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Problems and Prospects of Soyabean Cultivation in Maharashtra

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Foreword

The gap between demand and production of edible oils in India has increased sharply in recent years. As a result, India has become the world's top vegetable oil importer and more than forty percent of the domestic availability is satisfied through imports. The increasing gap between demand and production of edible oil in India certainly highlights the need to increase the oilseed production. Among the major oilseeds satisfying domestic demand for edible oil, soybean has emerged as one of the important crops. Maharashtra is a major soybean producing state with higher productivity. In view of this, this study titled 'Problems and Prospects of Soybean Cultivation in Maharashtra' was entrusted to the Agro Economic Research Centre of Gokhale Institute of Politics and Economics, Pune by the Ministry of Agriculture, Government of India, New Delhi.

The study attempts to analyse the status of soybean cultivation in Maharashtra and studies the problems and prospects of cultivation of this crop in the state. The analysis of the data reveals that the area under and production of soybean has been increasing continuously since 1990 and its cultivation has spread to nontraditional districts cultivating soybean. However, it is observed that the growth rates of area and production have declined in the post 2000 decade as compared to the earlier decade. Moreover, growth rate of productivity is negative in the latter decade. This calls for a strategy for arresting the decline in yield observed for the post 2000 period and for sustaining and increasing the current level of production. The primary data analysis highlights relative profitability of soybean, which is also supported by findings of the Report of the Commission for Agricultural Costs and Prices at all India level. However, the farmers face several agro-climatic, economic, institutional, technological and marketing constraints, economic constraints being the important ones. As per the responses, economic factors such as high input costs, shortage of human labour, price related risks turn out to be important constraints in soybean cultivation. The analysis indicates that the severity of the constraints is highest for the marginal farmers and lowest for the large category farmers.

Extension of irrigation facilities, timely provision of quality seeds, strong extension machinery for dissemination of information, proper implementation of the existing schemes are some of the policy implications arising out of the analysis.

It is hoped that the results of the study would be useful for the researchers and the policy makers as well.

I thank Jayanti Kajale and Sangeeta Shroff for undertaking this study on behalf of the Centre.

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Problems and Prospects of Soybean Oilseed Production in Maharashtra

Introduction

The Indian agricultural sector has evolved through various phases since independence. From a food deficit and stagnant sector at the time of independence, it has reached the stage of being a surplus food sector satisfying the domestic as well as foreign demand. The technological and institutional policy initiatives of the government during 1960s stimulated growth of this sector and it has made considerable progress since then. The food grains production which was 50 million tonnes in 1950-51 reached a level of 196.81 million tonnes in 2000-01. As per the recent estimates, 252million tonnes of food grains were produced in 2010-11. India is now one of the top performers as far as production of some commodities such as wheat and rice are concerned. This was possible due to the technological breakthrough achieved in case of rice and wheat. The usage of new high yielding varieties (HYVs) of these crops lead to remarkable increase in yield of these crops making the country self sufficient in food grains. With the success of these crops, the government started looking for such varieties of other crops also. Oilseeds was one such crop, demand for which outpaced the supply and India had to import edible oil. The technology mission on oilseeds (TMO) was launched in 1986 with the objective of increasing production of oilseeds. As a result of this, the oilseeds production increased gradually. It was observed that after the launch TMO and during 1986-87 until 1996-97, oilseeds production performed much better than the cereals. The area under oilseeds grew rapidly. This particular phenomenon was called 'yellow revolution' wherein the crop pattern showed changes - area under coarse cereals got replaced by oilseeds and pulses (Gulati and Kelly, 1999). Today India contributes around 8 percent to the world production of oilseeds(fao.org/fileadmin/templates/est/COMM_MARKETS_MONITORING/Oilcrops/Documents/Food_outlook_oilseeds/Food_outlook_Nov_12.pdf).

Increasing area and production of the oilseeds indicates increasing importance of oilseeds i.e. the oils – in the consumption basket of the population. The NCAER elasticity estimates show that the per capita demand for edible oils would rise to 16 kgs in 2014-15

(Damodaram and Hegde 2000). The per capita consumption level of edible oil was 7.74 kgs and 9.95 kgs per annum in rural and urban area respectively in 2009-10 (GoI 2012). These figures are lower than the global average figure of 24 kg/year (http://www.icra.in/Files/ticker/Indian_Edible_Oils-note11072011.pdf). Consumption of edible oil in India has been growing faster than its production. It can be seen from table 1.1 that though net domestic availability has been increasing it has not been able to satisfy domestic demand and the year wise data on imports shows that around 34 to 52 percent of the total availability is attributed to imports.

Table 1.1: Availability of Edible Oils (In lakh tones)

Year	Net Domestic availability	Import	Total Availability or Consumption	Imports as percentage of total Availability
2000-01	54.99	41.77	96.76	43.17
2001-02	61.46	43.22	104.68	41.29
2002-03	46.64	43.65	52.9	48.34
2004-05	72.47	45.42	117.89	38.53
2005-06	83.16	42.88	126.04	34.02
2006-07	73.70	47.15	120.85	39.02
2007-08	86.54	56.08	142.62	39.32
2008-09	84.56	81.83	166.39	49.18
2009-10	79.46	88.23	167.67	52.61
2010-11	97.82	83.71	181.53	46.11

Source: GoI (2012)

The gap between demand and production of edible oil in India has increased sharply in recent years. Since 2000-01, production of oilseeds grew at the rate of 4.7 percent per annum, but edible oil consumption increased at the rate of 6.5 percent per annum (<http://www.business-standard.com/article/press-releases/>, February 20, 2013). Net domestic availability has increased in 2010-11 and has led to slight reduction in imports. However, due to increasing demand and consumption of edible oils, India still is the world's top vegetable oil importer. This certainly highlights the need to increase the oilseed production.

Our demand for edible oils is mainly satisfied by palm oil, soybean oil and mustard oil. As mentioned earlier, with the technological breakthrough in wheat and rice, attention was focused on other crops and soybean was one such oilseed crop. New varieties of soybean were introduced for commercial usage in India in 1970s. There was a marked increase in the area as well as production of this crop. Today soybean or the 'miracle bean' has come to occupy an important position as a global crop. Popularly known as an oilseed

crop rather than a legume, the world area under cultivation of this crop is growing continuously. The world soybean production has increased two and half times from 24.7 million tonnes in 1981-82 to 220.81 million tonnes in 2007-08 (<http://www.sopa.org/st8.htm>). Its importance as an oilseed crop is revealed from its share in the total world oilseed production which was as high as 56 percent in 2011 (<http://www.soystats.com/2012/Default-frames.htm>). The major players in the world production viz. the U.S.A., Argentina, Brazil and China produce around 85 percent of the world soybean production. India occupies fifth position after China in this regard.

The following table shows that groundnut, rapeseed-mustard and soybean are the major oilseeds that together contribute 80 percent to the area and 90 percent to the total oilseeds production in the Indian context. The share of soybean in area and production of major oilseeds increased very rapidly after it was introduced in 1970s. In 2010-11 around 35 percent of the area and 39 percent of the production of major 9 oilseeds at all India level was contributed by soybean. For the year 2011-12, the 4th advance estimate shows that the area under soybean was 10.18 million hectares and the production was 12.28 million tones. Share of area under and production of groundnut is declining continuously whereas that of rapeseed and mustard is fluctuating and was around 25 percent in 2010-11.

Table 1.2: Share of Major Edible Oilseeds in Area and Production of Total Oilseeds in India
(In percent)

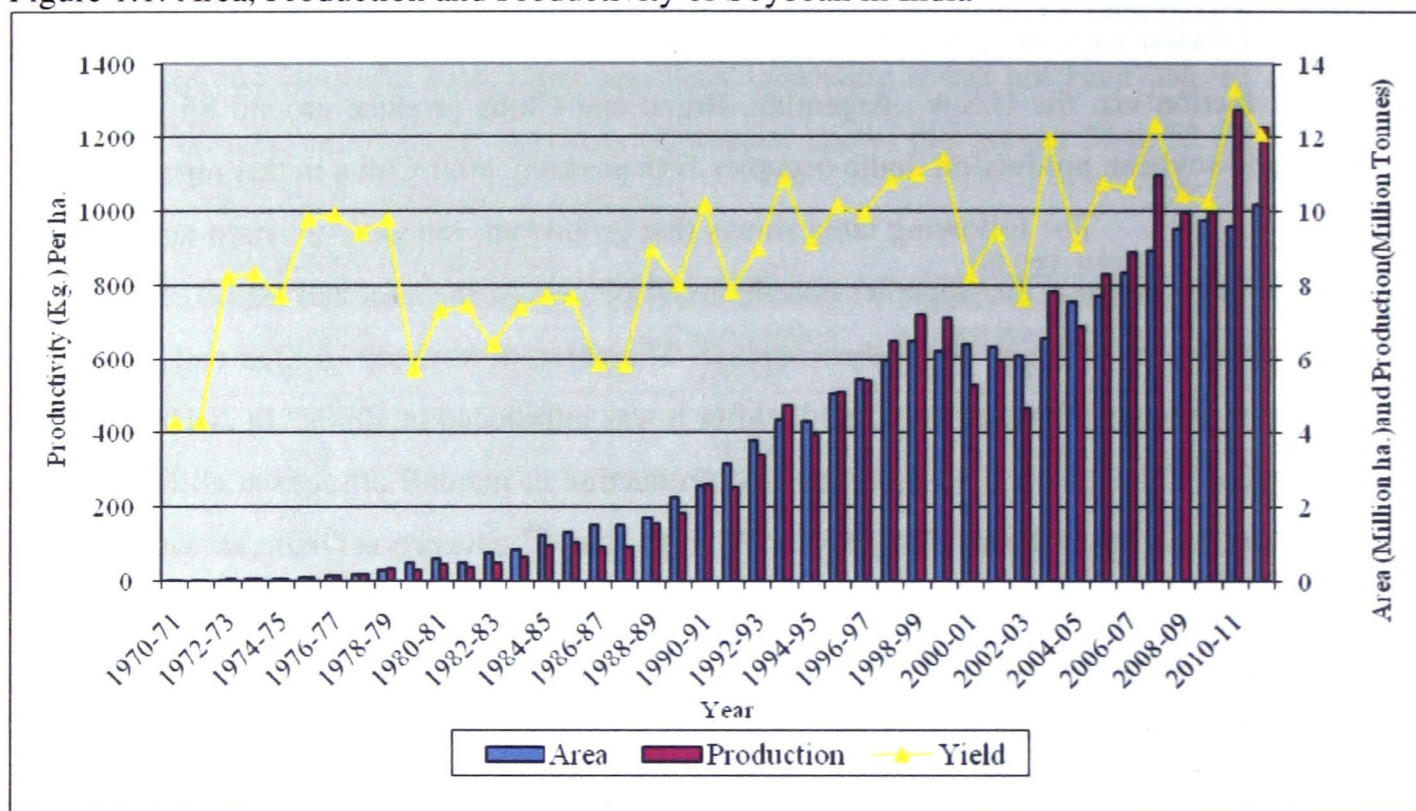
Year	1961		1971		1981		1991		2001		2010-11	
	A	P	A	P	A	P	A	P	A	P	A	P
Groundnut	46.91	68.91	44.05	63.45	38.64	53.47	34.41	40.35	28.81	34.76	21.53	25.43
Rapeseed Mustard	20.92	19.34	19.95	20.56	23.35	24.55	23.93	28.1	19.68	22.72	25.35	25.18
Soybean	-	-	0.18	0.1	3.47	4.7	10.6	13.97	28.19	28.63	35.27	39.22
Total	67.83	88.25	64.18	84.11	65.46	82.72	68.94	82.42	76.68	86.11	82.15	89.83

Source: GoI, 2012

Figure 1.1 shows that area and production of soybean increased rapidly after 1988-89 almost for a decade. However, with the initiation of India's own programme of economic liberalisation and the Uruguay Round Agreement, major policy decision relating to edible oils was taken. These were put under open general license and the duty was lowered from 65 percent to 15 percent over a period of four years- from 1994 to 1998. Consequently,

imports increased to the benefit of the consumers, prices of edible oils crashed leading to temporary period of decline in area and production. However, there was again a spurt in 2004-05. Area and production of soybean has been increasing since then.

Figure 1.1: Area, Production and Productivity of Soybean in India



Source: GoI, 2012.

Madhya Pradesh and Maharashtra are the two major soybean producing states and currently contribute more than 80 percent to the total area and production of soybean in India. Table 1.3 shows the share of various states in total area and production of soybean in the year 2010-11. It is seen that Madhya Pradesh, the highest producing state contributes more than 50 percent to the total area under and production of soybean. It is followed by Maharashtra which occupies around one third area under soybean and contributes 33 percent to the total soybean production. It can be noted that the per hectare yield in case of Maharashtra is higher than that in Madhya Pradesh. Maharashtra being a major soybean producing state with higher productivity, this study attempts to analyse the status of soybean cultivation in Maharashtra and studies the problems and prospects of soybean cultivation in the state.

Table 1.3: Share (TE 2011-12) of Various States in Area and Production of Soybean and Productivity of Soybean (In percent)

States	Area	Production	Yield (Kg./Hectare)
Madhya Pradesh	56.20	55.95	1168.67
Maharashtra	29.88	29.60	1207.33
Rajasthan	8.29	9.75	1391.33
Andhra Pradesh	1.43	1.58	1379.00
Karnataka	1.86	1.15	742.67
Others	2.38	2.03	-
All India	100.00	100.00	1186.00

Source: GoI, 2012

1.1 Role of Agriculture in the State Economy

The state of Maharashtra is the second largest state in India in terms of area and population. It houses the financial capital of India i.e. Mumbai and contributes 14.4 percent to the gross domestic product (GDP). The per capita gross state domestic product (GSDP) at factor cost per annum of the state in 2011-12 was Rs.1,05,623 and was higher than the per capita GDP at factor cost of the country which was Rs. 69,497. The state has growing secondary and tertiary sectors which contribute almost 87.1 percent to the state income. They have grown at the rate of 5.2 and 8.4 percent respectively during 2011-12. Maharashtra is a leading industrial state. The contribution of the state in total value of output was 16.8 percent and in net value added (NVA) was 21.4 percent in 2009-10 (Economic Survey of Maharashtra, 2012-13). The state has attracted around 20 percent of the foreign direct investment (FDI) since 1991 (Economic Survey of Maharashtra, various years).

Only around 12.9 percent of the state income is contributed by the agricultural sector. In spite of its progress in the industrial sector, the state still can be called as an agrarian state as almost 57 percent of the state population is still dependent on this sector for its livelihood. It can be noted that the share of agricultural and allied activities in the GSDP has been declining continuously. It declined from 23.31 percent in 1990 to 13.8 percent in

2007 and currently to 12.9 percent (Economic Survey of Maharashtra, 2011-12). Thus, it has declined by more than 50 percent. However, there has been no commensurate decline in the labour force in agriculture as per Census as well as NSSO estimates.

The major constraining factor for this sector is the scanty rainfall in several parts of the state and the extent of irrigation which covers only 18 percent of the land under cultivation as against 44.5 percent at all India level. During 2009-10, average per hectare yield of food grains in the state was 1074 kg. which was far below the national average of 1798 kg per hectare. This explains the lower productivity of several crops grown in the state.

Around 54 percent of the area under cultivation is occupied by food grains as of now and gradually the cropping pattern is shifting towards commercial crops. The area under food crops has declined to 54 percent from 69 percent in TE 1973-74. This is mainly due to a decline in area under the staple cereals- jowar and bajra. Area under pulses (except gram) has almost remained stagnant. The crops that have recorded increase in area and production are the oilseed crops. These mainly include soybean along with sunflower. Area under crops like sugarcane, cotton, has also increased. Area under fruits and vegetables has recorded an impressive growth, though in absolute terms, area under these crops is less. The changes in cropping pattern thus indicate preference of the consumers for high value crops with gradually increasing incomes. The gross cropped area in the state has increased only marginally indicating limits to area expansion.

Table1. 4: Share of Various Crops in the Gross Cropped Area of the State.

Crop	TE 1973-74	TE 1983-84	TE 1993-94	TE 2003-04	TE 2009-10
Total cereals	55.72	54.31	50.02	40.61	38.67
Total pulses	13.13	13.55	16.50	15.65	15.54
Total food grains	68.87	66.75	65.23	56.09	54.20
Total oilseeds	8.20	7.88	12.24	11.36	17.28
Sugarcane	0.91	1.45	1.93	2.38	3.86
Cotton	13.57	12.72	12.48	12.94	14.37

Source: Calculated from District wise Statistical Information relating to agriculture, GOM, Season and Crop Reports, various issues and Office of the Commissioner of Agriculture, Pune.

