estimates of the state government officials and knowledgeable persons and farmers for 1999-2000 were still lower looking to the weather conditions, decreased demand in the market and infestation by insects pests. This incidentally was the reason for taking up this study (Table 2.1).

Table 2.1 Area, production and yield of soybean in Madhya Pradesh, 1990-91 to 1998-99

Particulars	Area		Production		Yield	
	Area (000' ha.)	Index (Base 1990-91)	Production (000' tonnes)	Index (Base 1990-91)	Yield Kg./ha.	Index (Base 1990-91)
1990-91	2,149.4	100.00	2,183.8	100.00	1,016	100.00
1991-92	2,648.8	123.23	2,092.5	95.82	790	77.76
1992-93	3,054.0	142.09	2,598.9	119.01	851	83.76
1993-94	3,415.1	158.89	3,599.3	164.82	1,054	103.74
1994-95	3,225.2	150.05	2,870.4	131.44	890	87.60
1995-96	3,849.2	179.08	3,891.5	178.20	1,011	99.51
1996-97	3,947.1	183.64	3,757.6	172.07	952	93.70
1997-98	4,469.7	207.95	4,845.1	221.87	1,084	106.69
1998-99	4,420.0	205.64	4,473.1	204.83	1,012	99.61

2.1.2 Production

The production of soybean in 1998-99 was 4,473.1 thousand tonnes. It was 2,183.8 thousand tonnes in 1990-91. It increased to 3,599.3 thousand tonnes in 1993-94 with some fluctuations in between. As in the case of area the production dropped down suddenly to 2,870.4 thousand tonnes in 1994-95. Thereafter, it generally increased from year to year like area and was 4,845.1 thousand tonnes in 1997-98. In the next year i.e. 1998-99 it decreased to 4,473.1 thousand tonnes and the farmers expected it to further decrease in 1999-2000 (Table 2.1).

2.1.3 Yield

The yield of soybean was 1,012 kg./hectare in 1998-99. It was 1,016 kg./hectare in 1990-91. In the subsequent three years it declined in the first two years but increased in the third year to 1054 kg./hectare. Like area and production yield increased in the first four years and was highest in 1993-94. However, 1994-95 seems to be bad year as in that year like area and production yield dropped suddenly to 890 kg./hectare. Like area and production yield was at its highest in 1997-98 to 1,084 kg./hectare. In 1998-99 like area and production the yield showed a decline and was 1,012 kg./hectare and the farmers expected it to decline further in 1999-2000 (Table 2.1).

2.2 Variation in the Districts

The variations in the area, production and yield of soybean during the years 1996-97 to 1997-98 and from 1997-98 to 1998-99 have been studied in the following paragraphs.

2.2.1 Variations in Area

Of the 45 districts of the state in 36 districts the area under soybean increased from 1996-97 to 1997-98. In 4 districts viz. Bastar, Jabalpur, Ratlam, Ratlam and Guna there was decline in area. In another 4 districts of Balaghat, Surguja, Rewa and Sidhi there was no change in area. In the remaining 1 district of Raigrh the area itself was very negligible. From the year 1997-98 to 1998-99 the area of soybean recorded an increase in 17 districts. The area declined in another 22 districts including the selected districts of Bilaspur, Narsinghpur and Dewas. The area remained same in 5 districts and it was negligible in Raigarh district (Table 2.2).

2.2.2 Variations in Production

The production of soybean declined from 1996-97 to 1997-98 in 7 districts including selected Narsinghpur district. The production recorded an increase in the same year in 33 districts. It remained constant in 3 districts and was negligible in the remaining 2 districts.

From the year 1997-98 to 1998-99 the production declined in as many as 35 districts including the selected districts of Bilaspur, Narsinghpur and Dewas. It recorded an increase in 6 districts and was constant in 2 districts. In the remaining 2 districts the production was negligible (Table 2.2).

2.2.3 Variations in Yield

In the case of yield it was noted that in 34 districts the yield of soybean increased from 1996-97 to 1997-98. In the remaining 12 districts the yield recorded a decline including selected districts of Bilaspur and Narsinghpur.

From the year 1997 -98 to 1998-99 the yield registered an increase in 6 districts. In the remaining 39 districts the yield decreased including that in the selected districts of Bilaspur, Narsinghpur and Dewas (Table 2.2).

Table 2.2 Districts showing decline in area, production and yield of soybean from 1996-97 to 1997-98 and from 1997-98 to 1998-99

Particulars	Name of districts
Decline in area from 1996-97 to 1997-98	Bastar, Jabalpur, Ratlam, Guna.
from 1997-98 to 1998-99	Durg, Rajnandgaon, Bilaspur, Jabalpur, Chhindwara, Seoni, Mandla, Narsinghpur, Sagar, Damoh, Panna, Tikamgarh, Chhatarpur, Satna, Indore, Dewas, Gwalior, Shivpuri, Guna, Bhopal, Vidisha, Betul.
Decline in production from 1996-97 to 1997-98	Bastar, Jabalpur, Seoni, Narsinghpur, Ratlam, Guna, Betul.
from 1997-98 to 1998-99	Durg, Rajnandgaon, Bilaspur, Jabalpur, Balaghat, Chhindwara, Seoni, Mandla, Narsinghpur, Sagar, Damoh, Panna, Tikamgarh, Chhatarpur, Rewa, Satna, Shahdol, Jhabua, Khargone, Khandwa, Mandsaur, Dewas, Morena, Bhind, Gwalior, Shivpuri, Guna, Datia, Sehore, Bhopal, Raisen, Vidisha, Betul, Rajgarh, Hoshangabad.
Declined in yield from 1996-97 to 1997-98	Bilaspur, Jabalpur, Balaghat, Seoni, Narsinghpur, Sagar, Panna, Dhar, Ratlam, Betul, Bhopal, Vidisha.
from 1997-98 to 1998-99	Raipur, Durg, Rajnandgaon, Bastar, Bilaspur, Surguja, Raigarh, Jabalpur, Balaghat, Chhindwara, Seoni, Mandla, Narsinghpur, Sagar, Damoh, Panna, Tikamgarh, Chhatarpur, Rewa, Sidhi, Satna, Shahdol, Jhabua, Khargon, Khandwa, Mandsaur, Dewas, Morena, Bhind, Gwalior, Shivpuri, Guna, Datia, Bhopal, Sehore, Raisen, Vidisha, Betul, Hoshangabad.

2.3 Soybean in the Selected Districts

In the following paragraphs details of trends in area, production and yield of soybean in the selected 3 districts have been described.

2.3.1 Bilaspur District

In Bilaspur district the area under soybean in 1990-91was 0.3 thousand hectares. It increased gradually till 1997-98 when it was 7.2 thousand hectares. The index thus rose from 1990-91 (100.00) to 1997-98 to 2400.00.

The production was 0.2 thousand tonnes in 1990-91. It rose gradually and was 4.8 thousand tonnes in 1997-98. The index showed on increase from 1990-91 to 2400.00 in 1997-98.

In the case of yield the figure for 1990-91 was 868 kg./ha. There was no trend in subsequent years but generally increased till 1994-95 to 1100 kg./ha. Thereafter it declined continuously in the latter 4 years and was 535 kg.ha. in 1998-99. The index showed a decline from 100.00 in 1990-91 to 61.64 in 1998-99. Thus, it is observed that area and production of soybean showed an increasing trend till 1997-98 but dropped in 1998-99. The yield however was maximum in 1993-94. Thereafter, it recorded a continuous decline till 1998-99 (Table 2.3).

Table 2.3 Area, production and yield of soybean in Bilaspur district, Madhya Pradesh, 1990-91 to 1998-99

Particulars	Area		Production		Yield	
	Area (000' ha.)	Index (Base 1990-91)	Production (000' tonnes)	Index (Base 1990-91)	Yield Kg./ha.	Index (Base 1990-91)
1990-91	0.3	100.00	0.2	100.00	868	100.00
1991-92	0.3	100.00	0.2	100.00	611	70.39
1992-93	0.7	233.33	0.5	250.00	774	89.17
1993-94	0.9	300.00	1.0	500.00	1174	135.25
1994-95	1.6	533.33	1.8	900.00	1100	126.73
1995-96	2.3	766.67	2.1	1050.00	926	106.68
1996-97	4.6	1533.33	3.8	1900.00	826	95.16
1997-98	7.2	2400.00	4.8	2400.00	666	76.73
1998-99	5.5	1833.33	3.0	1500.00	535	61.64

2.3.2 Narsinghpur District

The area under soybean in this district was 49.8 thousand hectares in 1990-91. It generally increased from year to year with some fluctuations till 1997-98, when it was 121.6 thousand hectares. In 1998-99. However, it recorded a decline and was 117.8 thousand hectares.

The production of soybean was 53.1 thousand tonnes in 1990-91. It showed generally an increasing trend till 1997-98 with fluctuations in between when it was 172.00 thousand tonnes. In the subsequent year, however, it dropped suddenly to 137.50 thousand tonnes.

The yield of soybean was 1,068 kg./ha. In 1990-91. It increased to 1,428 kg./ha. Till 1993-94. It dropped suddenly in 1994-95 to 967 kg./ha. Thereafter, it recovered and was 1,671 kg./ha. In 1995-96 and 1,630 kg./ha in 1996-97. Subsequently, it declined to 1415 kg./ha. in 1997-98 and 1, 168 kg./ha. In 1998-99.

It is thus observed that area and production generally increased from 1990-91 till 1997-98. In the last year (1998-99) of the reference period, however, both area and production declined. The yield of soybean, on the other hand, increased till 1995-96 but continuously, declined in the subsequent 3 years (Table 2.4).

Table 2.4 Area, production and yield of soybean in Narsinghpur district, Madhya Pradesh, 1990-91 to 1998-99

Particulars	Area		Production		Yield	
	Area (000' ha.)	Index (Base 1990-91)	Production (000' tonnes)	Index (Base 1990-91)	Yield Kg./ha.	Index (Base 1990-91)
1990-91	49.8	100.00	53.1	100.00	1,068	100.00
1991-92	63.2	126.91	76.3	143.69	1,208	113.11
1992-93	76.9	154.42	108.8	.204.90.	1,415	132.49
1993-94	92.0	184.74	131.4	247.46	1,428	133.71
1994-95	78.8	158.23	76.2	143.50	967	90.54
1995-96	101.4	203.61	169.5	319.21	1,671	156.46
1996-97	101.9	204.62	166.1	312.81	1,630	152.62
1997-98	121.6	244.18	172.0	323.92	1,415	132.49
1998-99	117.8	236.55	137.5	258.95	1,168	109.36

2.3.3 Dewas District

The area under soybean was 127.4 thousand hectares in 1990-91. It increased from year to year and was 240.4 thousand hectares in 1997-98. In the last year, however, it decreased to 234.1 thousand hectares.

The production of soybean was 147.3 thousand tonnes in 1990-91. It fluctuated during the subsequent 6 years and increased to 346.8 thousand tonnes in 1997-98. Thereafter, it decreased abruptly to 295.4 thousand tonnes in 1998-99.

The yield of soybean 1990-91 was 1,156 kg./ha. From 1991-92 to 1996-97 it fluctuated between 724 kg./ha. in 1992-93 to 1092 kg./ha. in 1993-94. In 1997-98 it rose to 1443 kg./ha. but declined in the next year (1998-99) to 1,262 kg./ha.

It is thus observed that in Dewas District the area under soybean continuously increased from 1990-91 to 1997-98 but decreased in 1998-99. The production from 1990-91 to 1996-97 varied from year to year with several fluctuations but with a generally increasing trend and maximised in 1997-98. In 1998-99 like area it decreased. The yield was quite high in 1990-91 but showed a decline in 2 subsequent years but had increasing trend in the latter years till it was maximum in 1997-98. It again declined in 1998-99 (Table 2.5).

Table 2.5 Area, production and yield of soybean in Dewas district, Madhya Pradesh, 1990-91 to 1998-99

Particulars	Area		Production		Yield	
	Area (000' ha.)	Index (Base 1990-91)	Production (000' tonnes)	Index (Base 1990-91)	Yield Kg./ha.	Index (Base 1990-91)
1990-91	127.4	100.00	147.3	100.00	1,156	100.00
1991-92	155.4	121.98	148.4	100.75	955	82.61
1992-93	176.4	138.46	127.7	86.69	724	62.63
1993-94	186.4	146.31	203.6	138.22	1,092	94.46
1994-95	204.5	160.52	183.8	124.78	899	77.77
1995-96	219.3	172.14	223.2	151.53	1,018	88.06
1996-97	222.6	174.73	228.4	155.06	1,026	88.75
1997-98	240.4	188.70	346.8	235.44	1,443	124.83
1998-99	234.1	183.75	295.4	200.54	1,262	109.17

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CHAPTER –III

CHARACTERISTICS OF SELECTED DISTRICTS

In this chapter characteristics of the selected districts, like location, topography, soils, rainfall, population, literacy, land use, crops grown, irrigation and productivity of crops are studied to get some idea of the area of survey.

3.1 Bilaspur District

3.1.1. Location

Bilaspur district was located in the eastern part of Madhya Pradesh between latitudes 21°37' and 23°70' N and longitudes 80°12' and 83°40'E. It was bounded on the north by Surguja and Shahdol districts, in the east by Raigarh district, in the south by Raipur and Durg districts and in the west by Mandla district. The area of the district is 19,723 sq.km.

3.1.2 Topography

Bilaspur district is bounded by a semi-circular chain of hills. It has undulating and plain topography, closely cultivated and thickly populated. It is this region which forms the northern portion of the Chhattisgarh plain or upper basin of river Mahanadi.

The district is bounded on the north-west and east by ranges of hills while southern border is open and for the greater part marked by rivers, the Mahanadi and the Seonath. The eastern outer wall of the Satpuras, known as the Maikal range, runs from the north east to south west along the north-western border. Irregular ranges of hills alternating with small elevated plateaus stretch along the northern part of the district. On the eastern border, the Sakti hills lead almost down to the Mahanadi thus, completing the semi-circular chain by which the wide plain country is surrounded. The general slope of the district is from north-west to south-east.

3.1.3 Soils

The soils of the district can be classified into 5 groups viz., Kanhar, Matasi, Dorsa, Bhata and Kachhar.

1. Kanhar

Kanhar is the black clay soil of blue-black or brown-black colour, very retentive of moisture. As it is apt to suffer from water logging it is good soil for wheat but not for paddy. However, it is capable of growing a second crop and from this point of view is certainly the most valuable soil in the district. It is generally found in Mungeli tehsil and its plain regions which is the most fertile part of the district.

2. Matasi

It is yellow in colour and also varies from brown to red. It is paddy soil par excellence. It is not retentive of moisture, but with heavy rainfall gives a far better out turn than any other soil. Matasi can not grow a second crop and when unembanked is fit for little more than kodon and requires long resting fallows. The best matasi is found in the valleys of Mahanadi and Mand rivers and popularly known as Dudhia matasi. Seonath flows southwards or eastwards through the district. This type of soil is found in Janjgir and Sakti tehsils.

3. Dorsa

Dorsa is a mixture of Kanhar and Matasi and as the name itself suggests (do meaning two and rasa meaning is extracts) it is good soil for paddy but gives only a moderate outturn of wheat or second crop. It is generally divided in two classes.

i) First Grade Dorsa

It is a dark brown clay soil, which in many respects resembles Kanhar, which predominates over Matasi in its composition. The first grade Dorsa can grow any kind of crop and when sown with paddy are usually double cropped with linseed or rabi pulses. This type of soil is found in Mungeli tehsil and its plain regions.

ii) Second Grade Dorsa

It is a light brown soil in composition. The second grade Dorsa can grow paddy, linseed and rabi pulses, lighter millets, arhar and occasionally, wheat as a single crop. This type of soil is found in Janjgir, Sakti, Bilaspur and Katghora tehsils.

4. Bhata

The Bhata is a poor detritus of laterite and red in colour. Bhata consists of a slight sprinkling of a sandy soil over gravel and is good for nothing except the lightest kind of millets and seasamum. With heavy rainfall, a crop of kodon can be grown over this but otherwise it is the poorest soil in the district. This type of soil is found in Katghora tehsil.

5. Kachhar

The admixture of clay and sand is found on the banks of rivers and large streams. Kachhar which is an excellent soil for garden crops provided irrigation facilities are

3.1.4 Rainfall

The district gets most of the rainfall from south-west monsoon. The normal rainfall of the district is 1,391.7 mm. Of this more than 85 per cent (87.61 per cent) occurs between June to September in 41 rainy days out of the total of 44 rainy days (93.18 per cent) of the year. (Table 3.1).

Table 3.1 Distribution of rainfall and number of rainy days, Bilaspur district, Madhya Pradesh

Month	Normal rainfall		Number of rainy days	
	mm.	Percentage	No.	Percentage
June	183.6	13.19	7	15.91
July	427.3	30.70	15	34.09
August	409.3	29.41	15	34.09
September	199.1	14.31	4	9.09
October	54.8	3.94	1	2.27
November	16.6	1.19	--	---
December	4.7	0.34	--	---
January	18.2	1.31	--	---
February	28.8	2.07	--	---
March	20.7	1.47	--	--
April & May	28.6	2.05	2	4.55
Total	**1,391.7**	**100.00**	**44**	**100.00**

3.1.5 Population

The total population of the district according to 1991 census was 3,793.6 thousand. The district was rural in character as more than 80 per cent (83.00 per cent) of its population was rural. Its population is shared nearly equally by males and female, the proportion being 50.54 per cent and 49.46 per cent respectively. The scheduled castes population in the district was 18.12 per cent. The scheduled tribes population in the district was 23.03 per cent of total population. The density of population per sq. km. was 192.

3.1.6 Literacy

The literacy percentage of the district was 36.32. As in the case of other regions of the country, the percentage of literacy among rural population was remarkably lower (31.64) as compared to the urban population (59.16). A very wide difference was noticed between literacy percentage among female population (21.86 per cent) and male population (50.45 per cent).

As already mentioned Bilaspur district was rural district and this was clearly seen from the breakup of working population. As high as 80 per cent of the workers were engaged in agricultural pursuits. Of these 55.02 per cent were cultivators and 24.58 per cent, agricultural labourers (Table 3.2).

Table 3.2 Population characteristics, Bilaspur district, 1991

S.No.	Particulars	Percent
1	Persons (No.) 37,93,566	--
	a) Males	50.54
	b) Females	49.46
	c) Rural	83.00
	d) Urban	17.00
	e) Scheduled Castes	18.00
	f) Scheduled Tribes	23.03
2.	Density, persons per sq. km. 192	--
3.	Literacy	36.32
	a) Males	50.45
	b) Females	21.86
	c) Rural	31.64
	d) Urban	59.16
4.	Workers	40.71
	a) Cultivators	55.02
	b) Agricultural labourers	24.58
	c) Household industry	1.33
	d) Other workers	19.07

3.1.7 Land Use

Of the total geographical area of 1,966.0 thousand hectares the net area sown was 41.98 per cent. Forests occupied 39.04 per cent, land not available for cultivation, 7.90 per cent and other uncultivated land excluding fallow, 6.63 per cent (Table 3.3)

Table 3.3 Land utilisation, Bilaspur district, 1997-98

S.No.	Particulars	Area (Hectares)	Percentage to total geographical area
1	Forest	7,67,593	39.04
2.	Land not available for cultivation	1,55,349	7.90
	a) Area under non-agricultural uses	1,09,179	5.55
	b) Barren and unculturable land	46,170	2.35
3.	Other uncultivated land excluding fallow land	1,30,403	6.63
	a) Permanent pastures and other grazing land	1,30,403	6.63
	b) Land under miscellaneous tree crops and groves not included in net area sown.	--	--
4.	Culturable waste land	35,260	1.79
5.	Fallow land	52,279	2.66
	a) Current fallow	23,165	1.18
	b) Old fallow	29,114	1.46
6.	Net area sown	8,25,137	41.98
	Total geographical area	**19,66,021**	**100.00**

3.1.8. Cropping Pattern

The gross cropped area of the district was 1,016.9 thousand hectares. Bilaspur was one of the districts of Chhattisgarh plain, the rice bowl of the state. Paddy was, therefore, the most largely cultivated crop of the district contributing 69.23 per cent of the gross cropped area. The next important group of crops was "other pulses", mainly teora or lathyrus contributing 15.87 per cent (Table 3.3).

Table 3.4. Cropping pattern, Bilaspur district, 1997-98

(Unit - Hectare)

Crop	Area	Percentage to gross cropped area	Irrigated area	Percentage to total	Percentage of irrigated area to area under crop
Paddy	7,04,055	69.23	2,69,819	94.94	38.32
Jowar	1,200	0.12	--	--	--
Maize	11,337	1.11	3	--	--
Wheat	13,500	1.33	4,499	1.58	33.33
Barley	249	0.02	--	--	--
Other Cereals & Millets	22,133	2.18	--	--	--
Total Cereals	7,52,474	73.99	2,74,321	96.52	36.46
Gram	34,604	3.40	75	0.03	0.22
Tur	5,379	0.53	--	--	--
Other Pulses	1,61,363	15.87	408	0.14	0.25
Total Pulses	2,01,346	19.80	483	0.17	0.24
Total Foodgrains	9,53,820	93.79	2,74,804	96.69	28.81
Groundnut	4,688	0.46	492	0.18	10.50
Sesamum	3,646	0.36	1	--	--
Rapeseed & Mustard	5,651	0.56	204	0.07	3.61
Linseed	17,127	1.68	--	--	--
Niger	1,571	0.15	--	--	--
Soybean	7,225	0.71	8	--	--
Other Oilseeds Safflower	119	0.01	10	--	--
Sunflower	15	--	15	0.01	100.00
Castor	164	0.02	--	--	--
Total oilseeds	40,206	3.95	730	.0.26	1.82
Sugarcane	1,770	0.17	1,152	0.41	65.08
Total Fruits & Vegetables	17,136	1.69	6,434	2.26	37.55
Total Spices	3,429	0.34	1,031	0.36	30.07
Total Fodder Crops	35	--	34	0.01	97.14
Other Crops	538	0.05	21	0.01	3.90
Gross Cropped Area	10,16,934	100.00	2,84,206	100.00	27.95

3.1.9 Irrigated Crops and Irrigation Sources

Of the gross cropped area of 1,016.9 thousand hectares, 284.2 thousand hectare were irrigated. Since paddy was the most important crop, it formed the highest percentage of irrigated area (94.94). Wheat had 1.58 per cent of the irrigated area. Fruits and vegetables constituted 2.26 per cent of irrigated area.

Fodder crops were irrigated to the extent of 97.14 per cent. Sugarcane was irrigated to the extent of 65.08 per cent. Paddy was irrigated to the extent of 38.32 per cent. Wheat was irrigated to the extent of 33.33 per cent, groundnut to the extent of 10.50 per cent, rapeseed and mustard 3.61 per cent, fruits and vegetables 37.55 per cent and spices 30.07 per cent (Table 3.4). The irrigation was done mainly by canals (82.58 per cent). Tubewells contributed 6.72 per cent of the irrigated area. Tanks provided irrigation to 4.26 per cent of the irrigated area. The area commanded by wells was equal (4.26 per cent), "Other" sources irrigated 2.18 per cent of the area (Table 3.5).

Table 3.5 Sources of irrigation, Bilaspur district, 1997-98

Source	Area (Thousand hectares)	Percentage to total
Canals	234.1	82.58
Wells	12.1	4.26
Tubewells	19.1	6.72
Tanks	12.1	4.26
Others	6.2	2.18
Total	**284.2**	**100.00**

3.1.10 Yield per Hectare of Important Crops

The yields of cereals, pulses, oilseeds and all other crops were lower in the district than the state average. The yield of only kodo-kutki was 229 kg./ha. more than the state average (226 kg./ha.) (Table 3.6).

Table 3.6 Yield per hectare of important crops, Bilaspur district, 1997-98

(Unit- kg./hectare)

Crop	Bilaspur district	Madhya Pradesh
Paddy	522	877
Wheat	484	1,641
Maize	1,110	1,331
Jowar	505	807
Kodo kutki	299	226
Gram	344	946
Tur	575	716
Pea	137	348
Lentil	132	430
Teora	54	174
Urad	130	265
Moong-moth	266	280
Kulthi	202	289
Groundnut	918	998
Soybean	666	1,084
Sesamum	96	219
Niger (Ramtil)	219	163
Safflower (Kusum)	118	217
Castor	293	334
Sugarcane	2,874	3,861

3.1.11 Mandis

Bilaspur district had 7 regulated markets (mandis) five of these were of 4th category and two belonged to 3rd category (Table 3.7).

Table 3.7 Mandis of Bilaspur district, Madhya Pradesh

S.No.	Name of mandis	Category
1	Bilaspur	3
2	Mungeli	3
3	Jairamnagar	4
4	Kota	4
5	Lormi	4
6	Pendra Road	4
7	Takhatpur	4

3.2 Narsinghpur District

3.2.1 Location

Narsinghpur district lies almost in the central part of the state and is situated between 22°45' N and 23°15' N latitudes and 78°38' E and 79°38' E longitudes. It is surrounded by seven districts including Sagar in the north, Raisen in the north-west, Hoshangabad in west, Chhindwara in South, Damoh in the North-east, Seoni in the South-east and Jabalpur in the East.

3.2.2 Topography

The district occupies a part of the eastern Narmada valley, a continuous chain of the Satpura hills bordering on the south and a section of the Vindhya scarp on the north. The natural divisions of the district stretch into three narrow belts parallel in an east wet direction. The major part of the district is situated in south of the river Narmada, which is a natural feature diversely affecting the district.

3.2.3 Soils

The soils of the district can be classified into 5 groups viz. Kaber-I, Kaber-II, Mund, Domatta and Patarua.

1. Kaber-I

Kaber-I is the richest and heaviest soil in the valley. It is very fertile clay soil of great depth and rich in carbonate of lime. It is black in colour and usually takes on a blueish tinge when dry. It can produce all crops except those like cotton which suffers from excessive moisture. It has an extraordinary high capillarity and retains sufficient capillary moisture to bring a rabi crop to harvest without winter rains. The heaviest variety occurs in the east of Narsinghpur tehsil haveli, adjoining the Patan tehsil of Jabalpur.

2. Kaber-II

Slightly inferior Kaber-II is a lighter variety of the same species. It is a producer of wheat but also an excellent soil for all other crops, particularly rice and leguminous crops, such as gram, lentil, teora, and batra etc. In well drained positions it yields excellent crops of maghel, til and jowar also.

3. Mund

Mund is an ordinary loam soil classed as mund or morand. It is tractable to plough, but owing to its low degree of capillarity is dependent upon a well distributed rainfall. It contains a considerable amount of admixture of limestone nodules. Mund grows wheat and gulabi gram. It could also grow jowar, kodon, urad, moong and arhar mixed together if not waterlogged. Paddy does not thrive in it. It is also found in brown coloured soil. It produces alternatively, jowar, kodon, urad, moong and arhar mixed together and gram. It also grows lentil but it can not grow teora.

4. Domatta

Domatta is one of the inferior soils having a mixture of yellow soil and some sand. It does not grow wheat without irrigation but grows all other crops. Another of its kind has larger proportion of sand and yellow soil. It is excellent rice soil and also grows gram and the mixed crops of jowar, arhar, moong and urad etc. When embanked it is sometimes double cropped in good years with rice and gram.

5. Patarua

Patarua is really the remnant of the above three classes of the soil (Kaber-I, Kaber-II and Mund) washed away by way of erosion. Thus, it is an inferior coarse loam soil mixed with sand and chunkakar. It produces gram, til and teora. It is very inferior yellowish soil. It is usually allowed to lie fallow for some years. Gram and til are grown in alternate years.

3.2.4 Rainfall

The district gets most of the rainfall from south-west monsoon. The normal rainfall of the district is 1,300.8 mm. Of this more than 90 per cent (90.02 per cent) occurs between June to September in 36 rainy days of the total of 39 rainy days (92.31 per cent) of the year (Table 3.8).

Table 3.8 Distribution of rainfall and number of rainy days, Narsinghpur district, Madhya Pradesh

Month	Normal rainfall		Number of rainy days	
	mm.	Percentage	No.	Percentage
June	148.3	11.40	4	10.26
July	421.2	32.38	12	30.77
August	385.0	29.60	18	46.15
September	216.5	16.64	2	5.1
October	40.8	3.14	--	--
November	17.6	1.35	1	2.56
December	8.7	0.67	--	--
January	15.9	1.22	--	--
February	17.3	1.33	--	--
March	12.1	0.93	--	--
April & May	17.4	1.34	2	5.1
Total	**1300.8**	**100.00**	**39**	**100.00**

3.2.5 Population

The total population of the district according to 1991 Census was 785.5 thousand. The district was rural in character as more than 85 per cent (85.13 per cent) of its population was rural. The proportion of male population was 52.28 per cent and that of female 47.72 per cent, Scheduled castes population was 16.59 per cent of the total population. The scheduled tribes population in the district was 12.90 per cent. The density of population per sq. km. was 152.