1.2 Importance of Oilseeds in the State Economy

The growing importance of oilseed cultivation in Maharashtra's agriculture is clear from the increasing trend in area under oilseeds which was around 15 lakh ha in 1970-71 and 36 lakh ha in 2010 -11 thus registering an increase of more than 140 percent. The share of oilseeds in the gross cropped area (GCA) which was around 8 percent in TE 1973-74, increased to 17 percent in TE 2009-10. Table 1.5 provides a comparison of area and production of various major edible oilseeds in Maharashtra during TE 1993-94 and 2010-11. The area under total oilseeds has more than doubled and the production has grown nearly four times registering an increase of 290 percent over a period of thirty years. This shift indicates an increase in (derived) demand for oilseeds as well as supply of the same. The data on individual oilseeds shows that sunflower and soybean are the oilseeds that have registered increase in area and production and that the percentage change has been very high for soybean. The area and production of other oilseeds have declined.

Table 1.5: Trends in Area and Production of Major Edible Oilseeds in Maharashtra during TE 1983-84 and TE2010-11 (Area in 00 ha, Prod. in 00 tonnes)

Crop	Area				Production			
	TE 1983-84	TE 1993-94	TE 2003-04	TE 2010-11	TE 1983-84	TE 1993-94	TE 2003-04	TE 2010-11
Ground nut	4983.33	5622.33	3428	2811 (-43.59)	3672	5079.33	3579	2957.67 (-19.45)
Sunflower	531.33	3373.67	2786.33	2607.33 (390.72)	364.67	2456.33	1249.67	1586.28 (334.99)
Seas mum	1064.61	2733.33	1177.67	676 (-36.50)	258.67	767.33	368.61	160.77 (-37.85)
Linseed	2391.33	1598.67	619	473.67 (-80.19)	480.67	319	156.33	120.19 (-74.99)
Safflower	-	4788.67	2648	2015.69 (-57.9)	-	2546	1142	1225.61 (-51.86)
Soybean	-	3710	13165	29153 (685.79)	-	3988.33	17267.33	26710.63 (569.72)
Total oilseeds	16038.67	25537.33	25356.67	39016.18	8747	17178.33	25007.33	34066.33

Note: Figures in the bracket indicate percentage change over the aggregate period.

Source: Same as in table 1.4

The table below (table 1.6) shows shares of major oilseeds in total area and production of oilseeds in Maharashtra after 1990s, when production of oilseeds other than groundnut started increasing. Share of all major oilseeds has declined and that of soybean has increased.

Soybean which contributed 7 percent to the total oilseed area and 10 percent to the oilseed production, now occupies 75 percent of the total oilseed area and 85 percent of the production.

Table 1.6: Percentage Share of Major Edible Oilseeds in Area and Production of Total Oilseeds in Maharashtra

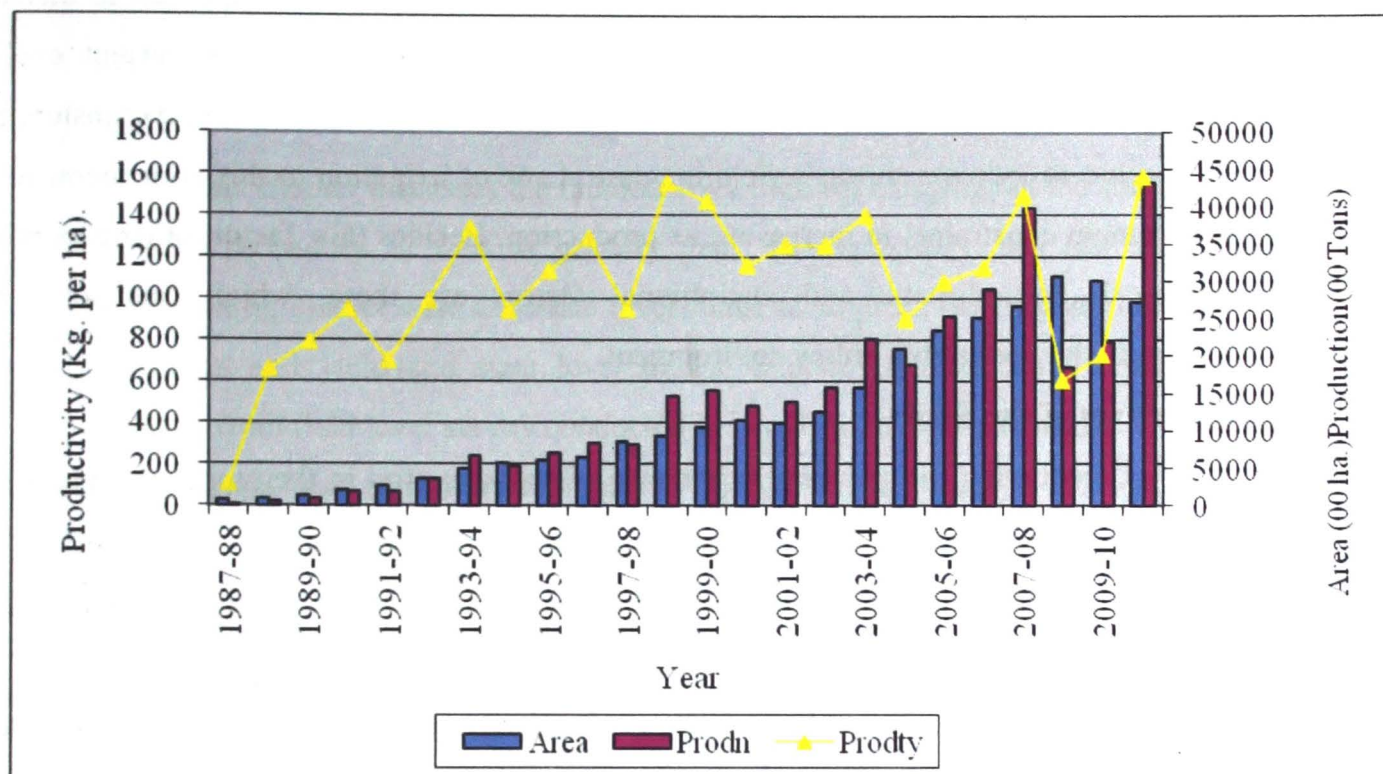
Oilseed	1991		2001		2010-11	
	A	P	A	P	A	P
Groundnut	22.66	30.73	15.78	17.18	7.59	6.83
Sunflower	12.65	15.43	13.18	8.35	5.9	2.6
Seas mum	10.04	3.86	5.35	1.44	1.53	0.39
Linseed	8.91	2.59	2.73	0.78	1.08	0.21
Safflower	22.91	9.26	11.57	5.81	4.3	1.86
Soybean	7.27	10.12	44.61	63.13	75.23	85.36
Other oilseeds	15.56	28.01	6.78	3.31	4.37	2.75
Total oilseeds	100	100	100	100	100	100

Source: Same as in table 1.4

Growth of Soybean Cultivation in Maharashtra

The major oilseed crop of Maharashtra was groundnut till mid 1980s. Since then, the farmers have started cultivating the non-conventional oilseed crop- specifically soybean. The area under this crop picked up at a fast rate primarily in the north east region of the state where the climatic conditions were suitable for soybean cultivation. Shorter duration of the crop (i.e. 3 to 3.5 months- from July to August) allows the cultivators to take the second crop on the same piece of land and add to their income/profits, which is not possible for a kharif crop like cotton. Being a purely commercial crop, it is not retained for home consumption. Similarly, it is not retained for the purpose of expulsion also as the processing requires a large operation unit and sophisticated technology. One time harvest of the crop makes the harvesting operation comparatively easier. Easy cultivation of the crop and benefits in terms of improvement in fertility also prompted farmers to undertake soybean cultivation. Soybean crop has been found to be very profitable as compared to other kharif crops (Kajale, 2002). Figure 1.2 depicts the movement of area, production and yield of soybean in Maharashtra.

Figure 1.2: Area Production and Productivity of Soybean in Maharashtra



Source: Same as in table 1.4

The available data brings out preference of the farmers for this particular oilseed crop. Soybean seems to have replaced area not only under other kharif oilseeds but also other kharif crops like jowar, rice etc. This phenomenon is noted by some studies (Khare, 1994; Gulati and Kelly, 1999 Kajale 2002.).

Soybean cultivation is concentrated in two regions of Maharashtra, viz: Vidarbha and Marathwada located in the eastern part of Maharashtra. Around 80 percent of the soybean production of the state is contributed by these regions. The area under the crop is highest in the former region specifically in Nagpur district. However, yield is seen to be higher for Kolhapur region located in western Maharashtra and which receives irrigation on a large scale.

1.3 Problems in Oilseed Production

As mentioned above soybean is a very sturdy, short duration and profitable crop. Maharashtra is a major soybean producing state and the yield of this crop is higher than that of many other major soybean growing states including Madhya Pradesh. However, the major

problem faced by the cultivators is lack of irrigation facilities for the crop. In fact most of the crop is grown under rain fed conditions. In view of the growing demand for edible oils and growing dependence on imports for satisfying domestic demand, it is important to increase production of oilseeds. Though soybean is the major oilseed of the state, the current level of its production have to be sustained and increased. As there are limits to area expansion, the production has to increase through yield increase. Lack of irrigation to this crop seems to be one of the main constraints in increasing its production. Besides this factor, other economic, technological, agro-climatic and institutional factors are there, which can boost the production in the favourable policy environment.

1.4 Objectives of the Study

Considering the growing importance of soybean crop in the cropping pattern and edible oils consumption basket, the basic objective of this study is to analyse the performance and potential of soybean crop sector and identify major problems/ constraints facing the sector in the state of Maharashtra. The specific objectives are as follows-

1. To examine trends and pattern of growth of soybean over time and across districts of Maharashtra and locate the sources of growth.
2. To Calculate costs of and income from soybean cultivation on sample farms and compare the profitability of soybean crop with the competing crops.
3. To identify major constraints in soybean cultivation and suggest policy options to improve production and yield.

1.6 Design of the Study

This introductory chapter is followed by chapter two that deals with methodology and sampling design of the study. Chapter three presents an overview of the soybean sector of the state. Chapter four presents analysis of the primary data collected through field survey. Chapter five summarizes the results and presents conclusions and policy implications.

Coverage Sampling Design and Methodology

This chapter discusses the methodology used for carrying out the study. The study has used secondary as well as primary data. The secondary data has been used for understanding district wise and state level status of soybean cultivation in terms of area, production and yield and state level trends in prices of soybean. Primary data was collected from field level survey conducted in two districts of Maharashtra.

2.1 Coverage and Sampling Design

It was decided to select major soybean producing districts (with a cap of minimum 3 and maximum 6 districts per state per crop) that occupy at least 10 percent of the total state soybean area. The selection of districts was to be based on acreage and yield as per the following classification:

Criterion for Selection of Sample Districts

Area	Yield	
	<i>High</i>	<i>Low</i>
<i>High</i>	High area - High yield (HH)	High area – Low yield (HL)
<i>Low</i>	Low area – High yield (LH)	Low are – Low yield (LL)

Since **HH, HL and LH** districts have potential for increasing production of oilseeds; it was proposed to select at least one district each from these three categories for household survey. Analysis of the data relating to area under soybean revealed that HH and LH districts could be easily located; however, it was not possible to find districts in the HL category thus revealing that wherever yields are low (lower than the state average), area would not expand to a large extent. Based on the TE 2010-11 data, districts were ranked as per area under cultivation and yield and only 2 districts (one each in HH and HL category each) could be selected. Accordingly, district Kolhapur (LH) and district Amravati (HH district) were selected.

At second stage 2 major soybean producing talukas in each district and two villages in each of the talukas were selected. From each selected village farmer

households representing different farm categories (Marginal 0-1 ha, Small 1-2 ha, Semi-medium 2-10 ha and Large >10h) based on probability proportional to size based on size distribution at the state level were selected. Following table shows the sampling design.

Table 2.1: The Sampling Design

District	Taluka	Villages	No. of sample households
Kolhapur	Hatkanangle	Rukadi	25
		Male	25
	Gadhinglaj	Kadgaon	25
		Gijavane	25
		Total households	100
Amaravati	Amaravati	Dawargaon	37
		Nandura khurd	38
	Nandgaon Khandeshwar	Jamgaon	37
		Mangarul Chavala	38
		Total households	150
Grand total			250

The 2005-06 data available at the time of the survey on landholding size depicted that around 44 percent of the households in the state belonged the marginal category, 30 percent to the small category, around 25 percent to the medium category and less than one percent to above 10 hectares category. Given the number of households available at the time of survey, an attempt was made to select households in various categories in conformity with the state level classification of operational holdings. This is depicted in table 2.2. The landholding pattern of Maharashtra is dominated by marginal and small landholdings. The table shows that more than 70 percent of the farmers selected belong to marginal and small categories. Only one farmer having a large landholding could be located.

Table 2.2 : Land Size wise Village wise Sample Households Selected

District	Block	Village	Land Group				
			Marginal	Small	Medium	Large	All
Kolhapur							
	Hatkanangle	Rukadi	7	7	11	0	25
	Hatkanangle	Male	8	10	6	1	25
	Gadhinglaj	Kadgaon	14	8	3	0	25
	Gadhinglaj	Gijavane	12	7	6	0	25
		All	41	32	26	1	100
Amravati	Amravati	Dawargaon	14	1	22	0	37
	Amravati	Nandura khurd	20	9	9	0	38
	Nandgoan_ Khandeshwar	Jamgoan	12	14	10	0	36
	Nandgoan_ Khandeshwar	Mangrul chawala	23	14	2	0	39
		All	69	38	43	0	150
Total			110	70	69	1	250

The field work was conducted in the above mentioned villages for the reference year 2011-12.

Overview of Oilseeds Sector: Current Status and Growth Behaviour

This chapter studies the cropping pattern of the state 1970s onwards till date. The cropping pattern of the state is dominated by food grains which occupy more than 50 percent of the area under cultivation. However, gradually, the cropping pattern has been shifting towards non food grain crops such as oilseeds. The chapter therefore analyses the growth behavior of the oilseeds sector of Maharashtra. It thereafter focuses on the major oilseed crop of the state-soybean and its performance after 1990s when it started growing rapidly.

3.1. Cropping Pattern Changes in the State: Area Shifts in Major Crops and Crop Groups

Table 3.1 presents an overview of the cropping pattern of the state during TE 1973-74 and 2009-10. The table reveals that area under rice, wheat and pulses has increased over the concerned period. However, area under total cereals has declined due to a decline in area under coarse cereals by 23 percent which in turn is due to decline in area under Jowar-the staple food crop of the state. As a result, there has been a net decline in area under food grains by 2.55 percent. An increase in area under pulses has not been able to compensate for the decline in area under food grains. In case of non food grain crops, there is a marked increase in the area under total oilseeds which is contributed by soybean and sunflower. Apart from oilseeds, cotton as well as sugarcane have registered an area increase. In relative terms, share of food grains has declined from 69 percent to around 54 percent and that of total oilseeds has increased from 9 percent to 17 percent over the concerned period. Whereas the area under cotton has increased marginally, that under sugarcane has increased considerably from 0.9 percent to 3.86 percent. Today, food grains, oilseeds and cotton together occupy around 85 percent share in cropping pattern of the state.

Table 3.1: Total Cropped Area under Selected Crops in the State: TE1973-74 to TE 2009-10

Crops	Area (000 ha)					% change
	TE 1973-74	TE 1983-84	TE 1993-94	TE 2003-04	TE 2009-10	
Rice	1321	1486	1563	1522	1523	15.25
Wheat	884	974	694	734	1119	26.52
Total coarse cereals	7953	8594	8183	6812	6087	-23.46
Total cereals	10158	11054	10440	9068	8728	-14.07
Total pulses	2393	2757	3444	3494	3508	46.60
Total food grains	12556	13586	13614	12525	12236	-2.55
Groundnut	596	498	562	343	281	-52.84
Rapeseed and Mustard	3.5	3.6	3.7	9.0	6.6	88.57
Soybean	-	-	371	1317	2915	685.80
Sunflower	-	53	337	279	261	390.72
Other oilseeds	1091	1049	1279	589	438	-59.87
Total oilseeds	1691	1604	2554	2536	3902	130.75
Cotton	2473	2588	2606	2889	3244	31.16
Sugarcane	166	295	404	531	872	42.5.94
Total cropped area	18231	20354	20871	22328	22574	23.82
Crops	Percent to Total/Gross Cropped Area					
Rice	7.25	7.30	7.49	6.82	6.75	-6.90
Wheat	4.85	4.79	3.32	3.29	4.95	2.06
Total coarse cereals	43.62	42.22	39.21	30.51	26.96	-38.19
Total cereals	55.72	54.31	50.02	40.61	38.67	-30.60
Total pulses	13.13	13.55	16.50	15.65	15.54	18.35
Total food grains	68.87	66.75	65.23	56.09	54.20	-21.30
Groundnut	3.27	2.45	2.69	1.54	1.25	-61.77
Rapeseed & Mustard	0.02	0.02	0.02	0.04	0.03	52.63
Soybean	-	-	1.78	5.90	12.91	625.28
Sunflower	-	0.26	1.62	1.25	1.16	-28.40
Other oilseeds	5.99	5.15	6.13	2.64	1.94	-67.61
Total oilseeds	9.27	7.88	12.24	11.36	17.28	86.41
Cotton	13.57	12.72	12.48	12.94	14.37	5.90
Sugarcane	0.91	1.45	1.93	2.38	3.87	324.62

Source: Calculated from District wise Statistical Information relating to agriculture, GOM, Season and Crop Reports, GOM various issues and data obtained from Office of the Commissioner of Agriculture, Pune.