3.2.6 Literacy

The literacy percentage of the district was 45.33. The literacy percentage among rural population was lower (41.61) than the urban population (66.60), the literacy percentage among females was lower (33.82) than the male population (55.83).

Narsinghpur district was a rural district and this was clearly seen from the break up of working population. About 80 per cent of the workers were engaged in agricultural pursuits. Of these 39.81 per cent were cultivators and 38.88 per cent were agricultural labourers (Table 3.9).

Table 3.9 Population characteristics, Narsinghpur district, 1991

S.No.	Particulars	Per cent
1	Persons (No.) 7,85,496	--
	a) Males	52.28
	b) Females	47.72
	c) Rural	85.13
	d) Urban	14.87
	e) Scheduled Castes	16.59
	f) Scheduled Tribes	12.90
2.	Density, persons per sq. km. 192	--
3.	Literacy	45.33
	a) Males	55.83
	b) Females	33.82
	c) Rural	41.61
	d) Urban	66.60
4.	Workers	36.08
	a) Cultivators	39.81
	b) Agricultural labourers	38.88
	c) Household industry	3.55
	d) Other workers	17.76

3.2.7 Land Use

Of the total geographical area of 513.7 thousand hectares the net sown area was 57.91 per cent. Forests occupied 26.53 per cent, other uncultivated land excluding fallow land 5.57 per cent, and land not available for cultivation 4.68 per cent (Table 3.10).

Table 3.10 Land utilisation, Narsinghpur district, 1997-98

S.No.	Particulars	Area (Hectares)	Percentage to total geographical area
1	Forest	1,36,295	26.53
2.	Land not available for cultivation	24,055	4.68
	a) Area under non-agricultural uses	23,029	4.48
	b) Barren and unculturable land	1,026	0.20
3.	Other uncultivated land excluding fallow land	28,607	5.57
	a) Permanent pastures and other grazing land	28,436	5.54
	c) Land under miscellaneous tree crops and groves not included in net area sown.	171	0.03
4.	Culturable waste land	16,427	3.20
5.	Fallow land	10,827	2.11
	a) Current fallow	4,986	0.97
	b) Old fallow	5,841	1.14
6.	Net area sown	2,97,440	57.91
Total geographical area		**5,13,651**	**100.00**

3.2.8 Cropping Pattern

The gross cropped area of the district was 409.2 thousand hectares. Of the gross cropped area 38.93 per cent was occupied by pulses, 31.22 per cent by oilseeds and 26.48 per cent by cereals. The district was famous for the cultivation of pulses and oilseeds. Among pulses, gram was the major crop and occupied 26.54 per cent. Other important pulse was tur which occupied 3.61 per cent. Among oilseeds, soybean was most important and contributed 29.71 per cent. Wheat was most important cereal and constituted 21.62 per cent of area. Sugarcane was also important crop and occupied 1.87 per cent of area (Table 3.11).

Table 3.11 Cropping pattern, Narsinghpur district, 1997-98

(Unit - Hectare)

Crop	Area	Percentage to gross cropped area	Irrigated area	Percentage to total	Percentage of irrigated area to area under crop
Paddy	8,184	2.00	--	--	--
Jowar	5,924	1.45	--	--	--
Bajra	29	--	--	--	--
Maize	434	0.11	--	--	--
Wheat	88,465	21.62	82.981	54.16	93.80
Other Cereals & millets	5,304	1.30	--	--	--
Total Cereals & millets	1,08,340	26.48	82.981	54.16	76.59
Gram	1,08,588	26,54	53,442	34.88	49.22
Tur	14,783	3.61	--	--	--
Other Pulses	35,956	8.78	3,671	2.40	10.21
Total Pulses	1,59,327	38.93	57,113	37.28	35.85
Total Foodgrains	2,67,667	65.42	1,40,094	91.44	52.34
Groundnut	29	0.01	--	--	--
Sesamum	3,573	0.87	--	--	--
Rapeseed & Mustard	1,096	0.27	829	0.54	75.64
Linseed	131	0.03	8	0.01	6.11
Niger	609	0.15	--	--	--
Soybean	1,21,578	29.71	1,170	0.76	0.96
Safflower	3	--	2	--	99.59
Sunflower	720	0.18	720	0.47	99.86
Total oilseeds	1,27,739	31.22	2,729	1.78	2.14
Sugarcane	7,670	1.87	7,670	5.01	100.00
Total Fruits & Vegetables	2,582	0.63	1,599	1.04	61.93
Total Spices	724	0.18	575	0.38	79.4
Total Fodder Crops	2,684	0.66	475	0.31	17.70
Other Crops	144	0.04	75	0.05	52.08
Gross Cropped Area	4,09,210	100.00	1,53,217	100.00	37.44

3.2.9 Irrigated crops and Irrigation Sources

Of the gross cropped area of 409.2 thousand hectares, 153.2 thousand hectares were irrigated. Wheat was the most important irrigated crop as it formed highest percentage of irrigated area (54.16). The other important crop was gram and shared 34.88 per cent. Sugarcane constituted 5.01 per cent and fruits and vegetables constituted 1.04 per cent of irrigated area.

Wheat, rapeseed and mustard, gram, spices and fruits and vegetables were the crops irrigated to a large extent. Wheat was irrigated to the extent of 93.80 per cent. Rapeseed and mustard was irrigated to the extent of 75.64 per cent, gram to the extent of 49.22 per cent, spices to the extent of 79.42 per cent and fruits and vegetables to the extent of 61.93 per cent. Sugarcane was totally irrigated (Table 3.11). The irrigation was done mainly by wells (48.88 per cent). Tubewells contributed 39.69 per cent of the irrigated area. The irrigation provided by pumps on nalahs and rivers constituted 9.99 per cent area (Table 3.12).

Table 3.12 Sources of irrigation, Narsinghpur district, 1997-98

Source	Area (Thousand hectares)	Percentage to total
Canals	2.2	1.44
Wells	74.9	48.88
Tubewells	60.8	39.69
Others	15.3	9.99
Total	153.2	100.00

3.2.10 Yield per Hectare of Important Crops

The yield of soybean, the most important crop of the district, was 1,415 kg./ha., higher than the state average. The yields of paddy, maize, jowar, kodo-kutki, tur, teora, urad, moong-moth, groundnut, niger and sunflower were higher in the district than the state average. On the other hand the yields of wheat, gram, pea and lentil were lower in the district (Table 3.13).

Table 3.13 Yield per hectare of important crops, Narsinghpur district, 1997-98

(Unit- kg./hectare)

Crop	Narsinghpur district	Madhya Pradesh
Paddy	1,152	877
Wheat	1,417	1,641
Maize	1,574	1,331
Jowar	1,290	807
Kodo kutki	268	226
Gram	860	946
Tur	1,397	716
Pea	341	348
Lentil	347	430
Teora	411	174
Urad	397	265
Moong-moth	460	280
Groundnut	1,310	998
Soybean	1,415	1,084
Sesamum	373	219
Niger (Ramtil)	361	163
Sunflower	714	316
Sugarcane	4,458	3,861

3.2.11 Mandis

There were 5 regulated markets (mandis) in Narsinghpur district. Four of these were of second category and one mandi belonged to fourth category (Table 3.14).

Table 3.14 Mandis of Narsinghpur district Madhya Pradesh

S.No.	Name of Mandis	Category
1	Narsinghpur	2
2	Gadarwara	2
3	Kareli	2
4	Gotegaon	2
5	Tendukheda	4

3.3 Dewas District

3.3.1 Location

Dewas district was situated in the Malwa Plateau in the west central part of Madhya Pradesh. It lies between 20°15' N and 23°20'N latitudes and 75°55'E and 77°08'E longitudes. The district was bounded by Ujjain district in the north, Indore district in the west, West Nimar district in the south west, East Nimar district in the south, Hoshangabad district in the South east, Sehore district in the east and Shajapur district in the north east. The tropic of cancer passes through the district near Nemawar village south of Khategaon town.

3.3.2 Topography

The topography of the district can be divided into four broad regions.

1. Dewas Plateau,
2. Kali Sindh Basin,
3. Vindhyan Range,
4. Middle Narmada Valley

3.3.3 Soils

The whole district, except a few patches in hilly areas, is covered by medium black cotton soil, though the colour and depth varies. The colour is light black to dark black. The soil is not very deep and is suitable for most of the crops especially, wheat, cotton, sugarcane, jowar, groundnut, etc. The percentage of clay is generally between 30 to 55. Malwa and Nimar soils have a reputation for fertility and productivity. Excepting a part of Kannod tehsil and the whole of Khategaon tehsil, which have soils as in Nimar the remaining area of the district is covered by Malwa soils. The structure of the soil is very favourable for crop production and it is not sticky as the black cotton soil of Jabalpur division. Soils are calcarious in nature and sufficient calcium is available which helps in crumb formation.

On hilly areas in the south of the district soils are lighter and more suited for jowar, etc. Minor millets are also grown on the hills.

3.3.4 Rainfall

The district gets most of the rainfall from south west monsoon. The normal rainfall of the district is 1,083.2 mm. Of this more than 90 per cent (91.87 per cent) occurs between June to September in 35 rainy days (Table 3.15).

Table 3.15 Distribution of rainfall and number of rainy days, Dewas district, Madhya Pradesh

Month	Normal rainfall		Number of rainy days	
	mm.	Percentage	No.	Percentage
June	150.7	13.91	10	28.57
July	362.2	33.44	12	34.29
August	291.6	26.92	11	31.43
September	190.6	17.60	2	5.71
October	27.1	2.50	--	--
November	25.0	2.31	--	--
December	5.1	0.47	--	--
January	9.2	0.85	--	--
February	3.7	0.34	--	--
March	3.2	0.30	--	--
April & May	14.8	1.36	--	--
Total	**1,083.2**	**100.00**	**35**	**100.00**

3.3.5 Population

The total population of the district according to 1991 census was 1,033.8 thousand. The district was rural in character as more than 70 per cent (74.11 per cent) of its population was rural. Its population was shared equally by males and females, the proportion being 51.99 per cent and 48.01 per cent respectively. The scheduled castes population in the district was 18.15 per cent. The scheduled tribes population was 15.04 per cent of the total population. The density of population per sq. km. was 147.

3.3.6 Literacy

The literacy percentage of the district was 35.30. As in the case of other regions of the country, the percentage of literacy among rural population was remarkably lower (28.59) as compared to the urban population (54.49). A very wide difference was noticed between literacy percentage among female population (20.44) and male population (49.02).

Dewas district was a rural district and this was clearly seen from the break up of working population. About 75 per cent of the workers were engaged in agricultural pursuits. Of the total workers 43.51 per cent were cultivators and agricultural labourers, 31.80 per cent (Table 3.16).

Table 3.16 Population characteristics, Dewas district, 1991

S.No.	Particulars	Per cent
1	Persons (No.) 10,33,807	--
	a) Males	51.99
	b) Females	48.01
	c) Rural	74.11
	d) Urban	25.89
	e) Scheduled Castes	18.15
	f) Scheduled Tribes	15.04
2.	Density, persons per sq. km. 147	--
3.	Literacy	35.30
	a) Males	49.02
	b) Females	20.44
	c) Rural	28.59
	d) Urban	54.49
4.	Workers	36.67
	a) Cultivators	43.51
	b) Agricultural labourers	31.80
	c) Household industry	1.86
	d) Other workers	22.83

3.3.7 Land Use

Of the total geographical area of 700.8 thousand hectares the net sown area was 52.89 per cent. Forests occupied 29.35 per cent, other uncultivated land excluding fallow land was 10.41 per cent and land not available for cultivation, 6.59 per cent (Table 3.17).

Table 3.17 Land utilisation, Dewas district, 1997-98

S.No.	Particulars	Area (Hectares)	Percentage to total geographical area
1	Forest	2,05,704	29.35
2.	Land not available for cultivation	46,157	6.59
	a) Area under non-agricultural uses	34,882	4.98
	b) Barren and unculturable land	11,275	1.61
3.	Other uncultivated land excluding fallow land	72,965	10.41
	a) Permanent pastures and other grazing land	72,941	10.41
	b) Land under miscellaneous tree crops and groves not included in net area sown.	24	--
4.	Culturable waste land	2,940	0.42
5.	Fallow land	2,367	0.34
	a) Current fallow	1,445	0.21
	b) Old fallow	922	0.13
6.	Net area sown	3,70,679	52.89
	Total geographical area	**7,00,812**	**100.00**

3.3.8 Cropping Pattern

The gross cropped area of the district was 576.7 thousand hectares. Of the gross cropped area 42.86 per cent was occupied by oilseeds, 24.78 per cent by cereals, 17.51 per cent by pulses and 6.16 per cent by fibres. The district was famous for the cultivation of oilseeds. Among oilseeds, soybean was most important and contributed 41.67 per cent. Gram was most important pulse and constituted 15.10 per cent. Among cereals, wheat was most important and contributed 18.89 per cent, jowar occupied 4.44 per cent and maize, 1.31 per cent. Among fibres, cotton was most important and occupied 6.16 per cent of area (Table 3.18).

Table 3.18 Cropping pattern, Dewas district, 1997-98

(Unit - Hectare)

Crop	Area	Percentage to gross cropped area	Irrigated area	Percentage to total	Percentage of irrigated area to area under crop
Paddy	735	0.13	--	--	--
Jowar	25,555	4.44	21	0.01	0.08
Bajra	84	0.01	--	--	--
Maize	7,570	1.31	56	0.04	0.74
Wheat	1,08,923	18.89	1,01,670	68.86	93.34
Barley	44	--	39	0.03	88.64
Other Cereals & Millets	14	--	2	--	14.29
Total Cereals & Millets	1,42,925	24.78	1,01,788	68.94	71.22
Gram	87,065	15.10	30,222	20.47	34.71
Tur	10,132	1.76	79	0.05	0.78
Other Pulses	3,781	0.66	2,665	1.80	70.48
Total Pulses	1,00,978	17.51	32,966	22.32	32.65
Total Foodgrains	2,43,903	42.29	1,34,754	91.26	55.25
Groundnut	439	0.08	1	--	0.23
Sesamum	2,955	0.51	--	--	--
Rapeseed & Mustard	514	0.09	146	0.09	28.40
Linseed	2,912	0.50	130	0.09	4.46
Soybean	2,40,356	41.67	471	0.32	0.20
Safflower	24	0.01	12	0.01	50.00
Sunflower	7	--	--	--	--
Total Oilseeds	2,47,207	42.86	760	0.51	0.31
Sugarcane	3,373	0.58	3,373	2.29	100.00
Total Fruits & Vegetables	5,406	0.94	5,054	3.43	93.49
Total Spices	1,537	0.27	1,409	0.95	90.73
Total Fodder Crops	39,638	6.87	1,008	0.68	2.54
Total Fibres	35,512	6.16	1,259	0.85	3.55
Other Crops	164	0.03	49	0.03	29.88
Gross Cropped Area	5,76,740	100.00	1,47,666	100.00	25.69

3.3.9 Irrigated Crops and Irrigation Sources

Of the gross cropped area of 576.7 thousand hectares 147.6 thousand hectares were irrigated. Wheat was the most important irrigated crop and formed highest percentage of irrigated area (68.86). The other important irrigated crop was gram and shared 20.47 per cent. Fruits and vegetables constituted 3.43 per cent of irrigated area. The other irrigated crop was sugarcane and constituted 2.29 per cent of irrigated area.