Table 3.2 shows the extent of change that has taken place as far as total cropped area, irrigated area and area sown more than once is concerned. It can be seen that the net increase in area is negligible, only 3 lakh ha during TE 1973-74 to 2009-10. In fact, the net sown area (NSA) has declined during last two decades. The table reveals limits to

area expansion. Though area sown more than once has been increasing, there are fluctuations in it through the time period and during this period, it has increased by 40 lakh ha. The net irrigated area has increased by 17 lakh ha, more than the NSA as the percentage of area irrigated is very low to begin with. It is seen that area irrigated more than once has not increased by the same extent as area sown more than once.

Table 3.2: Changes in Gross Cropped Area: Area Expansion and Crop Intensification Effects: TE 1973-74 to TE 2009-10 (00 in ha)

Indicators	TE 1973-74 to 1983-84	TE 1983-84 to 1993-94	TE1993-94 to 2003-04	TE 2003-04 to 2009-10	TE 1973-74 to 2009-10
Change in GCA	21231	5163	14570	2464	43428
Change in (GIA)	8066.67	7963	4364	7030	27423.67
Area Expansion					
Change in Net Sown Area (NSA)	8199	744	-4867	-897	3179
Change in Net irrigated area (NIA)	5654.33	7162.33	3099.67	1383.33	17299.66
Crop intensification					
Change in GCA - Change in NSA	13032	4419	19437	3361	40249
Change in GIA – Change in NIA	2412.34	800.67	1264.33	5646.67	10124.01

Source: Same as in table 3.1

The district wise extent of change in the cropping pattern is presented in tables 3.3 and 3.4. These tables present the absolute as well as relative (percentage) change in area under crops during TE1993-94 and TE 2009-10. At the state level, it is seen that area under other cereals has been declining. As a result, area under total cereals and that under food grains has been declining. It is noted that the decline in the absolute area under other cereals is greater than that under total food grains thus indicating diversion of area under these crops to non food grain crops. Though area under wheat and maize has increased, during this period, it has not been able to compensate for the decline in the area under total food grains. In percentage terms, area under wheat has grown by a larger extent i.e. by more than 200 percent in districts of Amravati division. Area under total pulses at the state level has grown by very low rate-i.e. by 1.85 percent as area under pulses has gone down in many districts. Positive change is noted in case of Latur and Amravati divisions. In case of maize, area has gone up by more than 300 percent at the state level. The

magnitude of percentage change is highest (635 percent) in case of Nasik division for maize.

In the case of non food grain crops, area under total oilseeds has increased during the concerned period (table 3.4). This is mainly due to the increase in area under soybean in majority of the districts. The area under other major oilseed- groundnut has declined throughout the period. Soybean thus emerges as one of the important oilseed crop of the state. During the concerned period, the area under this crop has gone up by more than 25 lakh hectares and by 685 percent, which is the highest among the individual crops as mentioned in the table. The incremental area under soybean is greater than that in total oilseeds, which indicates diversion of area from crops other than oilseeds to soybean. It is observed that the percentage increase is very high for some districts such as Osmanabad and Nanded as the area under this crop in these districts was very low to begin with.

Cotton is another important commercial crop of Maharashtra. Area under this crop has gone down in the traditional cotton growing belt of the state i.e. in Nagpur and Amravati divisions. However, districts of Nasik as well as Latur division have shown an increase in its area. As a result, on the whole, area under cotton has increased. A similar pattern is observed for sugarcane. At the state level, it has increased by more than 100 percent. The area has increased mainly in the districts of division Pune.

One of the ways for increasing the overall growth rate of Maharashtra agriculture was considered to be diversification of the agricultural sector and hence government supported horticultural programme was implemented way back in 1990s. Today, therefore, Maharashtra has attained the position of leading horticultural state of India. It has highest area i.e. 23 lakh ha. under fruits and vegetables contributing around 11 percent of the total area at all India level under these crops. It holds around 7 percent of the total production of fruits and vegetables. The area under fruits and vegetables in the state increased considerably leading to significant increase in production. The share of fruits and vegetables in the GCA of the state in TE 1962-63 was barely 0.79 percent; however it increased to 8.49 percent in TE 2009-10 (GoI, 2012). Table 3.4 shows that the percentage change in the area under fruits and vegetables was around 300 percent at the state level during 1991-92 to 2009- 10. Along with soybean, sugarcane, cotton, fruits

and vegetables have emerged as important crops in the cropping pattern and in the consumption basket.

Finally, the table shows that the GCA in the state has increased marginally by 17 lakh hectares. This is due to the increase in the area sown more than once as shown in table 3.2 The net sown area has however declined during the time period.

Table 3.3: Net Changes in Absolute and Relative terms for Major Food Grains Crops in the State: TE 1993-94 and TE 2009-10
(Absolute change (A) in '00ha; Relative change (R) in percentage)

District/ (Division)	Rice		Wheat		Maize		Other Coarse Cereals		Total Cereals		Total Pulses		Total Food Grain	
	A	R	A	R	A	R	A	R	A	R	A	R	A	R
Mumbai	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thane	-99.67	-6.65	0.33	33.33	1.00	0.00*	-58.67	-17.76	-157.00	-8.58	-3.00	-1.54	-150.00	-7.44
Raigad	-115.67	-8.06	-	-	1.33	0.00*	-101.67	-41.05	-216.00	-12.83	48.67	48.03	-167.33	-9.38
Ratnagiri	-53.67	-6.50	-	-	1.00	0.00*	-151.33	-38.77	-204.00	-16.77	38.33	87.12	-165.67	-13.14
Sindhudurg	1.67	0.21	-	-	1.33	400.00	-34.67	-47.93	-31.67	-3.69	18.33	44.35	-30.00	-3.28
Kokan	-267.33	-5.88	0.33	33.33	4.67	1400.00	-346.33	-33.28	-608.67	-10.89	102.33	26.86	403.00	7.96
Nashik	63.00	14.43	99.33	15.35	1018.00	683.22	-2343.67	-48.58	-1163.31	-19.21	-154.48	-14.73	-1148.45	-16.56
Dhule	-251.33	-83.68	69.33	31.85	189.33	106.97	-1692.33	-53.11	-1684.95	-43.41	-910.60	-59.32	-2602.22	-47.98
Nandurbar	200.33	0.00*	151.00	0.00*	288.33	0.00*	789.00	0.00*	1428.67	0.00*	780.33	0.00*	2209.01	0.00*
Jalgaon	-37.33	-97.39	122.67	37.44	743.67	2824.05	-2029.33	-56.14	-1200.30	-29.96	-244.58	-13.71	-1444.88	-24.95
Nashik	-25.33	-3.27	442.33	37.10	2239.33	635.57	-5276.33	-45.39	-2619.89	-18.79	-529.33	-12.12	-2986.55	-16.45
A'nagar	7.67	10.00	572.00	75.59	334.00	405.67	-1771.33	-20.21	-857.62	-8.86	264.00	25.28	-593.62	-5.54
Pune	0.00**	0.00**	120.67	22.95	103.67	158.67	-2203.33	-30.55	-1979.00	-23.49	-33.33	-4.07	-2012.33	-21.77
Solapur	-36.00	-95.58	375.00	106.64	165.67	101.84	-394.00	-5.57	110.67	1.45	-448.33	-38.42	-337.67	-3.84
Pune	-28.33	-3.85	1067.67	65.34	603.33	194.41	-4368.67	-18.95	-2725.95	-10.59	-217.67	-7.18	-2943.62	-10.23
Satara	87.67	21.28	140.67	50.66	115.33	272.44	-1139.33	-31.85	-795.67	-18.46	18.17	2.37	-777.50	-15.32
Sangli	23.00	14.02	78.33	36.04	241.67	304.62	-573.00	-16.23	-230.00	-5.76	-245.16	-26.75	-475.16	-9.68
Kolhapur	108.67	10.59	0.00**	0.00**	66.67	157.48	-302.67	-39.34	-127.20	-6.59	-91.05	-27.02	-217.25	-9.58
Kolhapur	218.67	13.65	219.00	37.22	423.67	258.33	-2014.33	-25.57	-1152.87	-11.27	-318.05	-15.74	-1469.92	-12.00
Aurangabad	-19.00	-100	111.00	31.24	889.33	319.14	-1350.33	-32.90	-369.00	-7.76	-548.16	-34.00	-917.16	-14.40
Jalna	-28.67	-100	-76.67	-26.59	426.33	203.66	-757.33	-27.67	-436.33	-13.37	-451.00	-28.97	-887.33	-18.41
Beed	-61.00	-85.51	451.67	231.62	58.67	126.62	-708.00	-14.35	-258.67	-4.93	47.79	3.90	-210.88	-3.26
A'bad	-108.67	-91.32	486.00	57.95	1374.33	257.21	-2815.67	-23.91	-1064.00	-8.02	-951.37	-21.65	-2015.37	-11.41
Latur	-164.67	-71.49	144.00	87.80	18.33	51.40	-786.00	-32.98	-788.33	-28.02	313.67	19.10	-494.67	-11.05
Osmanabad	-46.00	-33.25	130.33	57.08	103.00	177.59	398.67	12.63	586.00	16.37	615.00	41.56	1375.67	28.16
Nanded	-121.00	-56.37	-8.67	-4.05	0.33	2.94	-1184.00	-41.92	-1313.33	-40.23	668.67	54.03	-644.67	-14.32
Parbhani	-195.67	-78.48	-13.33	-3.23	**	**	-1169.00	-32.52	-1377.67	-32.27	-529.33	-22.72	-1907.00	-28.90
Hingoli	19.33	0.00*	255.67	0.00*	12.00	0.00*	669.33	0.00*	956.33	0.00*	930.33	0.00*	1886.67	0.00*
Latur	-508.00	-61.01	508.00	49.82	133.67	103.08	-2084.00	-17.43	-1937.00	-13.91	1998.33	29.87	216.00	1.06
Buldhana	-33.67	-100	325.33	177.13	608.47	780.09	-1430.13	-66.66	-530.13	-21.72	96.06	4.36	-434.08	-9.35
Akola	-61.00	-100	245.00	164.06	19.33	305.26	-2174.33	-78.93	-1970.95	-66.33	-1038.66	-35.96	-3009.60	-51.36
Washim	1.00	0.00*	219.67	0.00*	2.00	0.00*	331.00	0.00*	553.60	0.00*	1809.24	0.00*	2362.84	0.00*
Amaravati	-74.33	-59.63	358.67	263.73	10.67	200.00	-1272.33	-68.58	-977.47	-46.08	662.24	37.35	-315.22	-8.09

District/ (Division)	Rice		Wheat		Maize		Other Coarse Cereals		Total Cereals		Total Pulses		Total Food Grain	
	A	R	A	R	A	R	A	R	A	R	A	R	A	R
Yavatmal	-73.67	-94.44	197.33	139.62	4.00	200.00	-1655.67	-68.22	-1528.00	-57.70	-44.17	-2.32	-1478.17	-33.18
A'ti	-241.67	-81.28	1346.00	220.54	644.47	703.05	-6201.80	-67.54	-4452.94	-43.73	1484.71	16.94	-2874.23	-15.25
Wardha	-29.33	-98.88	69.00	41.65	0.67	0.00*	-735.67	-91.46	-695.33	-69.56	140.70	17.93	-554.63	-31.08
Nagpur	202.00	51.57	109.00	24.74	-2.00	-31.58	-1042.00	-83.81	-733.00	-35.21	349.00	35.29	-384.00	-12.50
Bhandara	-1599.67	-47.16	-114.67	-53.17	-3.67	-91.67	-97.67	-100	-1815.67	-48.95	-267.56	-44.77	-2083.23	-48.37
Gondiya	1922.00	0.00*	29.00	0.00*	1.00	0.00*	1.33	0.00*	1953.33	0.00*	197.33	0.00*	2150.67	0.00*
Chandrapur	-78.67	-5.13	92.67	43.51	-7.00	-91.30	-1248.33	-92.17	-1241.33	-39.94	112.90	14.36	-1095.10	-28.36
Gadchiroli	143.67	10.45	-7.67	-40.35	3.33	15.15	-165.67	-75.53	-26.33	-1.61	-1463.93	-89.56	-141.93	-7.39
Nagpur	560.00	8.33	177.33	16.82	-7.67	-19.17	-1325.67	-75.46	-2558.33	-22.18	-931.56	-19.44	-2108.22	-14.11
State	-400.67	-2.56	4246.67	61.21	5415.80	333.76	-24432.47	-31.22	-17119.65	-16.40	637.40	1.85	-13778.91	-10.12

Note: 1. A= Absolute change , R= Relative (percentage) change. 2. - = no area, *= no area in 1993-94, **= constant area in both the years,*** = no. area in 2009-10

Source: Same as in table 3.1

Table: 3.4 Net Changes in Absolute and Relative terms for Major Commercial crops in the State: TE 1993-94 and TE 2009-10
(Absolute change (A) in '00 ha; Relative change (R) in percentage)

District/ (Division)	Groundnut		R&M		Sesame		Soybean		Total oilseeds		Cotton		S Cane		Fruits and vegetables		GCA	
	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R
Mumbai	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-25	***
Thane	0.67	33.33	2.00	0.00*	0.67	6.9	-	-	-15.59	-30.56	-	-	-	-	-	-	-479	-16.07
Raigad	-0.33	-25	1.33	0.00*	-10	-83.33	-	-	-5.7	-37.98	-	-	-	-	-	-	-18.33	-0.84
Ratnagiri	1.33	200	0.67	0.00*	-29.33	-96.7	-	-	-43.62	-63.83	-	-	-	-	-	-	40.33	1.6
Sindhudurg	9	77.14	1.00	0.00*	1	150	-	-	7.75	14.9	-	-	-1.33	***	-	-	163.67	11.47
Kokan	10.67	68.09	5.33	0.00*	-37	-71.15	-	-	-57.15	-30.67	-	-	-1.33	***	-	-	-318.33	-3.49
Nashik	-162.33	-35.78	0.67	66.67	-2.67	-72.73	427.67	4751.85	167	22.15	372	5314.29	146.67	58.2	-	-	213.67	2.19
Dhule	-479.33	-64.14	1.67	0.00*	67.67	0*	125.33	1634.78	-563	-51.73	506.67	74.84	-47	-35.79	-	-	-2786.33	-35.45
Nandurbar	76.67	0*	2.33	0.00*	4.67	0*	244.33	0*	413.67	0*	525	0*	150	0*	-	-	3540.33	0*
Jalgaon	-265	-92.87	1.33	400.0	-580	-78.38	197	2037.93	-862.33	-62.22	2156.67	104.83	5.34	3.8	-	-	1979.67	18.55
Nashik	-830	-55.84	6.00	450.00	-510.33	-68.62	994.33	3775.95	-844.67	-26.16	3560.33	129.88	255	48.7	-	-	2947.33	10.43
A'agar	-77.33	-65.35	0.67	0.00*	-13.33	-72.73	559	13975	-209.67	-18.65	595	5100	561.67	142.92	-	-	1466	11.03
Pune	-45.67	-11.06	-2.67	-72.73	-11.33	-33.66	24.33	521.43	-381.67	-40.15	-0.33	-33.33	626.33	192.72	-	-	25	0.21
Solapur	-81.67	-79.29	-	-	-11	-86.84	23.33	466.67	-852.67	-64.64	-29.67	-77.39	928.66	276.66	-	-	-110	-0.95
Pune	-204.67	-32.26	-2.00	-54.55	-35.67	-55.15	606.67	4439.02	-1444	-42.55	565	1107.84	2116.66	200.89	-	-	1381	3.77
Satara	-221.67	-31.31	3.67	550.00	1.33	133.33	259	693.75	-3.33	-0.38	9.33	82.35	186.33	51.24	-	-	-336.33	-4.87
Sangli	-153.33	-35.33	5.33	0.00*	-3.33	-58.82	215.33	60.6	27.67	2.84	1	5.36	327	115.14	-	-	865.33	13.57
Kolhapur	-56	-8.91	-	-	-5.67	-94.44	303.33	108.2	273	29.07	0**	0**	396.67	56.64	-	-	2572	56.86
Kolhapur	-431	-24.35	9.00	1350.0	-7.67	-60.53	777.67	115.55	297.33	10.68	10.33	33.33	910	67.51	-	-	3101	17.41
A'bad	-108.33	-66.19	-4.67	0***	-99	-78.57	47.33	249.12	-712	-68.46	2183.67	355.84	-25	-10.29	-	-	1408.67	14.82
Jalna	-66.33	-89.24	-5.33	-72.73	-38	-69.09	367	8469.23	-226.33	-26.76	1637	139.12	96	82.52	-	-	77.67	1.05
Beed	-146.67	-69.07	0.33	5.56	-62.33	-59.55	597.67	2422.97	-304.33	-21.36	1576.67	330.31	404.34	301	-	-	109.33	1.18
A'bad	-321.33	-71.35	-9.67	-53.70	-199.33	-69.78	1012	2108.33	-1242.67	-37.54	5397.33	238.01	475.33	96.29	-	-	1595.67	6.1
Latur	-203.67	-81.14	-2.00	-27.27	-105	-67.02	2022	11665.38	1402.67	95.83	-227.67	-89.87	379	349.84	-	-	949	14.78
O'bad	-39.67	-30.05	2.00	200.00	-31.33	-41.96	361.33	108400	-185.67	-10.72	34.67	0*	291.67	217.66	-	-	672.33	9.69
Nanded	-29	-80.56	1.00	0.00*	-90.33	-71.69	1695.67	26773.68	1284.67	180.6	11	0.45	122.34	125.69	-	-	592	7.5
Parbhani	-45.67	-98.56	0.33	7.14	-68	-65.38	844.33	6665.79	-103.33	-6.56	-728.33	-26.05	16.67	13.44	-	-	-3731	-30.35
Hingoli	-	-	0.33	0.00*	10	0*	1271	0*	1611.33	0*	925.33	0*	112.33	0*	-	-	5209	0*
Latur	-318	-68.34	1.67	12.82	-284.67	-61.71	6194.33	16893.64	4009.67	73.12	15	0.27	922	198.85	-	-	3691.33	11
Buldhana	-129.67	-97.49	-0.33	***	-200.33	-84.17	2098.67	4595.62	1177	106.94	162.33	7.08	-3	-12.34	-	-	372.33	4.58

District/ (Division)	Groundnut		R&M		Sesame		Soybean		Total oilseeds		Cotton		S Cane		Fruits and vegetables		GCA	
	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R
Akola	-36.67	***	0.33	100.00	-114	-82.21	1198	2945.9	761.67	112.73	-1466	-45.81	-17.34	-88.15	-	-	-4534.67	-45.23
Washim	-	-	-	-	6.67	0*	2186.33	0*	2218.33	0*	525.67	0*	3	0*	-	-	5384.33	0*
Amaravati	-227.33	-94.85	0.67	200.00	-76.67	-97.87	2801.67	618.47	2573.33	292.98	-1813.33	-53.6	-4.34	-37.17	-	-	1721.33	19.19
Yavatmal	-47	-97.24	-	-	-112	-87.05	2893.33	3909.91	2632.67	650.58	-60.67	-1.51	7.33	11.17	-	-	494	5.33
Amaravati	-440.67	-96.29	0.67	66.67	-496.33	-85.04	11178	1822.5	9363	306.05	-2652	-20.57	-14.33	-11.81	-	-	3437.33	9.45
Wardha	-129	-95.32	-0.33	***	-105.67	-98.75	1714	357.58	1417.67	176.11	-408.67	-29.39	19.67	178.82	-	-	179.33	4.55
Nagpur	-143.67	-70.66	2.33	0.00*	-78.67	-98.74	1555.33	116.88	1138.67	61.57	9.33	1.66	-2.34	-50.07	-	-	271.67	4.64
Bhandara	-2	***	2.00	0.00*	-15.67	-74.6	-55.67	-39.76	-279	-67.99	-	-	4	27.88	-	-	-2166.67	-48.62
Gondiya	-	-	1.67	0.00*	11.33	0*	-	-	94.33	0*	-	-	3.67	0*	-	-	2129.67	0*
Chandrapur	-1.33	***	0	0.00*	-253.67	-97.94	1399	403.17	1009.67	108.68	-110	-17.74	-0.67	***	-	-	-106.33	-1.91
Gadchiroli	-0.33	***	2.00	0.00*	-44	-69.84	67.33	3366.67	16	16.61	9.67	362.5	-	-	-	-	-109.33	-5.54
Nagpur	-276.33	-80.72	1.33	0.00*	-486.33	-91.82	4680	203.57	1963.67	35.55	-499.67	-19.41	24.33	79.35	-	-	198.33	0.91
State	-2811.33	-50	0.67	0.00*	-2057.33	-75.27	25443	685.8	13659.52	53.87	6396.33	24.56	4687.67	116.15	1495.2	300.72	17033.67	8.16

Note: 1. A= Absolute change , R= Relative (percentage) change. 2. - = no area, * = no area in 1993-94, ** = constant area in both the years, *** = no area in 2009-10, 3. For fruits and vegetables, district wise data was not available.

Source: Same as in table 3.1

Table 3.5 shows the decade wise area, production and yield of oilseeds in the state. It can be seen that decade wise average area has increased continuously and by around 108 percent during 1971-1981 and 2001-2010. The average production increased by 216 percent. However, the yield increased by only around 51 percent during the period and has been fluctuating through the period. Thus, the dominant area expansion effect is clearly observed. This underlines the need for stepping up yield of the oilseeds.

Table 3.5: Trends in Average Area, Production, and Yield of Oilseeds in the State

	1971-72 to 1980-81	1981-82 to 1990-91	1991-92 to 2000-01	2001-02 to 2009-10
Area (000 hectares)	1626.71	2186.32	2556.47	3378.55
Production (000 tonnes)	1001.16	2146.08	2041.36	3160.46
Yield (kg/ha)	616.12	961.32	796.61	927.62

Source: Same as in table 3.1

It is seen from table 3.6 that the important oilseed crop in terms of area and production was ground nut during TE 1993-94 occupying 22 percent of area and 30 percent of production. This was followed by safflower and by sunflower. By 2010, this cropping pattern changed and soybean emerged as an important oilseed crop.

Table 3.6: Share of Oilseeds in Area and Production of Total Oilseeds Production in the State: TE 1993-94 and TE 2009-10 (In Percent)

Oilseeds	Area		Production	
	TE 1993-94	TE 2009-10	TE 1993-94	TE 2009-10
Groundnut	22.02	7.20	29.57	8.68
Rapeseed-mustard	0.14	0.17	0.09	0.08
Sesame	10.70	1.73	11.67	0.57
Soybean	14.53	74.72	23.22	78.41
Sunflower	13.21	6.68	14.30	4.66
Safflower	18.75	5.17	14.82	3.60
Niger seed	3.35	1.01	1.02	0.30
Castor seed	0.29	0.21	0.12	0.08
Linseed	6.26	1.21	1.86	0.35
Other oilseeds	10.74	1.89	3.33	3.27
Total Oilseeds	100	100	100	100

Source: Same as in table 3.1

Table 3.7 shows district wise shares of kharif and rabi oilseeds in the state.

Table 3.7: Changing Shares of Kharif and Rabi Oilseeds in Major Oilseeds Producing Districts in the State (In percent)

District /Division	Kharif		Rabi	
	TE 1993-94	TE 2009-10	TE 1993-94	TE 2009-10
Mumbai	-	-	-	-
Thane	92.81	75.31	3.27	18.83
Raigad	88.89	64.52	0.00	14.34
Ratnagiri	97.08	91.69	0.00	2.70
Sindhudurg	29.49	40.17	1.28	1.67
Konkan	76.39	61.41	0.00	7.74
Nasik	95.62	96.71	1.11	0.22
Dhule	71.95	89.53	0.95	0.32
Nandurbar	0.00	80.02	0.00	1.69
Jalgaon	80.95	85.61	8.20	2.36
Nasik	81.34	89.79	4.10	0.96
Ahmednagar	45.06	76.31	44.74	14.43
Pune	56.10	78.21	38.67	9.31
Solapur	60.05	27.95	31.97	17.73
Pune	53.98	65.28	38.03	13.73
Satara	92.57	93.08	5.13	2.19
Sangli	86.64	87.50	10.12	4.69
Kolhapur	101.46	96.45	0.04	0.00
Kolhapur	92.41	92.59	5.16	2.14
Aurangabad	47.18	57.32	48.88	33.13
Jalna	42.49	69.70	77.26	22.44
Beed	67.51	73.38	27.95	14.31
Aurangabad	52.17	69.76	47.12	19.73
Latur	90.12	79.42	14.32	8.38
Osmanabad	60.82	49.31	27.19	24.18
Nanded	86.46	89.75	17.81	3.94
Parbhani	36.79	64.38	49.61	26.91
Hingoli	0.00	80.53	0.00	15.87
Latur	53.21	74.30	28.98	14.17
Buldhana	95.55	97.88	47.46	1.23
Akola	49.88	93.39	47.90	2.11
Washim	0.00	98.87	0.00	0.86
Amravati	90.02	96.29	8.54	0.77
Yavatmal	69.11	98.30	13.34	0.05
Amravati	62.34	97.06	31.87	0.85
Wardha	88.86	99.03	19.50	0.03
Nagpur	84.03	98.62	15.66	0.54
Bhandara	38.91	67.77	59.79	30.97
Gondia	0.00	12.01	0.00	87.28
Chandrapur	40.80	90.29	47.40	9.27
Gadchiroli	6.92	67.66	91.01	32.94
Nagpur	49.53	94.48	22.09	4.76
State Total	67.70	87.13	27.25	6.62

Note: *area under kharif and rabi crops does not add up to 100 due to presence of 'other oilseeds' details of which are not mentioned separately.

Source: Same as in table 3.1

For the state as a whole, whereas in TE 193-94, 68 percent of the area was under kharif oilseeds, it increased to 87 percent in TE 2009-10. Thus, simultaneously, area

under rabi oilseeds declined from around 27 percent to around 11. This shows area expansion of oilseeds that are rain fed and contraction of area under rabi oilseeds. Soybean is grown mainly in the rain fed regions. Hence area under kharif oilseeds has been growing throughout the period. At the division level, the share of area under kharif crops has increased in Aurangabad, Latur, Amravati and Nagpur divisions where soybean is grown in large scale.

Table 3.8 shows the extent of area under oilseeds irrigated in each district of the state. The data is presented only for the years TE1993-94 and TE 1999-00 as data on irrigated area is not available for the latter years. It is seen that at the state level, irrigated area under oilseeds has almost stayed constant throughout the period. It has increased in districts of divisions Nasik, Pune and Aurangabad. In rest of the divisions, it has declined. Pune and Aurangabad are also the divisions wherein the share of area irrigated is comparatively higher than the rest of the divisions. The table however shows that the extent of area irrigated was very low in TE 2000 and that assured irrigation would probably enhance the yield levels of oilseeds.

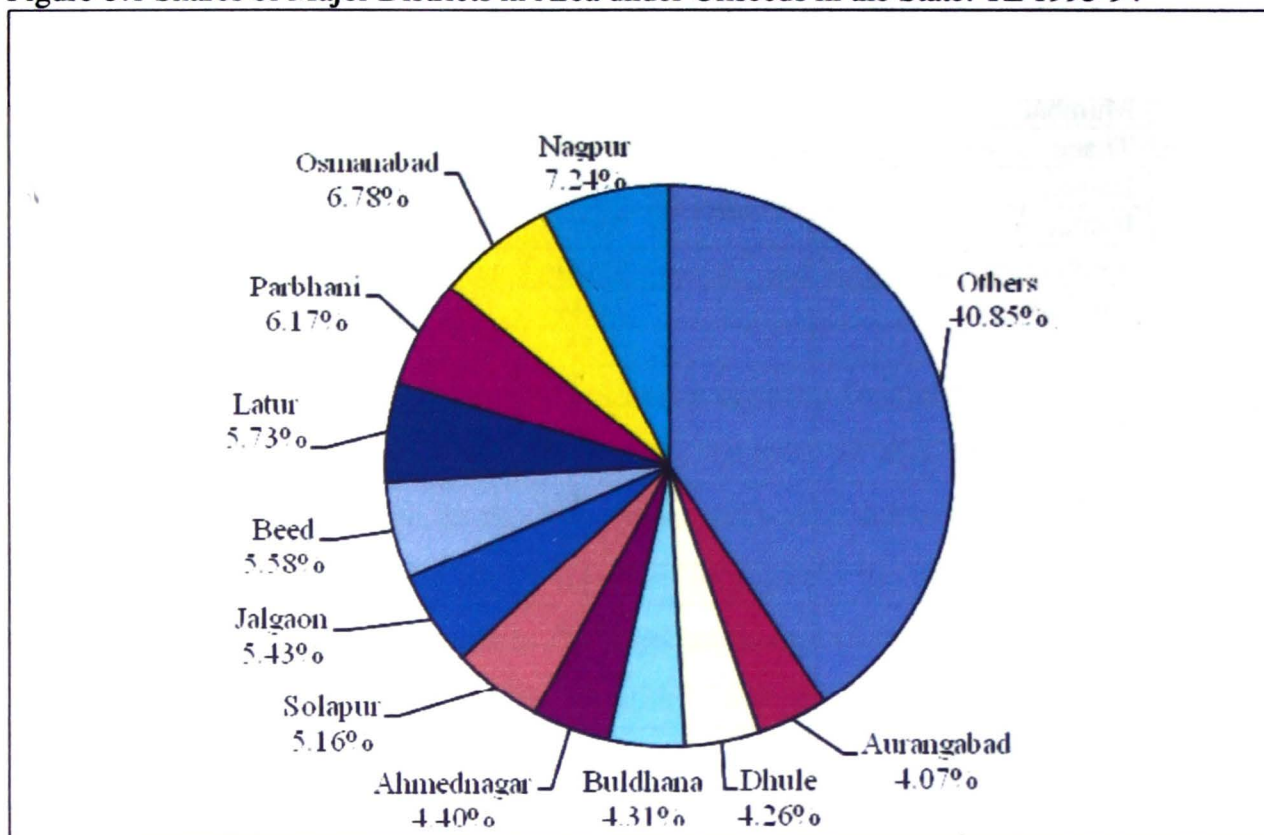
The details of the changing composition of leading districts in case of oilseeds during 1993-94 and 2009-10 are presented in the following pie charts. Nagpur, Osmanabad and Parbhani were the three leading districts area wise in TE 1993-94. In TE 2009-10 however, Amravati has emerged as the district with highest share of soybean area followed by Yavatmal and Nagpur. These districts are located in the Vidarbha region of Maharashtra. In case of production, in 1993-94, Kolhapur (in western Maharashtra) was the major district followed by Nagpur and Sangli (western Maharashtra). In 2009-10, Kolhapur was replaced by Amravati and attained third position. On the whole, districts from divisions Amravati, Nagpur and Latur are the major districts contributing to area and production of soybean in Maharashtra.