Wheat, barley, gram, other pulses, rapeseed and mustard, other oilseeds, fruits and vegetables and spices were irrigated to a large extent. Wheat was irrigated to the extent of 93.34 per cent barley to the extent of 88.64 per cent. Gram was irrigated to the extent of 34.71 per cent, rapeseed and mustard to the extent of 28.40 per cent and other pulses to the extent of 70.48 per cent. Fruits and vegetables were irrigated to the extent of 93.49 per cent and spices to the extent of 90.73 per cent. Sugarcane was totally irrigated. The most important sources of irrigation were wells and tube wells and occupied 44.41 per cent and 41.37 per cent, respectively. The other sources of irrigation were pumps on nalahs and rivers and contributed 9.28 per cent of irrigated area. The irrigation provided by canals constituted 2.84 per cent and tanks contributed 2.10 per cent (Table 3.19).

Table 3.19 Sources of irrigation, Dewas district, 1997-98

Source	Area (Thousand hectares)	Percentage to total
Canals	4.2	2.84
Wells	65.6	44.41
Tubewells	61.1	41.37
Tanks	3.1	2.10
Others	13.7	9.28
Total	**147.7**	**100.00**

3.3.10 Yield per Hectare of Important Crops

The yield of soybean, the most important crop of the district was 1,443 kg./ha. higher than the state average of 1,084 kg./ha. The yields of wheat, jowar, gram, pea, lentil, teora, urad, moong-moth, groundnut and sesamum were higher in the district than the state average. On the other hand the yields of paddy, maize, bajra, tur, cotton and sugarcane were lower in the district (Table 3.20).

Table 3.20 Yield per hectare of important crops, Dewas district, 1997-98

(Unit- kg./hectare)

Crop	Dewas district	Madhya Pradesh
Paddy	680	877
Wheat	2,250	1,641
Maize	940	1,331
Jowar	1,004	807
Bajra	881	1,088
Gram	1,146	946
Tur	517	716
Pea	525	348
Lentil	523	430
Teora	250	174
Urad	326	265
Moong-moth	390	280
Groundnut	1,084	998
Soybean	1,443	1,084
Sesamum	292	219
Cotton	472	501
Sugarcane	1,998	3,861

3.3.11 Mandis

Dewas district had 7 regulated markets (mandis). Four of these belonged to 3rd category and there was only one mandi each in 1st, 2nd and 4th category (Table 3.21).

Table 3.21 Mandis of Dewas district, Madhya Pradesh

S.No.	Name of Mandis	Category
1	Dewas	1
2	Khategaon	2
3	Hathpipalya	3
4	Kannod	3
5	Sonkachh	3
6	Loharda	3
7	Bagli	4

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CHAPTER IV

ANALYSIS OF DATA OF SELECTED FARMERS

Since the agronomical conditions of the three districts (belonging to three agro-climatic regions) varied considerably the factors responsible for declining status of soybean had peculiarities for each district. It was therefore, thought proper to describe the characteristics of selected farmers and the factors responsible for declining status of soybean independently for each district.

It may be mentioned that the sample did not have "large" category of farmers (10 hectares and above).

The description of farmers and factors of declining status of soybean for Bilaspur district follows. As mentioned earlier, for collecting field level data 30 farmers each were selected in three districts of Bilaspur, Narsinghpur and Dewas.

4.1 Bilaspur District

4.1.1 Operated Area

The total operated area of 30 farmers was 63.520 hectares. Thus the average area per farm was 2.117 hectares. The distribution of land among different size groups was quite skewed as although marginal and small farms were higher in number (56.67 per cent) the area under control of these farms was quite low (28.35 per cent). On the other hand 43.33 per cent farms belonging to semi-medium and medium categories commanded as high as 71.65 per cent of the area (Table 4.1).

Table 4.1 Operated area, selected farms, Bilaspur district, Madhya Pradesh

(Area – Hectares)

Size group	Operated area	Percentage to total	No. of holdings	Percentage to total
Marginal	5.450	8.58	8	26.67
Small	12.560	19.77	9	30.00
Semi-medium	24.270	38.21	9	30.00
Medium	21.240	33.44	4	13.33
Total	63.520	100.00	30	100.00
Average per holding	2.117	--	--	--

4.1.2 Irrigated Area

While the percentage of irrigated area was only 7.34 on the marginal size group it increased with the size of holdings and was 51.46 on the medium size group. Of the different irrigation sources, the highest percentage of irrigated area was commanded by canals (55.30) followed by area commanded by wells (44.70) (Table 4.2).

Table 4.2 **Sources of irrigation, selected farms, Bilaspur district, Madhya Pradesh**

(Area – Hectares)

Size group	Irrigated area under			Operated area	Percentage of Irrigated area to operated area
	Canals	Wells	Total irrigated area		
Marginal	0.400	--	0.400	5.450	7.34
	(100.00)		(100.00)		
Small	3.520	1.720	5.240	12.560	41.72
	(67.18)	(32.82)	(100.00)		
Semi- medium	6.000	5.620	11.620	24.270	47.88
	(51.64)	(48.36)	(100.00)		
Medium	5.670	5.260	10.930	21.240	51.46
	(51.88)	(48.12)	(100.00)		
Total	15.590	12.600	28.190	63.520	44.38
	(55.30)	(44.70)	(100.00)		

4.1.3 Cropping Pattern, 1997-98 to 1999-2000

In 1997-98 soybean was the most important crop occupying 37.70 per cent of the cropped area. Paddy was the second important crop and occupied 37.13 per cent of the cropped area. The third important crop was summer paddy and occupied 6.07 per cent of the cropped area. The next important crops were teora and wheat and occupied 5.92 per cent and 5.58 per cent respectively. The percentage of area under soybean was highest on small size farms and lowest on medium size group. However, the proportion had no relationship with the size. The percentage of area under paddy was highest on medium farms, whereas, the percentage under summer paddy was lower on medium size farms (Table 4.3).

Table 4.3 **Cropping pattern, selected farms, Bilaspur district, 1997-98, Madhya Pradesh**

(Area – Hectares)

Crops	Marginal		Small		Semi- medium		Medium		Total	
	Area	% to total	Area	% to total	Area	% to total	Area	% to total	Area	% to total
Soybean	3.530	42.79	9.340	68.42	11.320	35.45	5.860	22.63	30.050	37.70
Paddy	3.110	37.70	3.220	23.59	11.730	36.74	11.540	44.56	29.600	37.13
Arhar	--	--	--	--	0.410	1.28	--	--	0.410	0.51
Teora	0.800	9.70	1.090	7.99	1.210	3.79	1.620	6.25	4.720	5.92
Gram	0.400	4.85	--	--	2.020	6.33	0.810	3.13	3.230	4.05
Tomato	0.410	4.96	--	--	--	--	--	--	0.410	0.51
Coriander	--	--	--	--	2.020	6.33	--	--	2.020	2.53
Wheat	--	--	--	--	--	--	4.450	17.18	4.450	5.58
Summer paddy	--	--	--	--	3.220	10.08	1.620	6.25	4.840	6.07
Total	8.250	100.0	13.650	100.0	31.930	100.0	25.900	100.0	79.730	100.0

In 1998-99 the proportion of area under different crops was quite different than that in 1997-98. Paddy was the most important crop and occupied 41.96 per cent of the cropped area. Soybean was the second important crop and occupied 24.95 per cent of the cropped area. The third important crop was teora and occupied 13.29 per cent. It was noted that the proportion of area under soybean decreased by 12.75 per cent to that in 1997-98, whereas, that under paddy and teora increased by 4.83 per cent and 7.37 per cent respectively (Table 4.4).

Table 4.4 **Cropping pattern, selected farms, Bilaspur district, 1998-99, Madhya Pradesh**

(Area – Hectares)

Crops	Marginal		Small		Semi- medium		Medium		Total	
	Area	% to total	Area	% to total	Area	% to total	Area	% to total	Area	% to total
Soybean	0.960	13.43	7.220	47.29	8.490	26.99	3.640	13.23	20.310	24.95
Paddy	3.320	46.43	5.340	34.97	10.920	34.72	14.570	52.94	34.150	41.96
Arhar	--	--	--	--	0.400	1.27	--	--	0.400	0.49
Teora	1.700	23.78	1.900	12.44	3.980	12.66	3.240	11.77	10.820	13.29
Gram	0.400	5.59	0.810	5.30	4.040	12.85	--	--	5.250	6.45
Tomato	0.600	8.39	--	--	--	--	--	--	0.600	0.74
Chillies	0.170	2.38	--	--	--	--	--	--	0.170	0.21
Wheat	--	--	--	--	--	--	4.050	14.72	4.050	4.98
Summer paddy	--	--	--	--	3.620	11.51	2.020	7.34	5.640	6.93
Total	**7.150**	**100.0**	**15.270**	**100.0**	**31.450**	**100.0**	**27.520**	**100.0**	**81.390**	**100.0**

In 1999-2000 the proportion of area under different crops was still different. The area under paddy declined marginally than that in 1998-1999 but still formed 40.10 per cent in 1999-2000 and gram occupied the second position and formed 21.26 per cent. The third important crop was teora and constituted 18.76 per cent of the cropped area. It was noted that soybean which occupied the first position in 1997-98 declined abruptly and formed 8.51 per cent of the gross cropped area in 1999-2000. Whereas, the area under paddy increased than that in 1997-98. The area under summer paddy remained half in 1999-2000 to that in 1997-98 (Table 4.5).

Table 4.5 **Cropping pattern, selected farms, Bilaspur district, 1999-2000, Madhya Pradesh**

(Area – Hectares)

Crops	Marginal		Small		Semi- medium		Medium		Total	
	Area	% to total	Area	% to total	Area	% to total	Area	% to total	Area	% to total
Soybean	1.040	14.54	2.310	13.60	2.430	7.20	2.020	5.98	7.800	8.51
Paddy	3.920	54.82	5.340	31.43	13.340	39.52	14.160	41.92	36.760	40.10
Kodo	--	--	0.410	2.41	--	--	0.400	1.18	0.810	0.88
Arhar	--	--	1.200	7.06	0.400	1.19	--	--	1.600	1.75
Teora	1.700	23.78	3.730	21.95	2.860	8.47	8.910	26.38	17.200	18.76
Gram	0.320	4.48	4.000	23.55	11.320	33.54	3.840	11.36	19.480	21.26
Coriander	--	--	--	--	0.600	1.78	--	--	0.600	0.65
Chilli	0.170	2.38	--	--	--	--	--	--	0.170	0.19
Wheat	--	--	--	--	0.600	1.78	2.830	8.38	3.430	3.74
Summer paddy	--	--	--	--	1.600	4.74	1.620	4.80	3.220	3.51
Summer urd	--	--	--	--	0.600	1.78	--	--	0.600	0.65
Total	**7.150**	**100.0**	**16.990**	**100.0**	**33.750**	**100.0**	**33.780**	**100.0**	**91.670**	**100.0**

4.1.4 Yield of different crops

The yield of soybean in 1997-98 was 471 kg./ha. In 1998-99 it came down suddenly to 293 kg./ha. In the last year it again increased and was 406 kg./ha. Thus, the year 1998-99 was the bad year for soybean. In the case of paddy the yield in 1997-98 was 6,571 kg./ha. In 1998-99 it was less than half of that obtained in 1997-98 (2,693 kg./ha.). In 1999-2000 it again increased to 3,057 kg./ha. However, it was much lower than the year 1997-98. Thus, in both the crops of soybean and paddy the yields were good in 1997-98. These were much lower in 1998-99 and recovered in 1999-2000 but could not reach the level of 1997-98.

The same phenomenon was observed in the case of summer paddy (Table 4.6).

4.1.5 Factors responsible for declining status of soybean

The first and foremost reason for declining status of soybean was that the prices went down heavily as compared to previous years. This opinion was expressed by all the selected farmers . Another reason was that there was no purchaser of soybean in the nearby market as the oil extraction plant in Pandhari in the district had closed down and the soybean produce had to be sent to distant Durg mandi. This was expressed by 73.33 per cent of the farmers. The third reason given by 66.67 per cent farmers was that the soybean crop rotted due to heavy rains in both the years in 1997-98 and 1998-99 resulting in low yields of soybean .Another, 33.33 per cent farmers narrated that "bharri land", with upland light soil was used for soybean in the previous years. With the passage of time and with the cultivation of hitherto fallow land the pieces of such land were bunded and brought under paddy crop. Since, paddy was more profitable, such lands previously sown under soybean now were sown under paddy. Another important reason given by 26.67 per cent farmers was that sterility mosaic was noticed in patches which resulted in no flowering and therefore no production. This gave the farmers a very big blow in soybean cultivation. An equal number of farmers (26.67 per cent)said that gram was an important commercial rabi crop of their villages and the practice was to grow gram after kharif fallow. However, after the cultivation of soybean in kharif followed by gram in rabi the yield of gram got reduced and this was the economical loss. Therefore, the farmers went back to the practice of kharif fallow followed by gram in rabi. Thereby eliminating soybean in kharif season. Still another 20 per cent farmers opined that paddy was less risky and economically more competing crop than soybean (Table 4.7).

A typical problem in some villages of the district was that the crop was attacked by flocks of monkeys and the soybean pods were shelled and grains were eaten and heaps of shells were kept in the fields. This problem was more predominant in the case of villages which were close to forest .The forest department forbids the farmers from killing or injuring the monkeys and therefore the problem has increased unabated.