Table 3.8: Share of Irrigated Area under Oilseeds in Total Oilseed Area (In percent)

District/ Division	TE 1993-94	TE 1999-2000
Mumbai	-	-
Thane	4.58	2.56
Raigad	20.00	4.21
Ratnagiri	10.73	7.94
Sindhudurg	69.23	35.68
Konkan	28.44	19.14
Nasik	9.55	10.63
Dhule	15.28	20.82
Nandurbar	0.00	15.21
Jalgaon	12.43	19.35
Nasik	12.72	14.46
Ahmednagar	21.76	33.57
Pune	14.69	10.76
Solapur	24.21	32.26
Pune	20.76	26.06
Satara	6.01	7.85
Sangli	8.41	5.21
Kolhapur	0.92	1.66
Kolhapur Dn.	5.13	4.46
Aurangabad	11.22	17.45
Jalna	7.49	4.23
Beed	22.97	35.15
Aurangabad	15.32	21.33
Latur	3.55	1.58
Osmanabad	15.82	13.06
Nanded	12.51	21.16
Parbhani	16.01	14.06
Hingoli	0.00	16.23
Latur	12.08	10.88
Buldhana	1.76	2.47
Akola	5.72	3.98
Washim	0.00	1.76
Amravati	0.99	0.72
Yavatmal	19.28	8.57
Amravati	4.73	3.01
Wardha	3.85	1.55
Nagpur	4.34	2.30
Bhandara	3.09	1.00
Gondia	0.00	7.00
Chandrapur	0.36	0.45
Gadchiroli	2.42	1.47
Nagpur	3.17	1.65
State Total	10.77	10.05

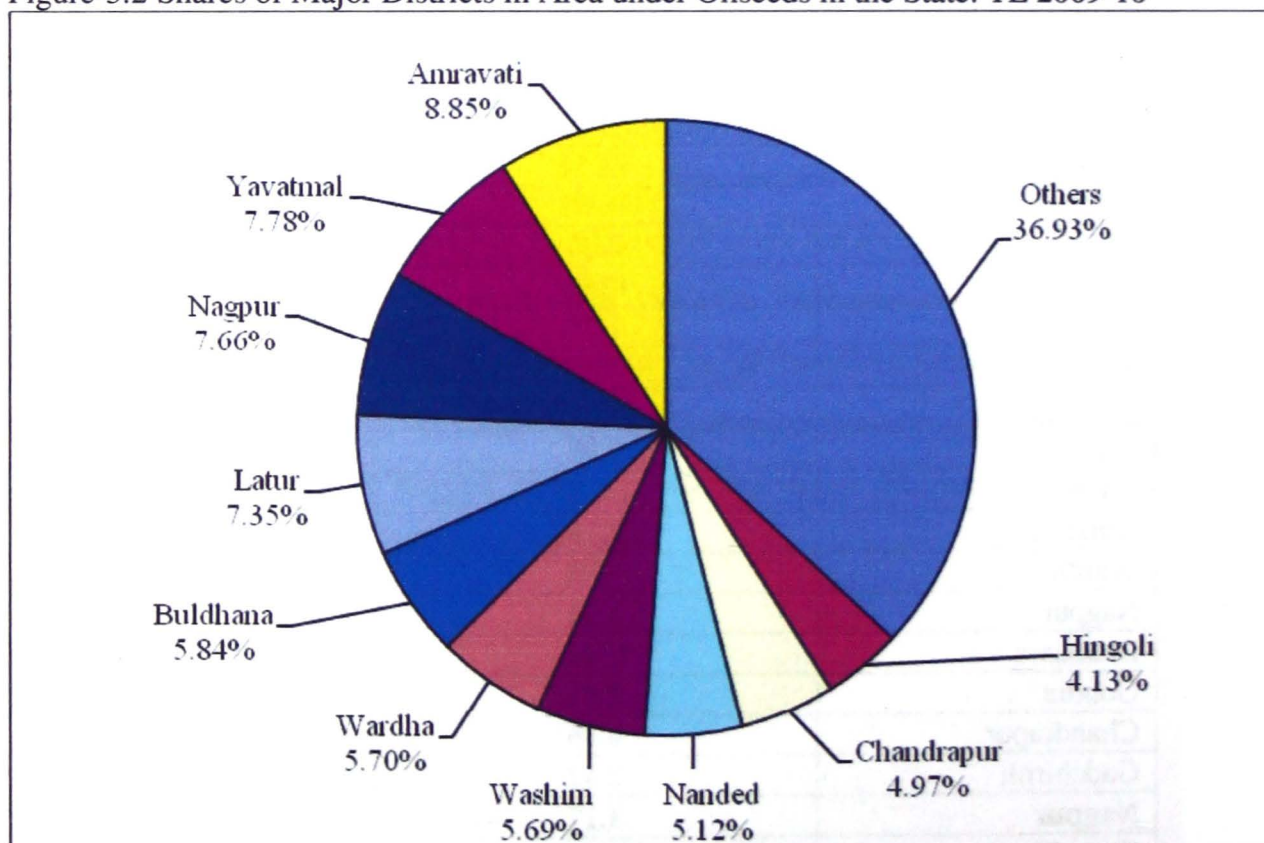
Note: Same as in table 3.1

Figure-3.1 Shares of Major Districts in Area under Oilseeds in the State: TE 1993-94



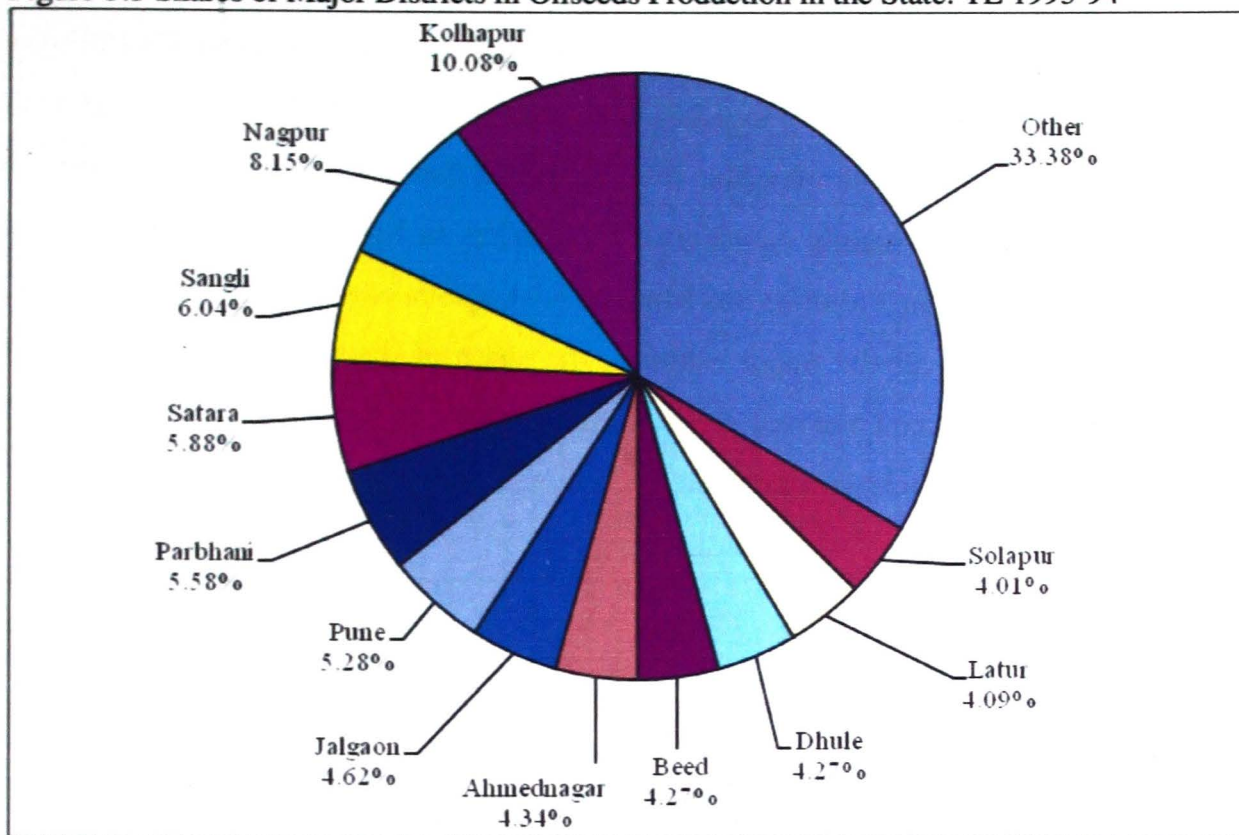
Source : Same as in table 3.1

Figure-3.2 Shares of Major Districts in Area under Oilseeds in the State: TE 2009-10



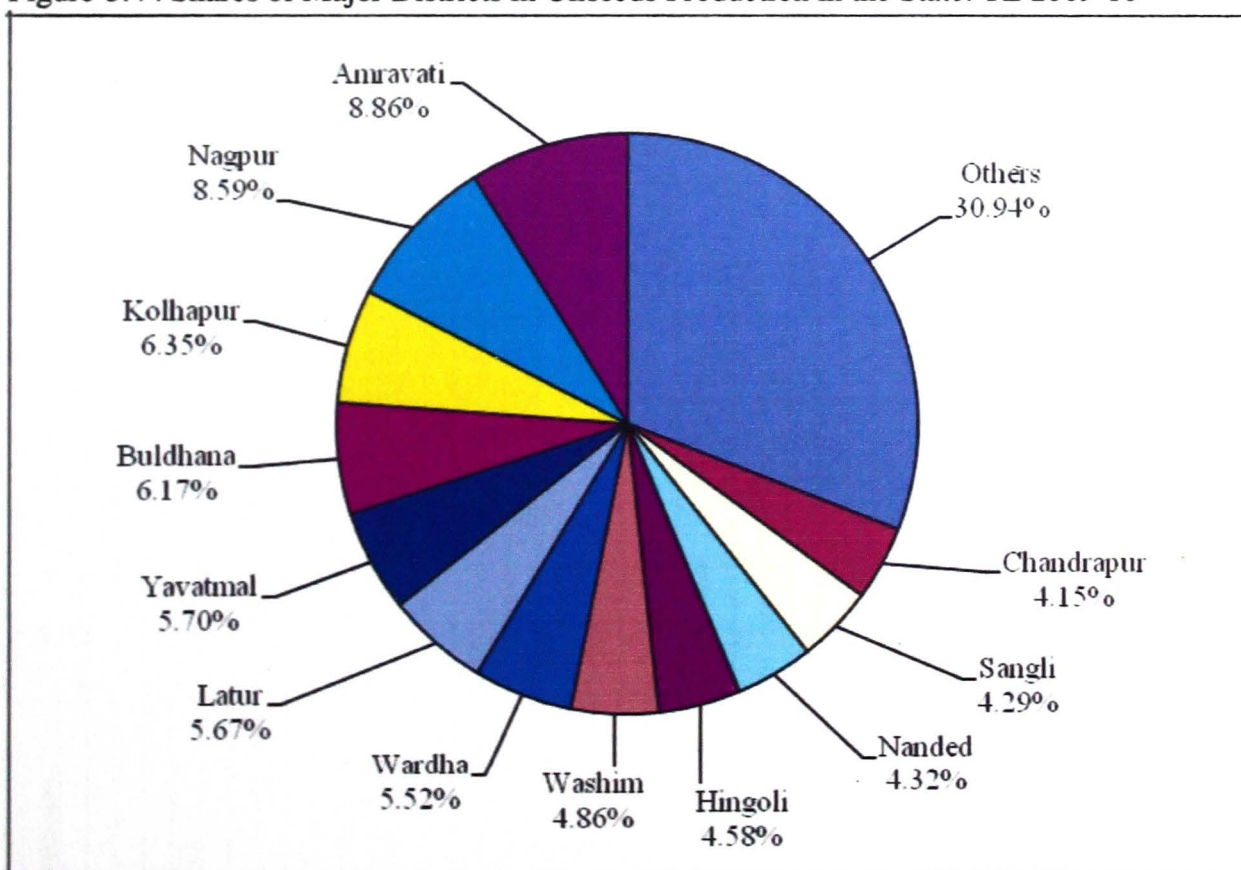
Source : Same as in table 3.1

Figure-3.3 Shares of Major Districts in Oilseeds Production in the State: TE 1993-94



Source : Same as in table 3.1

Figure-3.4 : Shares of Major Districts in Oilseeds Production in the State: TE 2009-10



Source: Same as in table 3.1

Tables 3.9a and 3.9b show shares of districts that have contributed largely (more than 5 percent) to the total area and production of various oilseeds in TE 1993-94 and in TE 2009-10. These districts together have contributed more than 50 percent to the total area and production of oilseeds. It is observed that for most of the oilseeds, except groundnut, area is mainly contributed by districts in Latur, Aurangabad, Amravati and Nagpur divisions in Vidarbha and Marathwada regions of the state. The state level figures indicate that for all the major oilseeds, the share of districts which were dominant in 1993-94, has reduced and new districts are emerging as dominant districts as far area and production of oilseeds is concerned.

Table 3.9a: Share of Districts Contributing More than 5 Percent to the Area under Oilseeds in TE1993-94 and TE 2009-10

Districts/Division	Groundnut		Soybean		Sunflower		Safflower		Rapeseed		Niger seed		Linseed		Sesame		Caster	
	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10
Mumbai	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Raigad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ratnagiri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sindhudurg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kokan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nashik	8.07	10.36	-	-	-	-	-	-	-	-	26.33	40.32	-	-	-	-	-	10.31
Dhule	13.29	9.53	-	-	-	-	-	-	-	-	-	-	-	-	-	10.01	6.28	-
Nandurbar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jalgaon	5.08	-	-	-	-	-	-	-	-	-	-	-	-	-	25.97	23.67	-	-
Nashik	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ahmednagar	-	-	-	-	-	-	10.16	6.09	-	-	-	5.24	-	-	-	-	8.52	-
Pune	7.35	13.07	-	-	-	-	7.48	-	9.32	-	-	5.83	-	-	-	-	-	-
Solapur	-	-	-	-	19.73	9.67	8.46	-	-	-	-	-	-	-	-	-	-	-
Pune	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Satara	12.59	17.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sangli	7.72	9.98	9.58	-	-	-	-	-	-	7.98	-	-	-	-	-	-	-	-
Kolhapur	11.18	20.36	7.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kolhapur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aurangabad	-	-	-	-	-	-	7.89	-	11.87	-	-	7.88	-	-	-	-	-	-
Jalna	-	-	-	-	-	-	8.98	6.23	18.65	-	-	-	13.51	-	-	-	-	5.84
Beed	-	-	-	-	16.68	6.62	5.64	6.38	15.26	10.33	-	-	7.61	5.35	-	6.26	24.22	14.09
Aurangabad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Latur	-	-	-	7.00	18.97	16.91	-	11.46	18.65	6.57	19.95	9.89	-	-	5.50	7.64	-	-
Osmanabad	-	-	-	-	22.49	24.02	7.41	15.18	-	-	17.30	7.27	6.94	13.72	-	6.41	6.28	-
Nanded	-	-	-	5.84	-	-	-	-	-	-	-	-	-	-	-	-	13.01	12.03
Parbhani	-	-	-	-	14.86	-	14.11	18.79	-	6.57	-	-	6.36	-	-	-	8.97	-
Hingoli	-	-	-	-	-	-	-	12.45	5.93	-	-	-	-	-	-	-	-	-
Latur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buldhana	-	-	-	7.36	-	-	10.82	-	-	-	-	-	-	-	8.35	5.57	-	-
Akola	-	-	-	-	-	-	6.63	-	-	-	-	-	-	-	-	-	-	5.84
Washim	-	-	-	7.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amaravati	-	-	12.21	11.16	-	5.36	-	-	-	-	-	-	-	-	-	-	6.73	7.22
Yavatmal	-	-	-	10.18	-	-	-	-	-	-	-	-	-	-	4.46	2.47	-	-
Amaravati	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wardha	-	-	12.92	7.52	-	-	-	-	-	-	-	-	4.27	-	3.76	-	-	2.41
Nagpur	3.62	2.12	35.87	9.90	-	-	-	-	-	7.98	-	-	14.03	2.89	2.81	-	-	2.75
Bhandara	-	-	-	-	-	-	-	-	2.54	2.82	-	-	14.91	8.02	-	-	-	-
Gondiya	-	-	-	-	-	-	-	-	-	-	-	-	-	17.03	-	1.68	-	-
Chandrapur	-	-	9.35	5.99	-	-	-	-	-	7.04	-	-	19.39	36.95	9.09	-	3.14	-
Gadchiroli	-	-	-	-	-	-	-	-	-	9.86	-	-	-	3.59	2.20	2.81	-	-
Nagpur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maharashtra	68.9	82.72	87.49	72.45	92.73	62.58	87.58	76.58	82.22	59.15	63.58	68.55	94.9	87.55	62.14	66.52	77.15	60.49

Source: Same as in table 3.1

Table 3.9b: Share of Districts Contributing more than 5 percent to the Production of Oilseeds in TE1993-94 and TE 2009-10