Table 4.6 Yield on selected farms, Bilaspur district, 1997-98 to 1999-2000, Madhya Pradesh

(Yield – kg. /hectare)

Crops	1997-98					1998-99					1999-2000				
	Marginal	Small	Semi-Medium	Medium	Total	Marginal	Small	Semi-Medium	Medium	Total	Marginal	Small	Semi-Medium	Medium	Total
Soybean	765	520	308	529	471	573	409	218	165	293	644	390	206	545	406
Paddy	1,871	2,267	2,030	3,745	6,571	1,524	2,266	2,656	3,145	2,693	1,837	2,878	3,036	3,482	3,057
Kodon	--	--	--	--	--	--	--	--	--	--	--	3,659	--	500	2,099
Arhar	--	--	244	--	244	--	--	250	--	250	--	333	250	--	313
Teora	250	367	413	741	487	324	447	339	556	421	588	480	350	561	511
Gram	250	--	743	741	681	1,250	741	644	--	705	625	281	365	215	322
Tomato	1,463	--	--	--	1,463	400	--	--	--	400	--	--	--	--	--
Coriander	--	--	198	--	198	--	--	--	--	--	--	--	417	--	417
Chillies	--	--	--	--	--	4,705	--	--	--	4,705	3,529	--	--	--	3,529
Wheat	--	--	--	854	854	--	--	--	593	593	--	--	1,833	813	991
Summar Paddy	--	--	5,124	4,938	5,062	--	--	1,796	5,446	3,103	--	--	3,750	4,630	4,193
Summer Urad	--	--	--	--	--	--	--	--	--	--	--	--	250	--	250

Table 4.7 Knowledge and opinion of the farmers regarding identification of factors responsible for declining status of soybean cultivation, Bilaspur district, M.P.

S.No	Particulars	Marginal	Small	Semi-Medium	Medium	Total
1	There is no purchaser of soybean as Pandhari Oil extraction plant is closed. If there is bulk stock it is purchased and sent to Durg mandi.	7	7	6	2	22
2	The selling price of soybean is very low.	8	9	9	4	30
3	The upland light soil (bharri land) is bunded and converted into paddy fields.	5	3	1	1	10
4	The soybean is not sown in matasi soil as roots do not develop therein and germination does not take place.	5	--	--	--	5
5	The soybean can not be sown on proper date of sowing i.e. 20th June because of stray cattle problems.	6	--	--	--	6
6	The soybean once grazed, does not develop again.	3	--	--	--	3
7	The crop rotted due to erratic and torrential rain during 1997-98 and 1998-99 that resulted in very low production.	7	3	6	4	20
8	The sterility mosaic was noticed in patches that resulted in no flowering and pod formation ultimately there was low production.	1	4	2	1	8
9	The crop was water logged and rotted.	--	1	3	--	4
10	The farmers can earn more profit by growing paddy crop rather than soybean.	--	4	1	1	6
11	In 1997-98 the soybean crop was good. In 1998-99 the crop was infected by fungus and rotted.	--	1	--	--	1
12	The soybean is a risky crop.	--	4	--	--	4
13	The soybean field was kept fallow in kharif and in rabi gram was grown.	--	--	6	2	8
14	The soybean field was inundated and crop rotted.	--	--	1	--	1
15	In upland undulating fields proper drainage is essential.	--	--	1	2	3
16	The soybean compaign was launched 3 years back by SOPA and such type of compaign is needed again.	--	--	1	2	3
17	The soybean field was attacked by monkeys flocks and grains of soybean pods were eaten by them and husks were heaped on the bunds of soybean field.	1	--	--	--	1

4.2 Narsinghpur District

4.2.1 Operated Area

The total operated area of selected 30 farmers was 67.291 hectares or 2.243 hectares per farm. Majority of the farmers belonged to small and semi medium size of holdings. There was only one farmer with marginal size of holding and 4 farmers belonged to medium size category (Table 4.8).

Table 4.8 Operated area, selected farms, Narsinghpur district, Madhya Pradesh

(Area - Hectares)

Size group	Operated area	Percentage to total	No. of holdings	Percentage to total
Marginal	0.850	1.26	1	3.33
Small	18.412	27.36	14	46.67
Semi- Medium	31.107	46.23	11	36.67
Medium	16.922	25.15	4	13.33
Total	67.291	100.00	30	100.00
Average per holding	**2.243**	--	--	--

4.2.2 Irrigated Area

The total irrigated area of the selected farms was 62.916 hectares or 93.50 per cent of the operated area. As is observed elsewhere the intensity of cropping was higher on smaller size of holdings than the larger size of holdings. Narsinghpur district is famous for tubewells and irrigation equipments like sprinklers. On the selected farms also as high as 88.20 per cent of the irrigated area was commanded by tubewells. Another 6.98 per cent was commanded by bore wells and the remaining 4.82 per cent by open wells (Table 4.9).

Table 4.9 Sources of irrigation, selected farms, Narsinghpur district, Madhya Pradesh

(Area -- Hectares)

Size group	Irrigated area under			Total irrigated area	Total operated area	Percentage of irrigated area to operated area
	Well Pump	Bore Well	Tubewell			
Marginal	--	0.850	--	0.850	0.850	100.00
Small	3.035 (16.57)	3,541 (19.84)	11.735 (64.09)	18.311 (100.00)	18.412	99.45
Semi medium	--	--	29.589	29.589	31.107	95.12
Medium	--	--	14.166	14.166	16.922	83.71
Total	3.035 (4.82)	4.391 (6.98)	55.490 (88.20)	62.916 (100.00)	67.291	93.50

4.2.3 Cropping Pattern, 1997-98 to 1999-2000

In 1997-98 the most important crop on the selected farms was soybean claiming 49.28 per cent of the cropped area. The district is also famous for gram and this was evident from the fact that 22.62 per cent cropped area was under gram. Wheat the third important crop claimed 19.18 per cent of the cropped areas. In some pockets of the district sugarcane is also coming up and on the selected farms the crop claimed 7.18 per cent of the cropped area. (Table 4.10).

Table 4.10 Cropping pattern, selected farms, Narsinghpur district, 1997-98, Madhya Pradesh

(Area – Hectares)

Crops	Marginal		Small		Semi- medium		Medium		Total	
	Area	% to total	Area	% to total	Area	% to total	Area	% to total	Area	% to total
Paddy	--	--	--	--	0.202	0.44	--	--	0.202	0.19
Soybean	0.850	50.00	17.906	56.92	23.012	50.22	9,636	38.03	51.404	49.28
Gram	--	--	6.271	19.93	8.497	18.54	8.825	34.82	23.593	22.62
Lentil	--	--	--	--	0.202	0.44	1.214	4.79	1.416	1.36
Teora	---	--	--	--	0.202	0.44	--	--	0.202	0.19
Wheat	0.850	50.00	6.877	21.86	8.237	17.98	4.047	15.97	20.011	19.18
Sugarcane	--	--	0.405	1.29	5.471	11.94	1.619	6.39	7.495	7.18
Total	1.700	100.0	31.459	100.0	45.823	100.0	25.341	100.0	104.323	100.0

In 1998-99 the percentage of area under soybean declined slightly and was 47.03 per cent. On the other hand the percentage of area under gram and wheat increased marginally, to be 23.85 and 21.24 per cent respectively (Table 4.11).

Table 4.11 Cropping pattern, selected farms, Narsinghpur district, 1998-99, Madhya Pradesh

(Area – Hectares)

Crops	Marginal		Small		Semi- medium		Medium		Total	
	Area	% to total	Area	% to total	Area	% to total	Area	% to total	Area	% to total
Paddy	--	--	--	--	0.202	0.44	--	--	0.202	0.19
Arhar	--	--	--	--	0.404	0.87	--	--	0.404	0.38
Urad	--	--	0.101	0.30	--	--	--	--	0.101	0.09
Moong	--	--	0.101	0.30	--	--	--	--	0.101	0.09
Soybean	0.850	50.00	17.399	52.29	22.406	48.26	9.456	37.59	50.111	47.03
Gram	--	--	6.473	19.45	9.306	20.04	9.634	38.29	25.413	23.85
Wheat	0.850	50.00	8.293	24.92	9.45	20.36	4.046	16.08	22.640	21.24
Sugarcane	--	--	0.911	2.74	4.661	10.03	2.023	8.04	7.595	7.13
Total	1.700	100.0	33.278	100.0	46.430	100.0	25.159	100.0	106.567	100.0

In the year 1999-2000 the percentage of area under soybean decreased further and stood at 46.82 per cent. However, the percentage of area under gram and wheat declined slightly to be 21.62 and 20.80 respectively.

It was thus, observed that while the percentage of area under soybean declined form year to year that under gram and wheat increased from 1997-98 to 1998-99 but again declined in 1999-2000 (Table 4.12).

Table 4.12 Cropping pattern, selected farms, Narsinghpur district, 1999-2000, Madhya Pradesh

(Area – Hectares)

Crops	Marginal		Small		Semi- medium		Medium		Total	
	Area	% to total	Area	% to total	Area	% to total	Area	% to total	Area	% to total
Paddy	--	--	--	--	0.202	0.38	--	--	0.202	0.17
Arhar	--	--	--	--	1.922	3.58	--	--	1.922	1.66
Urad	--	--	0.101	0.28	--	--	--	--	0.101	0.09
Moong	--	--	0.101	0.28	--	--	--	--	0.101	0.09
Soybean	0.850	50.00	17.703	49.41	24.834	46.24	10.851	44.09	54.238	46.82
Gram	--	--	8.659	24.17	10.517	19.58	5.868	23.84	25.044	21.62
Wheat	0.850	50.00	8.436	23.54	10.158	18.92	4.653	18.91	24.097	20.80
Sugarcane	--	--	0.830	2.32	6.070	11.30	3.238	13.16	10.138	8.75
Total	1.700	100.0	35.830	100.0	53.703	100.0	24.610	100.0	115.843	100.0

4.2.4 Yields of Different Crops

The yield of paddy per hectare in 1997-98 was 1,980 kg./ha. In the year 1998-99 the yield decreased significantly and was 1,238 kg./ha. However, the yield again increased in the year 1999-2000 and was 1,485 kg./ha. Thus, the yield of paddy decreased from 1997-98 to 1998-99 but again increased in 1999-2000. However, it did not reach the level of 1997-98. In the case of soybean the yield in 1997-98 was 905 kg./ha. It decreased in 1998-99 and was 727 kg./ha. In the last year i.e. 1999-2000 the yield further decreased to 673 kg./ha. Thus, the yield of soybean showed a declining trend from year to year during the three year period. Gram, another important crop of the district yielded 1,267 kg./ha. in 1997-98. The yield declined to 1,195 kg./ha. in 1998-99 but again increased to 1,495 kg./ha in 1999-2000 the highest in 3 years. Thus, the yield of gram was highest in the last year of the reference period. Wheat was another important crop of the district. The yield of this crop was 1,774 kg./ha. in 1997-98. The yield declined slightly in 1998-99 and was 1,705 kg./ha. In the last year of the reference period the yield again increased to 1,801 kg./ha. It is thus, noted that the yields of both gram and wheat were highest in the last year of the reference period. It can be concluded that rabi crops did better during the three reference years than kharif crops (Table 4.13).

Table 4.13 Yield on selected farms, Narsinghpur district, 1997-98 to 1999-2000, Madhya Pradesh

(Yield – kg. /hectare)

Crops	1997-98					1998-99					1999-2000				
	Marginal	Small	Semi-Medium	Medium	Total	Marginal	Small	Semi-Medium	Medium	Total	Marginal	Small	Semi-Medium	Medium	Total
Paddy	--	--	1.980	--	1.980	--	--	1.238	--	1.238	--	--	1.485	--	1.485
Arhar	--	--	--	--	--	--	--	1.733	--	1.733	--	--	676	--	676
Urad	--	--	--	--	--	--	2.475	--	--	2.475	--	990	--	--	990
Moong	--	--	--	--	--	--	2.475	--	--	2.475	--	990	--	--	990
Soybean	235	854	843	1.204	905	235	756	723	730	727	235	782	674	525	673
Gram	--	1.260	1.377	1.167	1.267	--	1.224	1.101	1.266	1.195	--	1.293	1.811	1.227	1.495
Lentil	--	--	742	988	953	--	--	--	--	--	--	--	--	--	--
Teora	--	--	495	--	495	--	--	--	--	--	--	--	--	--	--
Wheat	823	1.876	1.821	1.705	1.774	1.412	1.640	1.788	1.705	1.705	1.529	2.288	1.752	1.075	1.801
Sugarcane	--	4.938	2.376	1.235	2.268	--	2.744	6.007	4.696	5.267	--	3.976	4.234	4.015	4.143

4.2.5 Factors Responsible for Declining Status of Soybean

The selected farmers gave different reasons for set back to soybean in different years. All the selected farmers said that in 1997-98 it rained heavily after the crop was harvested and left open in the field or threshing floor. In 1998-99 the farmers complained that soybean seed had to be sown thrice. On the first two occasions resowing had to be done as after sowing there were heavy rains and seedlings were destroyed due to water logging. On the third occasion there was long dry spell after sowing. Another reason for set back in 1999-2000 was very low price offered for soybean. This reason was given by all the selected farmers. Another reason given by 80 per cent of the selected farmers was that various species of weeds appeared during kharif season in soybean crop. The expenditure incurred on weedings became uneconomic proposition and many of the selected farmers put forth that labourers were not available for weeding soybean crop. In 1999-2000 it rained heavily, firstly, when the crop was sown and secondly, at the ripening stage. Half of the selected farmers complained that the cost of fertilisers, pesticides and wages of labourers had gone up enormously. Not only this but the quality of the inputs deteriorated. About one-fourth of the selected farmers complained about sterility mosaic in the year 1998-99. An equal number pointed out to the root rot disease in two varieties namely, J.S.-335 and J.S.-90-41. About 13 per cent of the selected farmers had grievance that due to soybean cultivation the water table in the district was depleting. Formerly, haveli cultivation was prevalent wherein rabi crop was sown after kharif fallow. Since the soybean was cultivated in erstwhile kharif fallow land the yields of rabi crops, particularly, gram were declining. An equal number of farmers added that due to soybean cultivation there was shortage of soil moisture in rabi and they had suspended the cultivation of 'gulabi gram', (pink gram). (Table 4.14).

Table 4.14 Knowledge and opinion of the farmers regarding identification of factors responsible for declining status of soybean Narsinghpur district, M.P.

S. No	Particulars	Marginal	Small	Semi-Medium	Medium	Total
1	In 1997-98 it rained when crop was harvested and left open in the field under the sky.	1	14	11	4	30
2	In 1998-99 the soybean seed was sown thrice	1	12	11	4	28
i)	It rained as and when seed was sown					
ii)	The farmers resown their owned seed, while, it rained again					
iii)	The seed was resown for the third time when there occurred dry spell.					
3	In 1999-2000 it rained torrentially when crop was sown and it rained again at ripening of the crop.	1	10	11	4	26
4	The costs of inputs (like, seed, fertilisers, pesticides and wages of labourers) increased.	1	8	2	4	15
5	The selling price of soybean is low.	1	14	11	4	30
6	The weeding was done thrice in J.S.-335 variety of soybean.	1	2	--	--	3

7	In 1998-99 sterility mosaic was noticed in J.S.-335	1	6	1	--	8
8	The exotic, high yielding, short duration, early varieties resistant to pests and diseases are not being released.	1	8	2	--	11
9	In 1998-99 the infection of root rot disease occurred in J.S.-335 and J.S. 90-41 varieties of soybean that resulted in smaller grains.	--	8	1	--	9
10	The numerous weed species were found in soybean crop during kharif season.	--	9	12	3	24
11	The cultivation of pink gram was suspended	--	3	--	4	7
12	The labourers were not available for weeding operation of soybean crop.	--	9	9	4	22
13	In 1997-98 girdle beetle attacked the soybean crop that resulted in low production.	--	5	1	--	6
14	There is continuous decrease in production of soybean from 1997-98 till 1999-2000 during the three consecutive years.	--	4	7	3	14
15	The net return was low	--	7	6	1	14
16	The quality of soybean seed was not maintained by National Seed Corporation (NSC).	--	2	1	1	4
17	The recommended doses of fertilisers, insecticides and pesticides and their formulations were not used by farmers.	--	2	--	--	2
18	The sugarcane and vegetable crops are being grown as a substitute crop to replace soybean.	--	--	1	--	1
19	The field located near river was flooded and the crop rotted and destroyed.	--	--	1	--	1
20	The practice of haveli cultivation prevalent in the district was replaced by soybean cultivation that resulted in depletion of water table.	--	--	--	4	4

4.3 Dewas District

4.3.1 Operated Area

The total operated area of the selected 30 farmers of Dewas district was 57.025 hectares or 1.901 hectares/farm. In this district also majority of the formers belonged to small and semi medium size groups. (Table 4.15).

Table 4.15 Operated area, selected farms, Dewas district, Madhya Pradesh

(Area - Hectares)

Size group	Operated area	Percentage to total	No. of holdings	Percentage to total
Marginal	4.725	8.29	8	26.67
Small	15.960	27.99	11	36.67
Semi- Medium	26.610	46.66	9	30.00
Medium	9.730	17.06	2	6.66
Total	57.025	100.00	30	100.00
Average per holding	**1.901**	--	--	--

4.3.2 Irrigated Area

Of the total operated area on the selected farms 35.880 hectares were under irrigation. Thus, the percentage of irrigated area to operated area was 62.92. It was generally noted that the percentage of irrigated area increased with the size of holdings. The entire irrigated area was under the command of tubewells (Table 4.16).

Table 4.16 Sources of irrigation, selected farms, Dewas district, Madhya Pradesh

(Area – Hectares)

Size group	Irrigated area*	Un-irrigated area	Operated area	Percentage of irrigated area to operated area
Marginal	2.950	1.775	4.725	62.43
Small	8.520	7.440	15.960	53.38
Semi- medium	16.910	9.700	26.610	63.55
Medium	7.500	2.230	9.730	77.08
Total	35.880	21.145	57.025	62.92

* *The entire irrigated area is commanded by tubewells*

4.3.3 Cropping Pattern, 1997-98 to 1999-2000

In 1997-98 only 3 crops were grown on the selected farms. Of the three crops soybean was most important and accounted for 51.22 per cent of the gross cropped area. Gram was second important and occupied 26.18 per cent of the gross cropped area. The remaining wheat crop occupied 22.60 per cent (Table 4.17).

Table 4.17 Cropping pattern, selected farms, Dewas district, 1997-98, Madhya Pradesh

(Area – Hectares)

Crops	Marginal		Small		Semi- medium		Medium		Total	
	Area	% to total	Area	% to total	Area	% to total	Area	% to total	Area	% to total
Soybean	4.350	53.05	15.835	53.72	26.610	50.00	9.730	50.00	56.525	51.22
Wheat	3.350	40.85	7.770	26.36	11.070	20.80	2.750	14.13	24.940	22.60
Gram	0.500	6.10	5.870	19.92	15.540	29.20	6.980	35.87	28.890	26.18
Total	8.200	100.0	29.475	100.0	53.220	100.0	19.460	100.0	110.355	100.0

In the year 1998-99 soybean continued to dominate the cropping pattern and occupied 52.75 per cent of the gross cropped area slightly more than that in 1997-98. The second position was occupied by wheat (instead of gram in 1997-98) and claimed 23.51 per cent of the gross cropped area. The percentage of area under gram was 22.34 slightly lower than that in 1997-98. In this year potato emerged as fourth crop although it occupied 1.40 per cent of the gross cropped area (Table 4.18).

Table 4.18 Cropping pattern, selected farms, Dewas district, 1998-99, Madhya Pradesh

(Area – Hectares)

Crops	Marginal		Small		Semi- medium		Medium		Total	
	Area	% to total	Area	% to total	Area	% to total	Area	% to total	Area	% to total
Soybean	4.350	50.00	15.835	53.72	26.610	53.74	9.730	50.00	56.525	52.75
Wheat	3.350	38.51	7.020	23.82	12.570	25.38	2.250	11.56	25.190	23.51
Gram	1.000	11.49	6.620	22.46	10.340	20.88	5.980	30.73	23.940	22.34
Potato	--	--	--	--	--	--	1.500	7.71	1.500	1.40
Total	8.700	100.0	29.475	100.0	49.520	100.0	19.460	100.0	107.155	100.0

In 1999-2000 soybean continued to occupy the first position but it contributed slightly less percentage (49.51) to the gross cropped area. Gram and wheat were next important as the percentage area of these crops in the gross cropped area was around 23.00. Potato which emerged as a new crop in 1998-99 had higher percentage of gross cropped area (4.06) in this year. In addition 3 crops namely; onion, garlic and fodder made their appearance although the percentage of area under each was less than 0.50. It can thus, be seen that soybean had a slightly decreased percentage of area in 1999-2000 than the previous two years. Gram and wheat occupied between 22 to 26 per cent of the gross cropped area in different years. Another feature was emergence of new crops of potato, onion, garlic and fodder in the second and third years of the reference period (Table 4.19).

Table 4.19 Cropping pattern, selected farms, Dewas district, 1999-2000, Madhya Pradesh

(Area – Hectares)

Crops	Marginal		Small		Semi- medium		Medium		Total	
	Area	% to total	Area	% to total	Area	% to total	Area	% to total	Area	% to total
Soybean	4.600	49.34	15.835	48.47	26.610	50.00	9.730	50.00	56.775	49.51
Wheat	3.275	35.12	7.645	23.40	11.320	21.27	3.500	17.98	25.740	22.45
Gram	0.500	5.36	9.190	28.13	11.880	22.32	4.730	24.31	26.300	22.93
Potato	--	--	--	--	3.160	5.94	1.500	7.71	4.660	4.06
Onion	0.200	2.14	--	--	0.250	0.47	--	--	0.450	0.39
Garlic	0.225	2.41	--	--	--	--	--	--	0.225	0.20
Fodder	0.525	5.63	--	--	--	--	--	--	0.525	0.46
Total	9.325	100.0	32.670	100.0	53.220	100.0	19.460	100.0	114.675	100.0

4.3.4 Yield of Different Crops

Soybean the most important crop of the selected farmers yielded 982 kg./ha in 1997-98. In 1998-99 the yield was lower and stood at 905 kg./ha. In 1999-2000 the yield further declined and was 804 kg./ha. It is thus observed that soybean crop yielded lower and lower during three years of the reference period. On the other hand two rabi crops of wheat and gram had increased yields during the reference period. Wheat yield was 2,380 kg./ha in 1997-98. It increased to 2,580 kg./ha. in 1998-99 and further to 2,703 kg./ha. in 1999-2000. Gram yield was 703 kg. / ha. in 1997-98.. It increased to 781 kg. / ha. in 1998-99. However, in the last year i.e.1999-2000 it decreased to 647 kg./ha (Table 4.20).

Table 4.20 Yield on selected farms, Dewas district, 1997-98 to 1999-2000, Madhya Pradesh

(Yield – kg. /hectare)

Crops	1997-98					1998-99					1999-2000				
	Marginal	Small	Semi-Medium	Medium	Total	Marginal	Small	Semi-Mecium	Medium	Total	Marginal	Small	Semi-Medium	Medium	Total
Soybean	805	1,225	849	1,028	982	805	1,228	722	925	905	706	1,042	598	1,028	804
Wheat	1.806	2,999	2,304	1,636	2,380	1.940	3,390	2,363	2,222	2,580	2,412	3,375	2,332	2,714	2,703
Gram	400	698	759	602	703	500	830	841	669	781	600	544	564	1,057	646
Potato	--	--	--	--	--	--	--	--	12,000	12,000	--	--	8,228	18,000	11,373
Onion	--	--	--	--	--	--	--	--	--	--	10,000	--	20,000	--	15,556
Garlic	--	--	--	--	--	--	--	--	--	--	11,111	--	--	--	11,111
Fodder	--	--	--	--	--	--	--	--	--	--	27.619	--	--	--	27.619

4.3.5 Factors Responsible for Declining Status of Soybean

In 1999-2000 the main factor for unpopularity of soybean was that there were heavy rains at the time of maturity of crops. As a result, the matured crop rottted in the field. It was expressed by 53.33 per cent of the selected farmers. Half of the selected farmers complained of sterility mosaic in both the years of 1997-98 and 1998-99. This resulted in very low yield. About 16 per cent farmers complained about sterility mosaic in variety J.S.-335 and also rust infection in 1997-98. Nearly, 13 per cent of the farmers agreed that although sterility mosaic was not noticed in 1999-2000 but complained that the heavy rains after the crop harvest caused rottening of grains on the threshing floor.

Although the popularity of soybean was on the decline in the district due to agronomical as well as economic factors (lower price fetched), the farmers expressed that it was not possible for them to abandon the cultivation of soybean because the profitability from soybean was still higher than the other traditional kharif crops like, maize, bajra, jowar and groundnut. Therefore, there was no likelyhood of the farmers not growing this crop atleast for some years to come (Table 4.21).

Table 4.21 Knowledge and opinion of the farmers regarding identification of factors responsible for declining status of soybean Dewas district, M.P.

S. No	Particulars	Marginal	Small	Semi-Medium	Medium	Total
1	The infection of sterility mosaic was noticed in patches in J.S.-335 variety of soybean alongwith infection of rust in 1997-98.	--	1	3	1	5
2	The sterility mosaic was seen in patches in 1997-98 and 1998-99 in J.S.-335.	4	4	4	3	15
3	There was no sterility mosaic in 1997-98 and 1998-99 in J.S.-335.	1	1	--	--	2
4	It rained at maturity of crop as a result of it the crop rotted in 1999-2000.	3	5	7	1	16
5	The sterility mosaic was not noticed in 1999-2000 but it rained after harvesting of the crop that resulted in rotted grains.	1	3	--	--	4
6	The crop was attacked by cut worms.	1	--	--	--	1
7	There was itch in harvesting of soybean in 1997-98.	1	--	--	--	1
8	The sterility mosaic was higher in dense crops	--	1	--	--	1
9	The imbalanced use of fertilisers resulted in lesser production in 1997-98 and 1998-99.	--	1	--	--	1

4.4 Remedial Measures to Improve the Status of Soybean

Since the agro-climatic conditions in the three selected districts varied considerably the factors responsible for declining status of soybean in the three districts also varied. Therefore remedial measures suggested for improving the status of soybean

by officials and farmers varied from district to district. Of course, some of them were common.

Another point needing to be mentioned is that there was very little to offer as remedial measure in the face of vagaries of climate such as heavy rains after harvesting or long dry spells after sowing. However some suggestions have been offered and have been narrated.

4.4.1 Bilaspur District

a) The prices offered for soybean were far lower during the previous 2-3 years. The reasons were; firstly the soybean extraction plant in the district was closed. The produce had to be carried to Durg mandi reducing farmers share in price. Secondly due to reduced demand of DOC in foreign markets the prices went down. It was suggested that OILFED should appear on the scene and purchase soybean from farmers in the villages.

b) Although no immediate solution could be offered to protect standing soybean crop in heavy rains and water logging it is suggested that – drainage of the soil should be improved and secondly soybean should be grown as mixed crop with either maize, arhar or jowar which could withstand the adverse weather conditions.

c) Gradual replacement of soybean by paddy is mainly due to low yields and low prices offered for soybean. The remedial measures have been partially described in the above paragraphs.

d) For protecting soybean crop from sterility mosaic both scientists and extension workers have to toil hard and find a solution and demonstrate it on farmers' fields.

e) To stop the farmers from keeping kharif fallows and growing gram subsequently because of depleting yields of gram grown after soybean, suitable recommended practices have to be canvassed both for soybean and gram so that both crops could thrive well.

f) Proper IPM measures have to be followed to remove the farmers opinion that soybean was more risky than paddy.

g) The problem of monkeys can be solved by adopting a strategy by forest officials in close coordination with farmers.

h) Early sowing of soybean can be practised if menace of stray cattle could be controlled by all farmers through decision in institutions like panchayats.

i) A systematic compaign earlier adopted by SOPA should continue for many years to come both for cultivation and marketing.

4.4.2 Narsinghpur District

a) As in Bilaspur district the problem of heavy rains after soybean crop was harvested and kept in the open on threshing floor, was faced by farmers of this district. In order to protect the harvested crop it is suggested that the crop stock should be covered by tarpauline or any such cover. The state department of agriculture should offer subsidy on the cover since protection at that stage is crucial.

b) To protect the farmers against dwindling price the govt. or institution like OILFED should intervence and purchase the stocks at remunerative prices.

c) To get rid of weeds farmers should be trained in the use of weedicides.

d) Remedial measure to get rid the sterility mosaic has been described earlier.

e) The state department of agriculture should adopt strict quality control measures in the case of fertilisers, culture, weedicides and pesticides.

f) To prevent farmers from, going back to adopting kharif fallow gram rotation to conserve moisture and nutrition, farmers should be advised to follow suitable recommended practices for both soybean and gram after duly testing the soil and irrigation water.

g) It has become essential that plant breeders evolve and recommend high yielding short duration, resistant varieties to mosaic and root rot and other diseases and entomologists and plant pathologist evolve and recommend suitable plant protection measures against girdle beetle, mosaic and root rot.

h) Soybean campaign earlier sponsored by SOPA should continue in future so that farmers' problems are understood better and solved on the spot itself.