Districts/Division	Groundnut		Soybean		Sunflower		Safflower		Rapeseed		Nigerseed		Linseed		Sesame		Caster	
	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10
Mumbai	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thane	-	-	-	-	-	-	-	-	-	-	5.50	-	-	-	-	-	-	-
Raigad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ratnagiri	-	-	-	-	-	-	-	-	-	-	5.31	5.07	-	-	-	-	-	-
Sindhudurg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kokan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nashik	6.99	8.51	-	-	-	-	-	-	-	-	31.88	42.34	-	-	-	-	-	9.20
Dhule	9.93	6.15	-	-	-	-	-	-	-	-	-	-	-	-	-	10.31	6.45	6.48
Nandurbar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.36
Jalgaon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36.40	31.19	-	-
Nashik	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ahmednagar	-	-	-	-	6.98	-	7.65	6.58	-	-	-	5.72	-	-	-	-	8.06	-
Pune	11.04	12.37	-	-	-	-	7.33	-	10.21	-	-	6.40	-	-	-	-	-	-
Solapur	-	-	-	-	12.78	9.31	6.17	-	-	-	-	-	-	-	-	-	-	-
Pune	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Satara	17.21	22.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sangli	7.04	8.87	14.09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kolhapur	22.44	28.55	13.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.88
Kolhapur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aurangabad	-	-	-	-	-	-	5.59	5.44	14.29	-	-	-	7.00	2.06	5.26	-	-	-
Jalna	-	-	-	-	-	-	8.06	7.45	20.41	-	-	-	-	-	-	-	-	6.00
Beed	-	-	-	-	12.21	5.98	6.48	-	16.33	8.23	5.69	-	5.22	5.36	-	-	30.64	10.73
Aurangabad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Latur	-	-	-	5.58	16.80	16.58	-	10.39	18.37	-	14.04	7.03	-	-	-	-	-	-
Osmanabad	-	-	-	-	13.39	24.00	6.53	14.22	-	-	15.56	7.88	5.64	12.92	-	-	6.45	-
Nanded	-	-	-	-	6.39	5.24	-	-	8.16	-	3.79	-	-	-	-	6.78	9.68	11.05
Parbhani	-	-	-	-	8.88	5.38	15.58	19.64	2.04	-	2.85	-	5.64	-	-	5.61	8.06	-
Hingoli	-	-	-	5.03	-	-	-	13.33	-	-	-	-	-	-	-	-	-	-
Latur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buldhana	-	-	-	7.58	-	-	14.38	-	-	-	-	-	-	-	7.82	5.33	-	-
Akola	-	-	-	-	-	-	8.88	-	-	-	-	-	-	-	-	-	-	6.67
Washim	-	-	-	6.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amaravati	-	-	9.49	10.82	-	5.30	-	-	-	5.03	-	-	-	-	-	-	-	12.89
Yavatmal	-	-	2.09	7.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amaravati	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wardha	-	-	12.16	6.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nagpur	-	-	29.56	10.68	-	-	-	-	-	9.67	-	-	18.39	-	-	-	-	-
Bhandara	-	-	2.70	-	-	-	-	-	-	-	-	-	13.79	9.55	-	-	-	-
gondiya	-	-	-	-	-	-	-	-	-	-	-	-	-	10.45	-	-	-	-
Chandrapur	-	-	8.83	5.07	-	-	-	-	-	9.67	-	-	24.24	41.46	5.52	-	6.45	-
Gadchiroli	-	-	-	-	-	-	-	-	-	7.04	-	-	-	-	-	-	-	-
Nagpur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Maharashtra	74.65	86.96	92.87	64.84	77.43	71.79	86.65	77.05	89.81	39.64	84.62	74.44	79.92	81.8	55	59.22	75.79	73.26

Source: Same as in table 3.1

Soybean Crop in Maharashtra

Soybean came to be cultivated in Maharashtra on a commercial basis very late i.e. in late 1980s. It however started expanding in 1990s. As in case of total oilseeds at the national level, the area as well as production of this crop rapidly increased. Table 3.10 shows decade wise average area, production and yield of soybean in Maharashtra. The area increased by 203 percent and the production by nearly 195 percent during this period. It is the only crop which has registered a considerable area increase among all the principal crops during last two decades. It is observed however that the yield of soybean has been fluctuating and was particularly low during 2008-09 (601kg/ha) and 2009-10 (728 kg/ha). Hence, there is a marginal decline in the yield of soybean as compared to 1990s. However, it is higher than other major soybean growing states of Madhya Pradesh and Rajasthan.

Table 3.10 : Average Area, Production, and Yield of Soybean in the State

	1981-82 to 1990-91*	1991-92 to 2000-01	2001-02 to 2009-10
Area (000 hectares)	82.7	693.75	2099
Production ('000 tonnes)	88.7	840.85	2482
Yield (kg/ha)	62.59	1151.79	1143.26

Note: *Area-1984-85 onwards, Production and Yield- 1987-88 onwards

Source: Same as in table 3.1

Table 3.11 shows the changing shares of the districts in total state soybean acreage during last 20 years. It can be seen that soybean is grown mainly in the Vidarbha (Amravati and Nagpur divisions) and Marathwada (Latur and Aurangabad) regions of the state. Nagpur was the dominant district and the division in early 1990s. This was followed by Kolhapur and Amravati divisions. However, share of Nagpur division declined continuously and that of Amravati increased. District Amravati is the district with highest share of area under soybean followed by Yavatmal and Nagpur. Share of Kolhapur division, which contributed around 18 percent to the state acreage in TE 1993-94, declined to around 5 percent in TE 2009-10. A similar pattern is observed as far as production of soybean is concerned. The share of districts in Kolhapur and Nagpur divisions has been reducing over a period of time. Currently, districts in Amravati division are major contributors – around 36 percent to the state soybean production.

Amravati is the highest contributor to production and is followed by districts Nagpur and Buldhana.

Table 3.11: Share of Districts in Total Soybean Area and Total Soybean Production in the State:

Districts / Divisions	Share in State Acreage			Share in State Production		
	TE 1993-94	TE 2003-04	TE 2009-10	TE 1993-94	TE 2003-04	TE 2009-10
Konkan Dn.	0.00	0.00	0.00	0.00	0.00	0.00
Nasik	0.24	0.55	1.50	0.26	0.72	2.14
Dhule	0.21	0.14	0.46	0.22	0.17	0.46
Nandurbar	0.00	0.13	0.84	0.00	0.13	1.21
Jalgaon	0.26	0.26	0.71	0.24	0.42	1.51
Nasik Dn.	0.71	1.08	3.50	0.72	1.44	0.00
Ahmednagar	0.11	1.03	1.93	0.11	0.89	2.22
Pune	0.13	0.04	0.10	0.12	0.06	0.17
Solapur	0.13	0.04	0.10	0.15	0.03	0.11
Pune Dn.	0.37	1.11	2.13	0.38	0.99	2.50
Satara	1.01	1.13	1.02	0.92	1.59	2.20
Sangli	9.58	4.12	1.96	14.09	5.33	4.15
Kolhapur	7.56	4.86	2.00	13.95	6.99	4.60
Kolhapur Dn.	18.14	10.11	4.98	28.96	13.91	10.95
Aurangabad	0.51	0.23	0.23	0.59	0.24	0.31
Jalna	0.12	0.58	1.27	0.14	0.56	1.42
Beed	0.66	1.24	2.13	0.57	1.08	0.88
Aurangabad Dn.	1.29	2.05	3.64	1.30	1.87	2.61
Latur	0.47	3.74	7.00	0.52	3.02	5.58
Osmanabad	0.01	0.80	1.24	0.01	0.31	0.96
Nanded	0.17	3.28	5.84	0.18	3.40	4.85
Parbhani	0.34	2.15	2.94	0.36	2.52	3.22
Hingoli	0.00	4.43	4.36	0.00	5.20	5.03
Latur Dn.	0.99	14.40	21.37	1.07	14.45	19.63
Buldhana	1.23	6.00	7.36	1.51	6.76	7.58
Akola	1.10	2.26	4.25	1.18	2.10	4.24
Washim	0.00	7.28	7.50	0.00	7.64	6.11
Amravati	12.21	11.77	11.16	9.49	9.84	10.82
Yavatmal	1.99	6.28	10.18	2.09	6.60	7.04
Amravati Dn.	16.53	33.60	40.45	14.27	32.95	35.79
Wardha	12.92	11.70	7.52	12.16	11.39	6.93
Nagpur	35.87	15.67	9.90	29.56	13.39	10.68N
Bhandara	3.77	0.63	0.29	2.70	0.61	0.33
Gondia	0.00	0.01	0.00	0.00	0.00	0.00
Chandrapur	9.35	9.46	5.99	8.83	8.83	5.07
Gadchiroli	0.05	0.19	0.24	0.06	0.17	0.17
Nagpur Dn.	61.97	37.65	23.94	53.31	34.39	23.19
Total Maharashtra	100.00	100.00	100.00	100.00	100.00	100.00

Source: Same as in table 3.1

Following table (table 3.12) shows that Amravati and Nagpur are also the regions wherein share of soybean in edible oilseed acreage and production of the district is very high- more than 90 percent for most of the districts.

Table 3.12: District wise Share of Soybean Area and Production in Area under and Production of Edible Oilseeds (In percent)

District	Share in edible oilseed acreage in the district			Share in edible oilseed acreage in the district		
	TE 1993-94	TE 2003-04	TE 2009-10	TE 1993-94	TE 2003-04	TE 2009-10
Konkan Dn.	0.00	0.00	0.00	0.00	0.00	0.00
Nasik	1.79	16.09	59.41	2.68	30.51	69.09
Dhule	0.97	3.99	28.22	1.63	9.52	37.76
Nandurbar	0.00	14.45	71.10	0.00	25.59	81.42
Jalgaon	0.79	9.05	43.06	1.58	30.69	75.08
Nasik Dn.	1.10	10.12	50.28	1.87	23.82	68.05
Ahmednagar	0.41	23.92	68.05	0.89	46.67	76.97
Pune	0.54	0.74	5.84	0.59	1.85	9.83
Solapur	0.42	1.20	7.41	1.17	3.51	12.55
Pune Dn.	0.70	8.73	36.35	0.83	15.95	45.41
Satara	4.56	18.71	36.32	3.85	25.61	46.22
Sangli	36.87	57.22	57.49	55.55	78.05	76.58
Kolhapur	30.62	49.33	49.84	32.74	51.19	58.83
Kolhapur Dn.	25.91	43.77	48.69	31.52	52.11	60.85
Aurangabad	2.24	6.56	21.61	5.93	18.89	34.22
Jalna	0.60	16.99	62.23	1.48	33.33	72.90
Beed	2.09	18.74	59.96	3.58	40.69	54.05
Aurangabad Dn.	1.74	15.11	54.59	3.67	33.57	58.28
Latur	1.42	32.46	72.43	3.16	56.18	77.77
Osmanabad	0.03	8.68	25.24	0.06	12.85	29.43
Nanded	1.25	56.82	87.76	2.85	75.09	90.23
Parbhari	0.94	34.41	60.91	2.10	54.85	72.02
Hingoli	0.00	59.11	79.90	0.00	82.94	86.94
Latur Dn.	0.84	35.54	67.84	1.98	62.36	76.45
Buldhana	4.20	86.75	94.66	9.16	95.74	96.85
Akola	6.33	79.24	87.97	13.56	90.61	91.99
Washim	0.00	92.30	98.77	0.00	97.25	99.04
Amravati	52.74	94.45	94.75	62.31	97.39	96.26
Yavatmal	23.37	91.86	99.32	46.30	97.95	99.56
Amravati Dn.	21.11	90.90	95.79	31.14	96.66	96.95
Wardha	65.93	98.21	99.47	82.34	99.21	99.56
Nagpur	82.26	95.64	97.39	88.27	97.29	97.95
Bhandara	85.02	86.37	91.34	93.35	96.94	96.25
Gondia	0.00	4.76	0.00	0.00	20.41	0.00
Chandrapur	56.92	98.34	99.22	88.52	99.59	99.41
Gadchiroli	3.03	47.53	72.22	13.73	81.01	86.39
Nagpur Dn.	72.18	96.17	97.89	86.61	98.38	98.55
Total Maharashtra	18.32	56.51	78.10	24.81	73.07	81.68

Source: Same as in table 3.1

At the state level also, around 78 percent of the edible oilseed area and 81 percent of edible oilseed production is contributed by soybean. Soybean has thus emerged as the dominant oilseed of the state.

3.2. Factors Underlying Changes in Cropping Pattern

Cropping pattern in an agricultural economy changes mainly due to growing or declining demand for a particular crop domestically as well as internationally and the supply side factors such as production and market risks, technological factors etc. As the economy develops, per capita incomes and consumer preferences change towards high value crops and the share of area under food grains declines. The analysis in the previous sections clearly brings out the changing cropping pattern of the state. Whereas in TE 1973-74, share of area under food grains was 69 percent, it has declined to 54 percent in TE 2009-10. Thus, the area is shifting towards non food grain crops. This is similar to what has been happening at All India level. In case of Maharashtra, decline in the area under cereals is attributed mainly to decline in area under coarse cereals (jowar). The major gainers of this shift have been oilseeds particularly soybean. This can be seen from table 3.13

Table 3.13: Cropping Pattern in Maharashtra

Crop	TE 1973-74	TE 1983-84	TE 1993-94	TE 2003-04	TE 2009-10	Percentage change (%)
Total coarse cereals	43.62	42.22	39.21	30.51	26.96	38.19
Total food grains	68.87	66.75	65.23	56.09	54.20	-21.30
Groundnut	3.27	2.45	2.69	1.54	1.25	-61.77
Soybean	-	-	1.78	5.90	12.91	625.28
Total oilseeds	9.27	7.88	12.24	11.36	17.28	86.41
Cotton	13.57	12.72	12.48	12.94	14.37	5.90
Sugarcane	0.91	1.45	1.93	2.38	3.87	324.62
Other crops	7.38	11.2	8.12	17.23	10.28	40.10

It is observed that the supply as well demand related factors in case of oilseeds led to increase in the area under soybean. As has been discussed earlier, the derived demand for oilseeds has been increasing due to a very high and increasing demand for edible oils (which are highly substitutable) from consumers and from exporters of soybean meal. The per capita consumption of all edible oils in India has increased from 4.50kgs to 7.74 kgs in rural areas and from 6.81kgs to 9.95kgs in the urban areas during 1993-94 to 2009-10 (GoM,2012) and will be increasing even further. It is observed that the soybean

prices have been continuously increasing for last few years thus providing incentive for the cultivators to bring more and more area under cultivation (table 3.5). The data also shows that the international prices of soybean have been increasing. This short duration crop appears to be relatively profitable and hence, area and production of this crop expanded rapidly. It is observed that being a short duration (3 months) crop, its relative profitability is higher (Kajale 2002). The expansion of area under soybean has coincided with decline in area under other kharif crops such as jowar and groundnut in Maharashtra. Following table shows percentage change in minimum support prices (MSP), wholesale price index (WPI) and gross returns (GR) of kharif crops at all India Level. Values relating to percentage change in MSP, WPI and GR do not clearly bring out profitability of soybean. As soybean is a short duration crop, it yields income after a short span. Thus, the monthly income from this crop would be relatively higher than other kharif crops that are generally harvested after November i.e. 6 months. Therefore, monthly GR of the crops were also calculated. It is seen to be higher for soybean than all other crops concerned for the 1990-91 and 2008-09. This appears to be an indication of relative profitability of soybean crop can be assumed to be true for all soybean growing states including Maharashtra.

Table 3.14: Percentage Change in MSP, WPI and Gross Returns of Kharif Crops at All India Level

Crop	% change in MSP	% change in WPI	Gross Returns per hectare (Rs)		% change	Monthly Gross Returns (Rs)	
	1990-91 to 2008-09	1993-94 to 2008-09	1990-91	2008-09	1990-91 to 2008-09	(1990-91)	(2008-09)
Paddy	339	110 (rice)	5303	28959	446	883.83	4826.5
Jowar Hybrid	366.7	231.03 (Jowar)	1428	7686	438	238	1281
Groundnut	262.1	151.31	5734	24822	332	955.67	4137
Yellow Soybean	247.5	227.14	3612	15624	332	1204	5208
Cotton H4	300	-	5107	15570	204	851.17	2595

Source: GoI (2010)

The cropping pattern of the state is changing towards non food and high value crops because of demand driven factors such as changing consumption pattern, increasing

incomes, urbanization, globalization etc. as well supply side factors. This is in conformity with the changes taking place at the All India level.

3.3. Growth Trends (Absolute and Compound Annual Growth Rates) in Area, Production and Yield of Major Oilseeds in Maharashtra

This section studies trends in area, production and productivity since 1960s of all the major oilseeds in the state (tables 3.3.13a, 3.13b, 3.13c). Decade wise percentage change (during 2 points of time) as well as compound growth rates in area, production and productivity are found out. Area under oilseeds started increasing 1980 onwards. Hence for majority of the oilseeds area under cultivation is negligible during 1960-1980. Similarly, depending upon the availability of data, the aggregate period for each oilseed is different. The signs of percentage change figures are different than those of growth rate figures in some cases as the former is between two points of time. The major oilseeds in Maharashtra are soybean, groundnut, sunflower, seasmum. Area under other oilseeds is negligible and not available at points of time. It is observed that though the oilseeds were growing at a positive rate of growth in 1980 and 1990 onwards, the growth rate of area under all oilseeds became negative with expansion of area under soybean. For groundnut, decade wise and aggregate growth rate as well as percentage change is negative throughout the period. A similar pattern is observed for production as well as yield of oilseeds. In case of soybean, the decadal growth rates of area and production are higher in case of 1990s than the latter decade. It is also noted that growth rate of area is higher than that of production. As a result, growth rate of yield is very low and is negative during 2000-01 to 2009-10.

Decade wise coefficient of variation was found for all the major oilseeds of the state (table 3.14). It is seen that the values of C.V. are higher than those of other oilseeds as area and production of soybean expanded at a high rate. It is also observed that the C.V. of production is highest as compared to that of area and yield and variability is higher during the decade 1991-2000 when the growth rates in area, production and productivity are comparatively higher.

3.4: Variability in Area, Production and Yield of Soybean vis-vis Competing Crops

Variability in area, production and productivity of soybean was compared with that of the competing crops (table 3.15). It is seen that for soybean and the competing crops, the variability in production is higher than that in area as well as yield. Variability in area, production and yield of soybean is very high in 1990s as the crop expanded rapidly in this decade.

Table 3.15a: Percentage Change and Compound Growth Rate of Area under different Oilseeds in Maharashtra

crop	1960-61/ 1969-70		1970-71/ 1979-80		1980-81/ 1989-90		1991-91/ 1999-2000		2000-01/ 2009-10		Aggregate period		Aggregate period
	% C	GR	% C	GR	% C	GR	% C	GR	% C	GR	% C	GR	
Castor seed	-	-	73.08	-	48.52	-	13.11	-34.16	-62.43	-	161.54	-6.46	1970-71/2009-10
Linseed	-	-	-	-	-3.68	-0.23	-60.62	-4.41*	-48.35	-4.98	-86.02	-10.29	1960-61/2009-10
Rapeseed	-	-	44.83	4.44	-70	2.15	109.62	-4.81	-37.40	-5.12	165.52	-1.49	1970-71/2009-10
Niger seed	-	-	-	-	31.50	4.29	-32.93	-3.97*	-45.63	-5.21	-58.75	NA	1980-81/2009-10
Safflower	-	-	-	-	-	-	-47.41	-4.34	-36.45	-4.35	-70.31	-5.57	1970-71/2009-10
Sunflower	-	-	-	-	1114.81	35.35	17.12	-4.34	-34.85	-1.8	713.70	5.33	1990-91/2009-10
Sesame	-	-	-	-	120.16	14.95	-47.95	-9.38	-60.12	-8.17	-59.68	-2.74	1980-81/2009-10
Soybean	-	-	-	-	1953.06	**	419.23	19.31	164.49	13.67	1400.55	20.31	1984-85/2009-10
Groundnut	-12.92	-2.62	-24.49	-1.09	-3.84	0.5	-34.61	-5.21	-35.5	-3.84	-63.64	-2.45	1980-81/2009-10

Note: 1. *Linseed 1990-91 to 1997-98, Niger seed 1990-91 to 1998-99, Soybean 1984-85 to 1989-90. 2.NA- Growth rate could not be calculated due to non availability of full data series. 3. %C= percentage change, GR=growth rate 4.** Growth rate could not be calculated due to less number of observations.

Source: Same as in table 3.1

Table 3.15b: Percentage Change and Compound Growth Rate of Production of different Oilseeds in Maharashtra

crop	1960-61/ 1969-70		1970-71/ 1979-80		1980-81/ 1989-90		1991-91/ 1999-2000		2000-01/ 2009-10		Aggregate Gr		Aggregate period
	% C	GR	% C	GR	% C	GR	% C	GR	% C	GR	% C	GR	
Castor seed	-	-	83.33	-	55.56	-	65.00	0.96	-60.66	-	181.93	-10.16	1970-71/2009-10
Linseed	-	-	-	-	30.02	2.14	-41.80	-69.76	-45.66	-5.25	-78.02	-8.77	1960-61/2009-10
Rapeseed	-	-	140	11.43	-53.57	-2.77	82.61	-40.12*	3.69	1.83	294.02	2.84	1970-71/2009-10
Niger seed	-	-	-	-	44.14	2.74	-22.07	-46.49*	-46.57	-5.71	-51.00	NA	1980-81/2009-10
Safflower	-	-	-	-	-	-	4.3	-3.0.*	-10.66	0.42	-37.52	-3.68	1970-71/2009-10
Sunflower	-	-	-	-	1250.51	33.5	-25.79	-7.12	-34.06	0.9	489.72	4.19	1990-91/2009-10
Sesame	-	-	-	-	158.67	15.55	-40.36	-7.57	-53.12	-8.93	-37.08	-1.79	1980-81/2009-10
Soybean	-	-	-	-	2281.25	**	705.3	26.31	65.82	7.71	1053.31	14.25	1987-88/2009-10
Groundnut	-24.95	-3.99	-6.64	2.01	57.10	4.95	-33.55	-2.45	-26.80	-3.81	-62.00	-1.16	1980-81/2009-10

Note: 1.* Soybean 1987-88 to 1989-90, Linseed 1990-91 to 1997-98, Niger seed 1990-91 to 1998-99, Rapeseed 1990-91 to 1998-99

2. %C= percentage change, GR=growth rate

Source: Same as in table 3.1

Table 3.15c: Percentage Change and Compound Growth Rate of Yield of different Oilseeds in Maharashtra

crop	1960-61/ 1969-70		1970-71/ 1979-80		1980-81/ 1989-90		1991-91/ 1999-2000		2000-01/ 2009-10		Aggregate GR and C.V.		Aggregate period
	% C	GR	% C	GR	% C	GR	% C	GR	% C	GR	% C	GR	
Castor seed	-	-	5.93	-	64.97	-	-28.60	-5.33	4.71	-	7.8	1.17	1990-91/2009-10
Linseed	-	-	-	-	61.31	2.25	40.87	3.62	5.22	1.29	79.09	1.02	1960-61/2009-10
Rapeseed	-	-	62.71	-	37.60	-6.76*	-29.19	-8.33	45.66	5.67	95.16	-0.06	1970-71/2009-10
Niger seed	-	-	-	-	7.57	-1.3	16.60	7.81	-1.73	-0.53	16.39	1.05	1980-81/2009-10
Safflower	-	-	-	-	-	-	33.82	1.93	40.53	4.98	41.91	-0.21	1970-71/2009-10
Sunflower	-	-	-	-	8.37	-0.44	-8.08	-2.34	1.2	3.68	-6.24	0.02	1990-91/2009-10
Sesame	-	-	-	-	-25.57	6.35	48.66	3.24	18.81	1.76	36.76	0.75	1980-81/2009-10
Soybean	-	-	-	-	772.26	**	55.09	9.72	-37.28	-5.25	-23.11	2.5	1987-88/2009-10
Groundnut	5.05	0.6	11.72	2.62	63.37	2.9	1.63	3.05	13.55	0.71	64.05	1.17	1980-81/2009-10

Note: 1.* Rapeseed 1981-82 to 1989-90, Soybean 1987-88 to 1989-90, Linseed 1990-91 to 1997-98, Nigerseed 1990-91 to 1998-99, Rapeseed 1990-91 to 1998-99 2. %C= percentage change, GR=growth rate

Source: Same as in table 3.1

Table 3.16: CV of Area, Production and Yield of different Oilseeds in Maharashtra

Crop	1960-61/1969-70			1970-71/1979-80			1980-81/1989-90			1990-91/1999-2000			2000-01/2009-10			Aggregate		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Castor seed		-	-	30.71	100.87	82.22	19.41	32.78	30.74	48.08	41.02	24.65	-	-	-	46.23	73.24	62.46
Linseed		-	-	-	-	-	-	6.01	12.92	12.1	21.78*	59.97*	24.54	22.05	30.39	11.75	62.51	59.10
Rapeseed		-	-	19.68	39.24	31.17	65.37	61.81	18.87	60.89	60.70	25.32	28.87	37.27	20.84	57.37	72.72	32.10
Niger seed	-	-	-	-	-	-	25.59	24.45	17.87	11.64*	39.78*	30.9	17.03	22.57	13.90	38.51	37.94	24.72
Safflower	-	-	-	-	-	-	-	-	-	23.23	44.12	32.19	15.26	20.47	19.09	38.38	48.45	25.58
Sunflower	-	-	-	-	-	-	-	-	-	15.87	39.52	22.29	14.79	23.35	26	41.66	54.46	19.83
Sesame	-	-	-	-	-	-	43.12	40.06	30.56	29.33	32.22	17.05	26.57	30.30	9.60	47.97	46.67	21.38
Soybean	-	-	-	-	-	-	60.14*	68.68*	38.5*	45.1	61.28	32.47	36.56	36.71	25.75	90.56	70.13	40.37
Groundnut	9.07	18.77	17.01	6.54	21.77	20.87	7.47	17.49	16.73	16.89	15.11	18.11	13.39	15.94	12.11	36.84	27.25	23.74

Source: Same as in table 3.1

Table 3.17: Variability in Area, Production and Yield of Soybean vis-à-vis Competing Crops

Crop	1960-61/1969-70			1970-71/1979-80			1980-81/1989-90			1990-91/1999-2000			2000-01/2009-10			Aggregate		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Kh. Jowar				7.24	26.85	24.06	3.60	22.98	22.92	15.31	26.42	19.49	22.42	25.95	10.11	26.40	31.87	23.95
Cotton	3.87	16	16.70	6.91	32.71	22.39	2.30	29.79	20.79	9.32	27.18	15.40	6.69	41.37	36.87	9.89	63.50	39.97
Sugarcane	12.10	15.43	23.07	29.45	34.82	27.10	11.51	12.66	9.64	14.63	18.01	13.89	34.18	39.20	10.14	59.41	107.69	70.84
Rice	1.39	17.40	17	5.71	26.27	22	3.61	15	13	2.77	6.23	8	1.72	16.14	15.14	6.61	26.52	22.02
Soybean				-	-	-	60.14*	68.68*	38.5*	45.1	61.28	32.47	36.56	36.71	25.75	90.56	70.13	40.37

Source: Same as in table 3.1

Note: * A= 1984-85 onwards, P,Y 1987-88 onwards.

Classification of Districts according to Growth in Area, Production and Yield of Soybean

The 34 districts of the state were classified decade wise according to the growth rates of area, production and productivity during 1990 to 2009-10. Following tables indicate districts that have experienced significant and non significant growth rates as well as districts for which growth rates could not be calculated due to errors in the data series. The latter happen to be mainly districts in coastal region (Konkan division) where soybean is not grown and also other districts where soybean is not a major crop.

Area

It is seen from table 3.18a that the district with highest share in state soybean area in TE 1993-94 such as Nagpur, Amravati, Sangli and Kolhapur have shown moderate growth rates as compared to districts such as Buldhana wherein area under soybean was almost zero and increased rapidly thereafter. It is also observed that growth rates of the leading districts such as Nagpur, Amravati, Yavatmal, Sangli, Kolhapur were relatively lower in post 2000 period than in the 1990s. In fact, Kolhapur and Sangli experienced negative growth rate in the post 2000 period. However, growth rates were higher for other districts such as Nasik, Dhule, Jalgaon etc. For the state as a whole, growth rate of area was higher (19.31 percent) in 1990s than in the post 2000 period (13.61 percent). It is seen that area under soybean has been expanding in other districts also in the post 2000 period. As a result, more number of districts have experienced significant positive growth rate as compared to the earlier decade. As mentioned earlier, districts like Osmanabad, Nanded and Latur have exhibited significant growth in post 2000 period as area under the crop was less to begin with and later on increased rapidly. For the period as a whole, Buldhana has exhibited highest growth rate and Beed has registered lowest growth rate of 5.67 percent.

Table 3.18a: District wise decade wise Growth of Area under Soybean

	1990s		2000s		1981-82 to 2009-10	
Significant Positive	Nashik	26.16	Nashik	30.23	Nashik	33.88
	Dhule	26.54	Dhule	28.54	Dhule	32.72
	Jalgaon	30.85	Jalgaon	32.03	Jalgaon	38.77
	Satara	22.26	Satara	11.43	Satara	33.98
	Parbhani	52.26	Parbhani	26.04	Parbhani	64.42
	Buldhana	105.98	Buldhana	16.66	Buldhana	112.28
	Akola	26.44	Akola	22.06	Akola	33.74
	Amaravati	21.72	Amaravati	9.8	Amaravati	32.72
	Wardha	22.21	Wardha	6.18	Wardha	27.32
	Nagpur	12.46	Nagpur	4.64	Nagpur	15.29
	Chandrapur	13.23	Chandrapur	5.79	Chandrapur	33.19
	Beed	4.79	Beed	35.92	Beed	5.67
	Bhandara	3.64	Nandurbar	43.84	Bhandara	10.7
	Sangli	12.74	Ahmednagar	29.2	Sangli	17.04
	Kolhapur	16.3	Pune	27.77	Kolhapur	21.57
	Yavatmal	45.81	Solapur	25.85	Yavatmal	57.69
			Aurangabad	11.76		
			Jalna	31.51		
			Latur	45.31		
			Osmanabad	37.96		
		Nanded	35.88			
		Hingoli	23.93			
		Washim	14.22			
		Yavatmal	21.7			
		Gadchiroli	16.88			
Significant Negative	-	-	Sangli	-0.05	-	-
			Kolhapur	-1.13		
			Bhandara	-0.54		
Positive Stagnant	-	-	-	-	-	-
Negative Stagnant	-	-	-	-	-	-
Could not be calculated	Mumbai	Aurangabad	Mumbai	Mumbai	Aurangabad	
	Thane	Jalna		Thane	Thane	Jalna
	Raigad	Latur		Raigad	Raigad	Latur
	Ratnagiri	Osmanabad		Ratnagiri	Ratnagiri	Osmanabad
	Sindhudurg	Nanded		Sindhudurg	Sindhudurg	Nanded
	Nandurbar	Hingoli		Nandurbar	Nandurbar	Hingoli
	Ahmednagar	Washim		Ahmednagar	Ahmednagar	Washim
	Pune	Gondiya		Pune	Pune	Gondiya
	Solapur	Gadchiroli		Solapur	Solapur	Gadchiroli

Note: Significance at ($\alpha = 0.05$), Source: Same as in table 3.1

Production

As against in case of area, for most of the districts, the growth rates of production of soybean are higher in 1990s than in the post 2000 period (table 3.18b). This is also observed for the state as a whole. Buldhana has registered highest growth rate in the 1990s. In the post 2000 period, Jalgaon has registered growth rate of 37.42 percent which is highest among districts. It is noted that in majority of the districts, growth rates are lower in the post 2000 period than the earlier decade. As a result, growth rate for the state as a whole was 26.31 percent for the 1990s and has come down to 7.71 in the post 2000 period. In four districts, growth rate was positive but non significant and in five districts, growth rate was non significantly negative i.e. almost constant in the post 2000 period. It is also observed that these growth rates are less than the growth rates of area as mentioned in the above table. For the aggregate period, Buldhana and Parbhani have registered higher growth rates – more than 30 percent as they have grown at consistently higher growth rates in the two decades concerned. It is observed that the growth rates of production are lower than that of area in the post 2000 period.

3.18b: Classification of Districts according to Growth in Soybean Production (In percent)

Type of Growth	1990s		2000s		1981-82 to 2009-10	
Significant increase	Nashik	33.88	Nashik	29.24	Nashik	29.02
	Dhule	32.72	Dhule	25.26	Dhule	13.76
	Jalgaon	38.77	Jalgaon	37.42	Jalgaon	27.45
	Satara	33.98	Satara	9.25	Satara	18.73
	Parbhani	64.42	Parbhani	21.16	Parbhani	34.68
	Akola	33.74	Akola	15.3	Akola	18.41
	Amaravati	32.72	Beed	15.99	Beed	25
	Yavatmal	57.69			Yavatmal	22.67
	Wardha	27.32			Wardha	11.99
	Nagpur	15.29			Nagpur	6.45
	Chandrapur	33.19			Chandrapur	11.67
	Kolhapur	21.57			Kolhapur	7.1
	Sangli	17.04			Sangli	5.74
	Buldhana	112.28			Buldhana	39.53
Bhandara	10.7			Amaravati	12.31	
Significant decline	-		-		-	
Positive but statistically non-significant	Beed	5.67	Buldhana	9.33	-	
			Amaravati	8.52		
			Yavatmal	7.99		
			Nagpur	4.86		
Negative but statistically non-significant	-		Bhandara	-1.26	Bhandara	-0.57
			Sangli	-3.29		
			Kolhapur	-0.68		
			Wardha	-0.87		
			Chandrapur	-3.45		
Could not be calculated			Mumbai	Aurangabad		
			Thane	Jalna		
			Raigad	Latur		
			Ratnagiri	Osmanabad		
			Sindhudurg	Nanded		
			Nandurbar	Hingoli		
			Ahmednagar	Washim		
			Pune	Gondiya		
		Solapur	Gadchiroli			

Note: Significance at ($\alpha=0.05$).

Source: Same as in table 3.1

Productivity

It is observed from table 3.18c that the growth rates of productivity are for most of the districts lower than those of area and production. This is because area has been expanding at a higher rate than production for most of the districts. In 1990s, all districts have registered a positive yield growth, which though is less than the area and production growth rate. The growth rates of fourteen districts are higher than the All India growth rate for this period. Only Nagpur had significant growth rate below all India level. However, in the next decade, only Jalgaon had positive and higher than all India growth rate. In all, fifteen districts registered growth rate that was below that at the all India level. These districts registered negative growth in the concerned period. For the aggregate period, only Nasik, Jalgaon and Satara have shown a positive growth rate, higher than all India level. All other districts have stagnant or negative growth rate.

District wise analysis of growth rates of area, production and productivity underlines stagnant and negative growth in productivity in the last decade and the slowdown in the growth in area and production at the district and state level. This definitely calls for implementation of policies for arresting the slowdown in the soybean sector.