4.4.3 Dewas District

a) Rotting of standing matured soybean crop in fields was the problem faced by farmers of this district also. Remedial measures like drainage and sowing soybean as mixed crop are recommended.

b) Problem of sterility mosaic and its solution in the form of resistant varieties to rust and mosaic and use of pesticides based on research by pathologists have already been mentioned.

c) The problem of lower market prices offered can be solved by intervention by government and institution like OILFED by procurement of soybean at remunerative prices.

d) Recommended practices w.r.t. seed rate fertiliser doses and application of insecticides / pesticides at proper time should be adopted. This should be monitored by field staff of the state department of agriculture.

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CHAPTER V

SUMMARY AND CONCLUSIONS

5.1.1 This study was taken up at the suggestion of the then Vice-Chancellor and Chairman of the Advisory Body of AERC, Jabalpur. He said that in the earlier meeting at Bhopal a view was expressed that area, production and yield of soybean was on the decline. There were several reasons for this phenomenon, he said.

In pursuance of his suggestion a study titled "Identification of factors responsible for declining status of soybean in Madhya Pradesh" was taken up after due approval of the Ministry of Agriculture for its inclusion in the programme of work of the Centre.

5.1.2 Objectives of the study were

1. To assess the decline in area, production and yield of soybean in the state, selected districts and selected farms in recent years.
2. To note the reasons for the decline in area, production and yield of soybean by discussing and consulting the state level and selected districts level officials, knowledgeable persons and selected farmers.
3. To seek the opinions and suggestions of the state level and district level officials and knowledgeable persons and selected farmers to remedy the reverse trend

5.1.3 The study was conducted in three Agro-Climatic Zones of the state represented by a district each. Thus, from Eastern Plateau and Hills Region, Bilaspur district was selected. From Central Plateau and Hills Region. Narsinghpur district was selected and from Western Plateau and Hills Region, Dewas district was selected.

5.1.4 From each of the selected 3 districts 30 farmers were selected from a cluster of villages where farmers showed disinterest in soybean cultivation since 3 years. The selection of farmers within a cluster was done by giving proportionate weightage to the number of farms in different size groups.

5.1.5 Data of the selected farms was collected in schedules. The reference years for field data were 1997-98, 1998-99 and 1999-2000,

5.2.1 In the state the area of soybean was 2,149.4 thousand hectares in 1990-91.It increased from year to year and was 3,415.1 thousand hectares in 1993-94. However, it decreased to 3,225.2 thousand hectares in 1994-95. In the subsequent 3 years it increased from year to year and was 4,469.7 thousand hectares in 1997-98. However, it decreased to 4,420.0 thousand hectares in 1998-99 and the estimate for 1999-2000 was still lower.

5.2.2 The production of soybean in 1990-91 was 2,183.8 thousand tonnes. It increased to 3,599.3 thousand tonnes in 1993-94 with some fluctuations. As in the case of area the production dropped to 2,870.4 thousand tonnes in 1994-95. Thereafter, it generally increased and was 4,845.1 thousand tonnes in 1997-98. In the last year it decreased to 4,473.1 thousand tonnes and farmers expected it to further decrease in 1999-2000.

5.2.3 The yield of soybean was 1,016 kg/ha. in 1990-91. In the subsequent 2 years it declined but increased in the third year to 1,054 kg/ha. The yield was highest in 1993-94. The year 1994-95 seen to be a bad year as in that year the yield dropped to 890kg/ha. Like area & production the yield was at its highest (1084kg/ha.) in 1997-98, In 1998-99 like area and production the yield showed a decline to 1,012 kg/ha. and the farmers expected it to decline further in 1999-2000.

5.2.4 Of the 45 districts of the state in 36 districts the area under soybean increased from 1996-97 to 1997-98.In 4 districts there was a decline in area. In another 4 districts there was no change in area. In the remaining one district the area itself was negligible. From the year 1997-98 to 1998-99 the area of soybean recorded an increased in 17 districts. The area declined in another 22 districts and remained the same in 5 districts. In the remaining one district the area was negligible.

The production of soybean declined from 1996-97 to 1997-98 in 7 districts. The production recorded increase in 33 districts. It remained constant in 3 districts and was negligible in 2 districts. From the year 1997-98 to1998-99 the production declined in 35 districts. It recorded increase in 6 districts and was constant in 2 districts. In the remaining 2 districts the production was negligible.

In the case of yield it was noted that in 33 districts the yield of soybean increased from 1996-97 to1997-98. In the remaining 12 districts the yield recorded a decline. From the year 1997-98 to 1998-99 the yield registered an increase in only 6 districts. In the remaining 39 districts the yield decreased.

5.2.5 In the selected Bilaspur district the area under soybean in 1990-91 was 0.3 thousand hectares. It increased gradually till 1997-98.In the last year it decreased to 5.5 thousand hectares. The production was 0.2 thousand tonnes in 1990-91. It rose gradually and was 4.8 thousand tonnes in 1997-98. In the last year it declined to 3.0 thousand tonnes. The yield of soybean was 868 kg/ha. in 1990-91. It declined to 611 kg/ha. in 1991-92. Thereafter, it increased in two subsequent years. In 1993-94 the yield was highest (1,174 kg/ha). Thereafter, it decreased continuously from year to year and was 535 kg/ha. in 1998-99.

5.2.6 In Narsinghpur district, like Bilaspur district the area increased from 49.8 thousand hectares in 1990-91 to 121.6 thousand hectares in 1997-98. In the last year i.e.1998-99 it declined to 117.8 thousand hectares. The production increased from 53.1 thousand tonnes in 1990-91 to 131.4 thousand in 1993.94. It dropped suddenly and was 76.2 thousand tonnes in 1994-95. Thereafter, it increased in 1995-96 and was highest in 1997-98. In 1998-99 it again decreased to 137.5 thousand tonnes. The yield in 1990-91 was 1,068 kg/ha. It increased from year to year and was 1,428 kg/ha. in 1993-94. It slumped to 967 kg/ha. in 1994-95. From 1995-96 to 1997-98 it varied between 1,415 kg/ha. to 1,671 kg/ha. It decreased to 1,168 kg/ha. in 1998-99.

5.2.7 In Dewas district the trends of area, production & yield of soybean were similar to those in Bilaspur and Narsinghpur districts. The area under soybean was 127.4 thousand hectares in 1990-91. It increased continuously and was 240.4 thousand hectares in 1997-98. It declined in 1998-99 to 234.1 thousand hectares. The production was 147.3 thousand tonnes in 1990-91. It increased with some fluctuations 203.6 thousand tonnes in 1993-94. It again decreased in 1994-95 but increased again till 1997-98, where it was highest (346/8 thousand tonnes). In the last year it again decreased.

5.3.1 Bilaspur district was located in the eastern part of the state. The district was rural in character as 83.00 per cent of the population was rural. Scheduled castes constituted 18.12 per cent and schedule tribes 23.00 per cent. The density of population was 192 per square kilometre. The literacy percentage in the district was 36.32. More than 80 per cent of the workers were engaged in agricultural occupations. The net area sown was 41.98 per cent of the geographical area. Forests occupied 39.04 per cent. Paddy contributed 69.23 per cent of the gross cropped area. The other important crop was teora or lathyrus contributing 15.87 per cent. Paddy was irrigated to the extent of 38.32 per cent and wheat, 33.33 per cent. Fruits and vegetables were irrigated to the extent of 37.55 per cent and spices 30.07 per cent. The main sources of irrigation were canals which commanded 82.58 per cent of the irrigated area. Tubewells commanded 6.72 per cent. The yields of most of the cereals, pulses, oilseeds and other crops were lower in the district than the state averages.

5.3.2 Narsinghpur district lay in central part of the state. This district was also rural in character as 85.13 per cent of its population was rural. Scheduled castes population was 16.59 per cent and scheduled tribes population was 12.90 per cent. The density of population was 152 per sq. km. The literacy percentage of the district was 45.33. About 80 per cent of the workers were engaged in agricultural occupations.

The percentage of net sown area was 57.91. Forest occupied 26.53 per cent. The district was famous for the cultivation of pulses and oilseeds. Gram occupied 26.54 per cent of the gross cropped area. Arhar occupied 3.61 per cent and soybean occupied 29.71 per cent. Wheat was the most important cereal and occupied 21.62 per cent of the gross cropped area. The irrigation in the district was mainly done by wells which commanded

48.88 per cent of the irrigated area. Tube wells contributed 39.69 per cent of the irrigated area. Wheat was irrigated to extent of 93.80 per cent. Rapeseed and mustard was irrigated to the extent of 75.64 per cent and gram to the extent of 49.22 per cent. While spices were irrigated to the extent of 79.42 per cent fruits and vegetables were irrigated to the extent of 61.93 per cent. The yield of soybean was 1,415 kg/ha. higher than the state average. The yields of paddy, maize, jowar, urad, moong, niger and sunflower were higher in the district than the state averages. The yield of wheat, gram, pea and lentil were lower in the district.

5.3.3 Dewas district was situated in the Malwa Plateau in west central part of Madhya Pradesh. More than 70.00 per cent of the district population was rural. Scheduled castes population was 18.15 per cent and scheduled tribes population was 15.04 per cent. The density of population was 147 per sq. km. The literacy percentage of the district was 35.30 About 75 per cent or the workers were engaged in agricultural occupations. The net sown area formed 52.89 per cent of the geographical area. Forests, occupied 29.35 per cent and uncultivated land excluding fallow, 10.41 per cent. The district was famous for cultivation of soybean which occupied 41.67 per cent of the area under oilseeds. Gram constituted 15.10 per cent and wheat 18.89 per cent. Cotton was also important crop contributing 6.16 per cent of the gross cropped area. Of the irrigation sources wells were most important and commanded 41.41 per cent of the irrigated area. Tubewells were equally important and commanded 41.37 per cent of the irrigated area. Wheat was irrigated to the extent of 93.34 per cent and barley to the extent of 88.64 per cent, while, gram was irrigated to the extent of 31.71 per cent. Rapeseed and mustard was irrigated to the extent of 21.40 per cent. Fruits and vegetables and spices were irrigated to the extent of more than 90.00 per cent. The yields of soybean in the district was higher than the state average. The yields of wheat, jowar, gram, pea, moong, and groundnut were also higher in the district than the state averages.

5.4.1.1 The average size of holding of the selected farmers of Bilaspur district was 2.117 hectares. The percentage of irrigated area on the marginal size group of farms was 7.34. It increased with the size of holdings and was 51.46 on the medium size group. Of the different irrigation sources canals commanded 55.30 per cent of the irrigated area and wells, 44.70 per cent. In 1997-98 soybean was the most important crop occupying 37.70 per cent of the cropped area. Kharif paddy occupied 37.13 per cent and summer paddy 6.07 per cent. In 1998-99 the proportion of area under paddy was highest. (41.96 per cent). Soybean was the second important crop and occupied 24.95 per cent. The third important crop was teora (13.29 per cent). Thus, area under soybean declined by 12.75 per cent, whereas, the percentage of area under paddy and teora increased. In 1999-2000 paddy continued to be the most important crop. Gram occupied second position and teora occupied third position. Soybean which occupied first position in 1997-98 slumped to fourth position in 1999-2000.The yield of soybean in 1997-98 was 471 kg/ha. In 1998-99 it came down to 293 kg/ha. In 1999-2000, it again increased and was 406 kg/ha. Thus, the year 1998-99 was the bad year for soybean. Although the yield in 1999-2000 was higher than 1998-99 it did not reach the 1997-98 level.

5.4.1.2 The most important factor as narrated by the farmers was lower price offered for soybean from year to year. The other factor specifically for Bilaspur district was that there were not many purchasers of soybean as the oil extraction plant at Pandhari was closed down. Due to this the soybean produce had to be transported to Durg. The third factor was that due to heavy rains the soybean crop was damaged resulting in low yield. Another area specific reason was that in the earlier years "Bharri Land" or upland light soil was used for soybean cultivation. With the passage of time such pieces of land were bunded and brought under paddy crop. Since paddy was more profitable crop there was gradual shift from soybean to paddy. The other factors were sterility mosaic, lower yield obtained of gram followed by soybean. This compelled the farmers to leave kharif fallow instead of growing soybean. Among other factors the first one was that paddy was less risky and economically more profitable than soybean. Therefore, farmers started growing paddy substituting soybean. Still another typical problem was attack by monkeys which completely wiped out the soybean plots.

5.4.2.1 In Narsinghpur district the average size of holdings of selected farmers was 2.243 hectares. Majority of the farmers were small and semi-medium in size. The irrigated area formed 93.50 per cent of the operated area. The intensity of cropping was higher on smaller size of holdings. As high as 88.20 per cent of the irrigated area was commanded by tubewells. Another 7.00 per cent was commanded by borewells. In 1997-98 soybean was the most important crop occupying 49.28 per cent of the cropped area. Gram was second important and occupied 22.62 per cent of the cropped area. Wheat was the third important crop and occupied 19.18 per cent of the cropped area. In 1998-99 the percentage of area under soybean declined slightly. The percentage of area under gram and wheat increased marginally. In 1999-2000 the percentage of area under soybean declined further. However, the percentage of area under gram and wheat declined slightly. Thus the percentage of area under soybean declined from year to year. The yield of soybean in 1997-98 was 905 kg/ha. It decreased in 1998-99 to 727 kg/ha. and further declined to 673 kg/ha in 1999-2000, Thus, both percentage of area and yield of soybean decreased from year to year .

5.4.2.2 The most common factor described by almost all the farmers was that there were heavy rains after harvesting when the crop was on the threshing floor. This affected the produce badly. In 1998-99 the farmers had to do the sowing of soybean thrice in the season. The reason of resowing on two occasions was heavy rains immediately on sowing resulting in water logging condition. On the third occasion there was a long dry spell after sowing. In 1999-2000 the reasons for set back were.

1) Low price offered,
2) Weed infestation and ,
3) High wages of labourers.

Another factor was high input cost on one hand and deterioration of quality of insecticides and pesticides. In Narsinghpur district haveli cultivation i.e. kharif fallowing

followed by gram or wheat was common. With the cultivation of soybean in kharif season the rabi crop was affected in two ways. Firstly there was not enough moisture left in the soil and secondly due to use of important nutrient by kharif crops, Rabi crops could not get sufficient nutrients resulting in low yields of important cash crops like pink gram, pea and wheat.

5.4.3.1 The average operated area of selected farmers of Dewas district was 1.901 hectares, Majority of the farmers were in the size groups of small and semi-medium. The percentage of irrigated area to operated area was 62.92. It generally increased with the size of holdings. The entire irrigated area was under the command of tubewells. In 1997-98 soybean was the most in important crop and accounted for 51.22 per cent of the gross cropped area. Gram (26.18 per cent) and wheat (22.60 per cent) were second and third important crops. In 1998-99 soybean continued to dominate the cropping pattern. The second position was occupied by wheat and the third position was of gram. In 1999-2000 soybean continued to occupy the first position but with slightly less percentage of the gross cropped area. Thus, soybean had slightly decreased percentage of cropped area in 1999-2000 than 1998-99. The yield of soybean in 1997-98 was 982 kg/ha. It decreased in 1998-99 to 905 kg/ha. and further declined to 804 kg/ha. in 1999-2000.

5.4.3.2 In 1999-2000 there were heavy rains at the time of maturity of crops. Due to water logging the crop was badly damaged. Another factor was sterility mosaic which damaged the crop in both the years 1997-98 and 1998-99.

5.4.4 Among the factors responsible for the declining status of soybean, lowering of prices was foremost important. Due to decline in the demand of deoiled cakes in the foreign markets there was a decline in demand of soybean and, therefore, prices in India.

It is suggested that the declining prices should be contained by state government interference and institution like OILFED.

Another factor was adverse climatic conditions. For consecutive three years there were unseasonal rains immediately after sowing and also after the harvesting of the crop and stocking it on the threshing floors.

Suitable soil drainage measures and supply of tarpaulin or other crop cover for threshing floor at subsidised rate are the remedial measures suggested.

Sterility mosaic, girdle beetle and root rot diseases were other factors. Entomologists and plant pathologists should take up systematic IPM research projects on soybean as the losses due to these are enormous.

In Bilaspur district the trend of replacement of soybean by upland paddy can be partially stopped if recommended practices of soybean are strictly followed and soybean fetched higher prices.

Similarly the trend of kharif fallow followed by gram can be partially reversed if soils can be replenished with nutrients and moisture after the harvest of soybean and during the cultivation of gram.

In Bilaspur district the typical problem of attack on soybean crop by flocks of monkeys can be tackled with mutual discussion between forest officials and panchayat members.

In Narsinghpur district the farmers complained about the large number of species of weeds appearing in soybean crop. It is suggested that scientists should recommend suitable weedicides. Farmers also complained about the deteriorating qualities of fertilisers and insecticides / pesticides. This problem can be solved if the state government officials kept strict vigil and adopt strict quality control measures.

Soybean campaign earlier sponsored by SOPA should continue for some more years so that farmers' problems are solved on the spot.

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Department of Agro-Economic Research Centre for M.P.
J.N.K. Vishwa Vidyalaya,
Jabalpur

Study on "Identification of factors responsible for declining status of soybean in Madhya Pradesh

Farmer's Schedule

Name of the farmer ---------- District ----------

Father's Name ----------

Caste ---------- Schedule Caste/Scheduled tribe/Backward Caste/Others

Name of Village ---------- D. Block ---------- Tehsil----------

Details of Land & Irrigation

S. No.	Particulars	Area (Hectare)			Source of Irrigation
		Irrigated	Unirrigated	Total	
1.	Owned Land				
2.	Unculturable/ Wasteland/ Old fallow				
3.	Culturable land				
4.	Area leased out				
5.	Area leased in				
6.	Operational area				

Crops grown during 1997-98, 1998-99 and 1999-2000

Crop/ Variety	1997-98 Area			Production of main product		
	Irri.	Unirri.	Total	Irri.	Unirri.	Total
1.						
Qty(Qtl)						
Value(Rs)						
2.						
Qty.(Qtl)						
Value(Rs)						
3.						
Qty(Qtl)						
Value(Rs)						
4. Qty(Qtl)						
Value(Rs)						
5.						
Qty(Qtl)						
Value(Rs)						
6.						
Qty(Qtl)						
Value(Rs)						
7.						
Qty(Qtl)						
Value(Rs)						
8.						
Qty(Qtl)						
Value(Rs)						
9.						
Qty(Qtl)						
Value(Rs)						

Crop/ Variety	1998-99 Area			Production of main product		
	Irri.	Unirri.	Total	Irri.	Unirri.	Total
1.						
Qty(Qtl)						
Value(Rs)						
2.						
Qty.(Qtl)						
Value(Rs)						
3.						
Qty(Qtl)						
Value(Rs)						
4. Qty(Qtl)						
Value(Rs)						
5.						
Qty(Qtl)						
Value(Rs)						
6.						
Qty(Qtl)						
Value(Rs)						
7.						
Qty(Qtl)						
Value(Rs)						
8.						
Qty(Qtl)						
Value(Rs)						
9.						
Qty(Qtl)						
Value(Rs)						

Crop/ Variety	1999-2000 Area			Production of main product	
	Irri.	Unirri.	Total	Irri.	Unirri.
1.					
Qty(Qtl)					
Value(Rs)					
2.					
Qty.(Qtl)					
Value(Rs)					
3.					
Qty(Qtl)					
Value(Rs)					
4. Qty(Qtl)					
Value(Rs)					
5.					
Qty(Qtl)					
Value(Rs)					
6.					
Qty(Qtl)					
Value(Rs)					
7.					
Qty(Qtl)					
Value(Rs)					
8.					
Qty(Qtl)					
Value(Rs)					
9.					
Qty(Qtl)					
Value(Rs)					

1. The area under soybean has been -

~~1996-97~~ _____ hectares

1997-98 _____ hectares

1998-99 _____ hectares

1999-2000 _____ hectares

2. What are the reasons for decline in area under soybean from 1996-97 to 1997-98 ?

3. What are the reasons for decline in area under soybean from 1997-98 to 1998-99 ?

4. What the reasons for the decline in area under soybean from 1998-99 to the current year (1999-2000)

5. The likely reasons are listed on following pages.

6. What crops substituted soybean in 1997-98, 1998-99 and in the current year.

The reasons could be one or more than one of the following

1. Climate

   A. Too much of rainfall resulting in waterlogging

   B. Very little of rainfall resulting in drying of crop.

2. Technological

   A. One or more than one of the following inputs were not available in sufficient quantity.

      a. Seed

      b. Fertilisers

      c. Pesticides

      d. Irrigation

      e. Labour for field preparation

      f. Labour for interculture

      g. Labour for harvesting

      h. Labour for threshing

      i. Labour for winnowing

   B. One or more than one of the following inputs were not available of good quality

      a. Seed

      b. Fertilisers

      c. Pesticides

      d. Irrigation

      e. Labour for field preparation

      f. Labour for interculture

      g. Labour at the time of harvesting

      h. Labour for threshing

      i. Labour for winnowing

C. Recommended Practices could not be followed w.r.t.

a. Seed

b. Fertilisers

c. Pesticides

d. Irrigation

e. Right time of field preparation

f. Right time of inter-culture

g. Right time of harvesting

h. Right time of threshing

D. Hike in price of one or more of the following inputs making these uneconomical to use.

a. Seed

b. Fertilisers

c. Pesticides

d. Irrigation Charges

e. Labour charges.

E. Biological

a. In the previous year/s crop had low germination percentage.

b. The crop was affected due to insects/pests

c. The crop was affected due to pathogen

d. The produce was affected by stored grain pests.

F. There were no proper extension officials available in the department to help farmers to fight the adverse crop conditions.

G. Although the support price announced was high there were no purchasers in the market at that price.

H. Financial aid in the form of loan from the bank was not received in time. This affected adoption of recommended practices.

Department of
Agro-Economic Research Centre for M.P.
J.N. Krishi Vishwa Vidyalaya
Jabalpur

Study on "Identification of factors responsible for declining status of Soybean in Madhya Pradesh"

Schedule for Officials & Knowledgeable persons

What are the factors responsible for declining status of soybean in the following years

1. From 1996-97 to 1997-98

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2. From 1997-98 to 1998-1999

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3. From 1998-99 to 1999-2000

General Factors

What are your suggestions

Comments received from Agro-Economic Research Centre, Allahabad

(The Designated Centre)

Title of the Study

In the title of this study the main problem on which the real research work has been carried out is missed by the able authors. The main problem is Soyabean Cultivation not Soyabean as it appears from the analysis in chapter IV on page 27, 32 and 37 of this draft report. Therefore, the title must be written as "An Identification of Factors Responsible for Declining Status of Soyabean Cultivation in Madhya Pradesh".

Inner Page of the Report

At the place of inner page just after the cover page the cover page of Executive Summary has been included in the binding by mistake. It must be excluded in the final report and replaced by inner page.

Project Team

The works performed by all the team members must be emphasized in detail under the Project Team.

Chapter-wise Comments on the Draft Report

Chapter I

Under the heading background the supporting data relating to decreasing area, production, yield and interest of farmers about Soyabean in MP must be given atleast to justify the problem of this study. The sampling design must also be given in tabular form to indicate the representativeness of the samples. The samples may be categorised according to reference years and area, production and yields of Soyabean for better results and avoid the complexities and confusions.

Chapter II

Since area, production and yields have been considered the main basis of selection, these must be linked with the samples and reference years.

Ths justification for selection of districts must also be given in a tabular form.

Chapter III

In this chapter the main characteristics of the selected districts responsible for cultivation of Soyabean i.e. Rainfalls, types of soils prices, market infrastructure and topography have been left in this draft report. These characteristics must be incorporated in the final report.

Chapter IV

In this chapter the area of four size groups of sample farmers is not indicated anywhere. In chapter I under the heading Methodology also nothing is mentioned about it, under the heading sampling design only three size-groups are mentioned. Thus, it should be corrected. Page 25 under the heading factors responsible for declining status of Soyabean (item 4.1.5) the main factors described by the authors are declining prices, lack of purchasers/markets, oil plant closed, heavy rainfalls, shifting of area to paddy and sterility mosaic but the supporting data in respects of these factors are neither collected nor analysed. From table 4.6 page 26 it appears that maximum Soyabean area has been shifted to paddy but it is not analysed separately in terms of percentage. Also in the knowledge and opinion surveys analysed for different districts the percentages are not calculated in the frequency distribution. Thus, data on prices, market arrivals, number of oil plants, rainfalls, shifting of area and affected area by diseases must be incorporated in this chapter.

Chapter V

The findings/conclusions of the main factors responsible should be incorporated and accordingly the suggestions should be corrected. Action points should also be incorporated in this chapter.

The relevant supporting data must be given in the Appendix Tables. Format of used schedules and questionnaires should also be given in Appendix.

The method of presentation is satisfactory on the whole. The executive summary should be corrected accordingly.

Annexure II

Follow up of comments received from AERC, Allahabad

1. Title of the study

Attention is drawn to the following paragraphs of the report.

1. Para 1 of Preface
2. Para 2 of Preface
3. 1.1 Background - 2 paragraphs
4. 1.3 Methodology

It may be mentioned that although the then Vice- Chancellor initially suggested the title as "Reasons of set back to soybean cultivation", the methodology etc., of the study were discussed in several meetings of a committee of scientists and the details of the study (including title) were finalised. The study was thereafter proposed to the Ministry of Agriculture by the then Vice-Chancellor and its approval was obtained.

Thus the title of the study had the approval of the then Vice-Chancellor, Committee of Scientists and Ministry of Agriculture.

It is, therefore, not possible to change the title at this stage.

Reference has been made w.r.t. tables on pages 33 (table 4.7), 38 (table 4.14) and page 43 (table 4.21) wherein the words "soybean cultivation" appear in the titles of the tables. The word "cultivation" after the word "soybean" is deleted from titles of the concerned tables.

Inner Page of the Report

Agreed. This has been done.

Project Team

Mr. S.C. Jain and Mr. Sita Ram have drafted the report. This has been mentioned.

Chapter wise Comments on the Draft Report

Chapter I

Under the heading "Background" the genesis of the study has been given. Chapter II gives the data on area, production and yield of soybean in the state and selected districts. This is the practice usually followed in the research reports.

The sampling was done on the principle of "probability proportion" of number of farms in each of the three groups. Since the size of holdings and the number varied from one cluster of villages to another, common size groups were not delineated and, therefore, there is no question of presenting the sampling design in tabular form. The reference year for the selection of sample farms was 1999-2000. With the adequate description of details of sampling, there remain no complexities and confusions.

Otherwise also details of operated area of selected farmers by size groups are given in tables 4.1 (page 28), 4.8 (page 34) and 4.15 (page 39).

Chapter II

For evolving the methodology (including selection of districts and farms) for the study a committee of scientists was constituted (para 1.3 on page 1). Among other things it recommended that to have a good spread of sample districts over the state of Madhya Pradesh a district each in the 3 agro-climatic zones be selected (see para 1.3.1 page 2). It was decided that firstly, the district should have a significant proportion of area under soybean and secondly the area, production and yield of soybean should show a declining trend in those districts. Taking into consideration both these criteria Bilaspur, Narsinghpur and Dewas districts were selected. While these districts had very high percentage of area under soybean, the declining trends in area, production and yields can be noticed from table 2.2. The details given in description under para 2.2 (page 4 and 5) and tables 2.2 on page 5 adequately justify the selection of districts.

Chapter III

In the description of the 3 selected district the information regarding topography, soils, rainfall and mandis has been added.

Chapter IV

There is no need to indicate area of four size groups of sample farmers. The standard all India classification of land holdings followed by Agricultural Census, Ministry of Agriculture, Govt. of India has been followed.

For sampling, after arranging the holdings of a cluster of villages of a district in the ascending order these were divided into three groups (the number of groups could be more than three) so that each group had equal cumulative total of area.

After the selection of holdings these were regrouped into four groups as per the standard classification. Therefore there is no question of making any corrections.

As regards factors responsible for declining status of soybean it may be mentioned that conclusions drawn therein were based on data collected in questionnaires. The data obtained were opinions expressed by farmers and were only descriptive. Therefore, frequency distribution of farmers expressing the opinions has been given.

Table 4.6 on page 32 gives yields of different crops during the years 1997-98, 1998-99 and 1999-2000 for Bilaspur district. It **DOES NOT** give shift in area under soybean to paddy. With only 30 farmers per district there was no need to calculate percentage of the frequency distribution.

Chapter V

Factors responsible for declining status in Bilaspur district have been narrated in paragraph 5.4.1.2. Factors for Narsinghpur district have been narrated in para 5.4.2.2 and those in Dewas district appear in 5.4.3.2. Suggestions have been given in para 5.4.4 on page 52 and 53. Action points, as usual, appear in the executive summary.

Format of schedule and questionnaire is being appended.

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