Table 3.18c: Classification of Districts according to Growth Rate in Productivity of Soybean in the State

Type of Growth Rate	Significant increase		Significant decline		Positive Stagnant		negative Stagnant	
1991-92 to 2000-01								
All India	2.57							
State growth rate higher than All India	Chandrapur	17.63	-		-		-	
	Nashik	6.13						
	Satara	9.59						
	Akola	5.77						
	Amaravati	9.03						
	Yavatmal	8.15						
	Bhandara	6.80						
	Dhule	4.88						
	Jalgaon	6.06						
	Sangli	3.81						
	Kolhapur	4.53						
	Parbhani	7.99						
	Buldhana	3.06						
Wardha	4.18							
State growth rate lower than All India	Nagpur	2.52	-		Beed	0.84	-	
Could not be calculated	Mumbai	Aurangabad						
	Thane	Jalna						
	Raigad	Latur						
	Ratnagiri	Osmanabad						
	Sindhudurg	Nanded						
	Nandurbar	Hingoli						
	Ahmednagar	Washim						
	Pune	Gondiya						
	Solapur	Gadchiroli						
2001-02 to 2009-10								
All India	3.02							
State growth rate higher than All India	Jalgaon	4.09	-		-		-	
State growth rate lower than All India	-		Dhule	-2.57	Kolhapur	0.46	Nashik	-0.76
			Satara	-1.95	Nagpur	0.21	Bhandara	-0.70
			Amarava	-1.17				
			Beed	-14.68				
			Yavatma	-11.26				
			Wardha	-6.64				
			Chandra	-8.72				
			Sangli	-3.24				
			Parbhani	-3.87				
			Buldhana	-6.29				
		Akola	-5.53					

Could not be calculated	Mumbai	Aurangaba					
	Thane	Jalna					
	Raigad	Latur					
	Ratnagiri	Osmanaba					
	Sindhudur	Nanded					
	Nandurbar	Hingoli					
	Ahmednag	Washim					
	Pune	Gondiya					
	Solapur	Gadchiroli					
1991-92 to 2009-10							
All India	0.69						
State growth rate higher than All India	Nashik	2.75	-		Parbhani	0.27	-
	Jalgaon	4.45			Amaravati	0.11	
	Satara	3.92					
State growth rate lower than All India	Bhandara	1.15	Dhule	-0.27	Sangli	0.90	-
	Kolhapur	1.27	Beed	-3.21			
	Nagpur	1.54	Buldhana	-1.02			
			Akola	-0.92			
			Yavatmal	-2.63			
			Wardha	-0.06			
			Chandrapur	-1.44			
Could not be calculated			Mumbai	Aurangabad			
			Thane	Jalna			
			Raigad	Latur			
			Ratnagiri	Osmanabad			
			Sindhudurg	Nanded			
			Nandurbar	Hingoli			
			Ahmednagar	Washim			
			Pune	Gondiya			
			Solapur	Gadchiroli			

3.5. Variability in Monthly/Annual Prices of Soybean and Edible Oils in the State

Table 3.19 depicts the monthly wholesale prices of soybean during 2001-2013. The period selected is post 2000 as prices of various oil seeds including that of soybean dipped down after 1998 in response to the reduction in tariffs on imported edible oil and decline in prices in the international markets during the east Asian crisis. The prices started recovering in the post 2000 period. It is seen that the prices of soybean have been gradually increasing through out the period. It is observed that monthly prices for each year have been increasing. e.g. the price in May 2010 was Rs1050 and was Rs.3770 in May 2013. This is observed for other years also. Based on this data, average annual prices were calculated. Figure 3.5 depicts

these annual prices. These annual prices have declined in 2005 and 2010, however have recovered thereafter. The annual wholesale price of soybean has been growing at the rate of 8.3 percent. In order to understand the seasonal fluctuations in prices, CV of the monthly wholesale prices for the concerned years was found. As soybean is a three month crop and arrives in the market in the months of September and October, prices under the pressure of arrivals start declining in September and October and start increasing thereafter. Prices are thus generally highest in the months preceding harvesting season. This can also be seen from table 3.19. It is also seen that the C.V ranges between 5.6 percent to 19 percent during the concerned years and is on higher side in the years when annual average price is higher and increasing (in the years 2002,2003,2004,2008 and 2012).

Table 3.19: Average Annual Wholesale Prices of Soybean in Maharashtra (Rs. per quintal)

Months/ Year	2001- 02	2002- 03	2003- 04	2004- 05	2005- 06	2006- 07	2007- 08	2008- 09	2009- 10	2010- 11	2011- 11	2012- 13
July	1056.72	1354	1334.01	1755.44	1218.5	1228.23	1602.41	2684.3	2194.1	1930.79	2293.53	4281.67
August	1137.25	1351	1157.89	1713.77	1183.52	1261.2	1494.75	2515.93	2222.51	1974.68	2347.34	4275.55
September	1027.94	1147	1156.55	1350.02	1145.64	1271.25	1492.77	2046.14	1945.29	1908.78	2196.4	3558.83
October	876.76	1146	1154.52	1151.21	1077.45	1134.34	1546.8	1643.14	2073.8	1947.8	1961.41	2965.49
November	1033.3	1267	1212.79	1247.08	1060.54	1259.98	1679.42	1597.03	2353.12	2004.98	2036.43	3094.24
December	960.46	1277	1340.71	1260.63	1050.82	1309.57	1807.08	1734.96	2341.75	2028.77	2206.96	3092.67
January	973	1291.35	1472.99	1199.2	1122.52	1344.08	1988.54	2129.01	2181.66	2244.21	2353.56	3111.44
February	1006	1357.64	1498.08	1192.9	1140.15	1366.6	2060.73	2231.78	2081.4	2326.06	2356.36	3110.99
March	1011	1397.3	1618.08	1234.06	1126.21	1437.35	2201.32	2204.48	1984.61	2238.31	2554.68	3359.06
April	1096	1506.5	1690.05	1240.39	1173.48	1536.83	2121.33	2467.28	1926.87	2312.02	3088	3833.86
May	1286	1481.89	1707.4	1204.42	1253.61	1496.01	2265.73	2549.21	1881.03	2269.98	3332.42	3770.29
June	1388	1454.33	1592.12	1205.73	1211.83	1501.96	2462.34	2404.96	1864.63	2252.03	3383	-
Average	1071.04	1335.92	1411.27	1312.90	1147.02	1345.62	1893.60	2184.02	2087.56	2119.87	2509.17	3495.83
CV	13.9	8.78	15.07	15.46	5.60	9.30	17.61	16.83	8.21	7.81	19.42	

Source: Calculated from the data obtained from www.agmark.nic.in

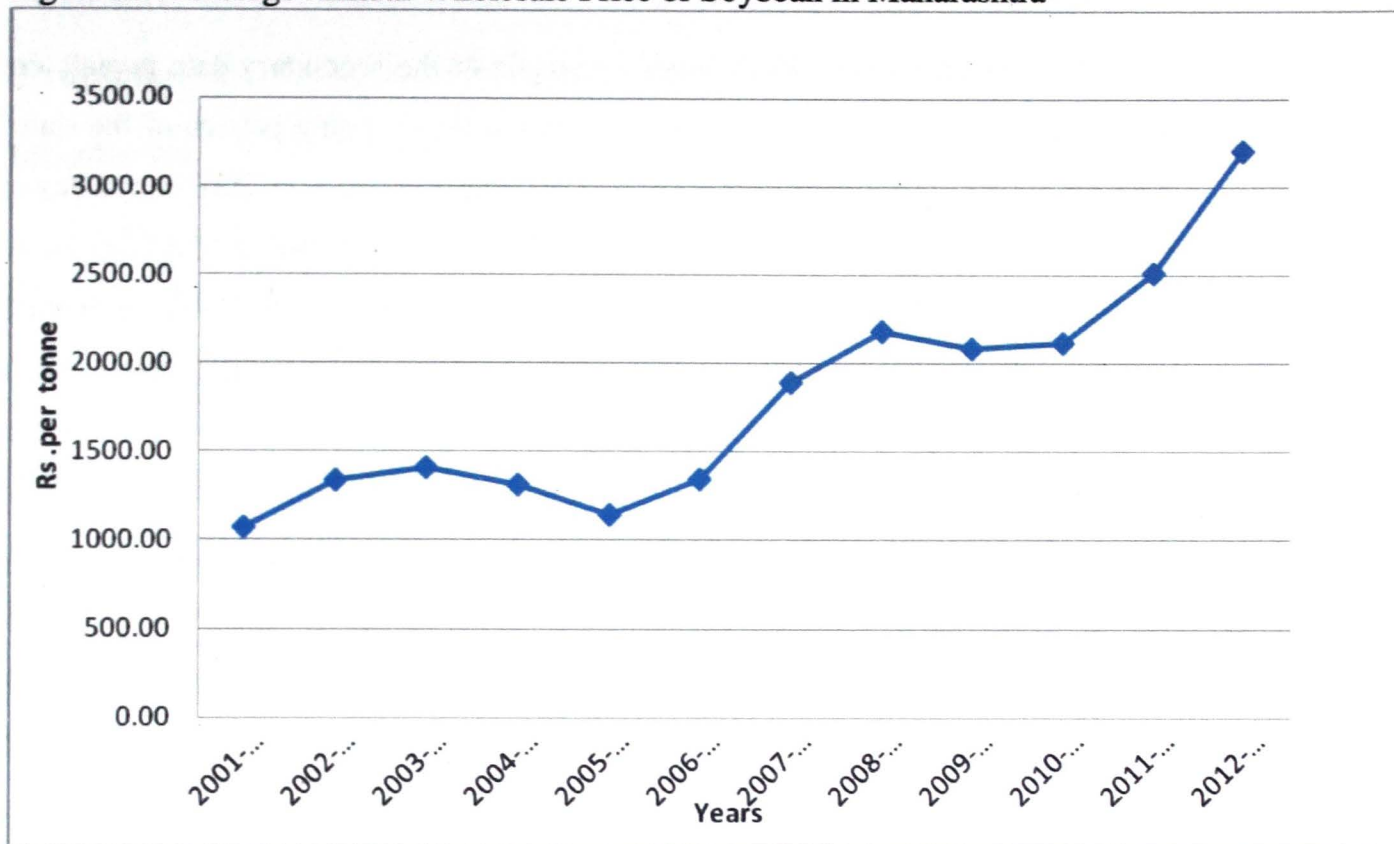
Table 3.20 shows prices of solvent extracted soybean oil and of solvent extracted refined soybean oil available for Indore and Mumbai market respectively. It can be seen that the prices have been increasing gradually throughout the period. It is also noted from figures 3.5 and 3.6 that the pattern of increase in price of soybean and soybean oil is similar. Thus, change in the input price i.e. soybean - seems to be reflected in that of the final product-soybean oil. The available data on international prices of soybeans and soybean oil shows that international prices also are gradually increasing; with higher prices in 2007 and 2008 followed by a decline.

Table 3.20: Trends in Prices of Soybean and Soybean Oil

	Average annual (July to June) wholesale price	S.E. Soybean Oil (Incl.S.T and Octroi (Rs./ M.T.)	S.E. Refined Oil (Excl. S.T.) (Rs. per tonne)
2001	1071.04	25052	26872
2002	1335.92	33041	34825
2003	1411.27	39475	40602
2004	1312.90	41154	42726
2005	1147.02	34224	35726
2006	1345.62	36801	39965
2007	1893.60	43493	47334
2008	2184.01	52407	57469
2009	2087.56	41673	45264
2010	2119.87	43341	46968
2011	2509.17	57853	62534
2012	3495.87	66786	70607
CV (%)	38.65	32	31

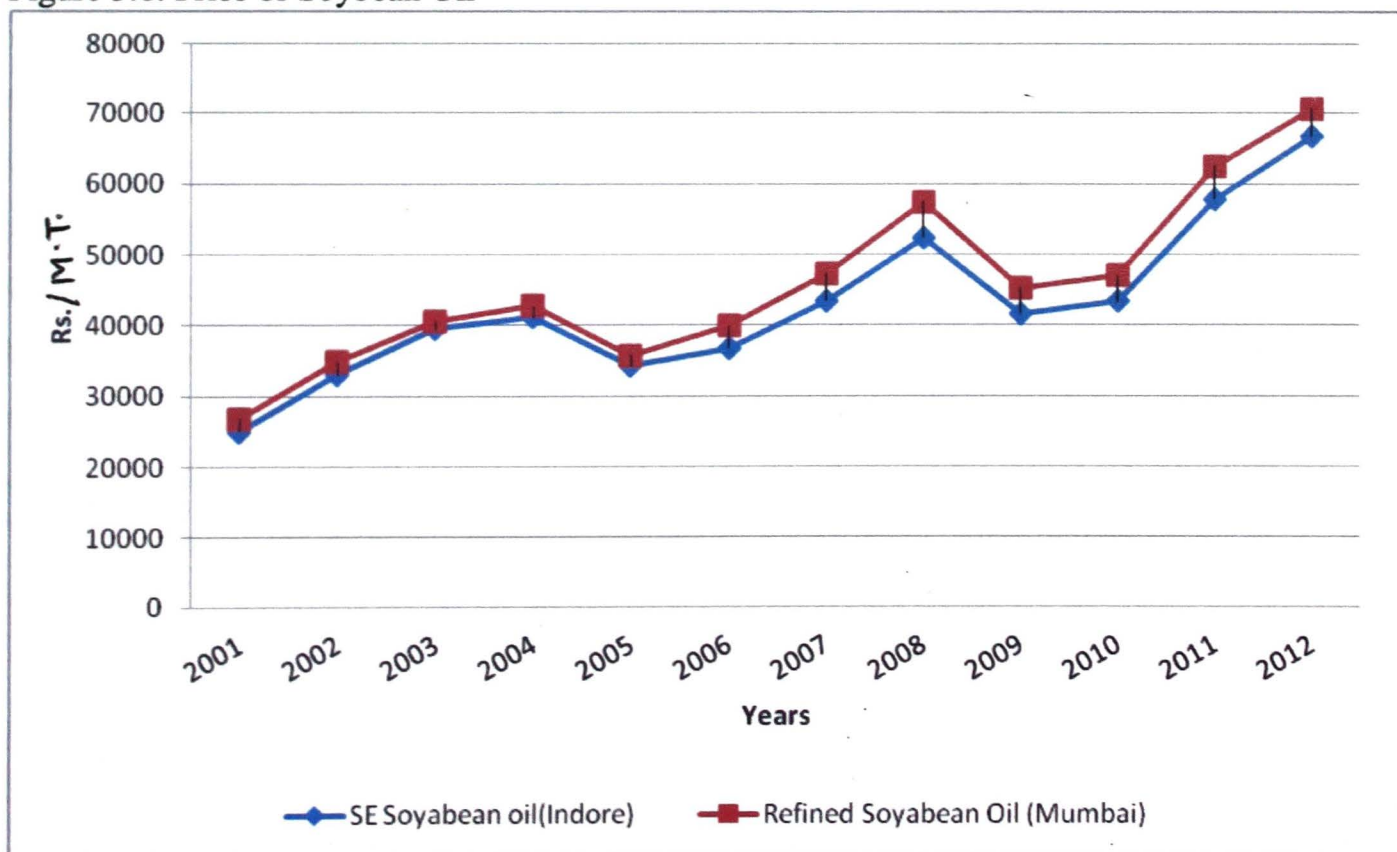
Source: www.agmarknet.nic.in, seaofindia.com

Figure 3.5: Average Annual Wholesale Price of Soybean in Maharashtra



Source: agmarknet.nic.in

Figure 3.6: Price of Soybean Oil



Source: Seaofindia.com

Concluding Remarks

The district wise and state level analysis of the secondary data reveals dominant position the soybean crop has come to occupy in the cropping pattern of the state. In TE 1993-94, only 1.78 percent of the GCA was under this crop, in 2009-10, it has come to occupy almost 13 percent of the GCA. The area and production of the crop have grown by 20 percent and 14 percent respectively during 1984-85 and 2009-10. 78 percent of the acreage under total oilseeds is contributed by soybean. Studies have noted shift of area under kharif crops such as jowar, paddy, ground nut as well as cotton and sugarcane over the years towards this crop. Districts belonging to the divisions of Nagpur and Amravati are the major districts growing soybean. The growth rates of area under and production of soybean indicate positive and significant growth in the post 2000 period in almost all the districts growing soybean. From the demand side, the increasing prices of soybean and soybean oil have provided incentive to the farmers to cultivate soybean. This highlights the relative profitability of the soybean crop in Maharashtra.

However, the analysis also reveals the major constraint facing the soybean cultivation- Firstly; it is observed that the growth rates of area and production – district wise as well as at the state level have slowed down in the post 2000 period. Secondly, the growth rate of productivity is negative / very low in most of the districts in the post 2000 period. Only three districts have registered positive and higher growth rate than that at the all India level. The major factor that explains this is the lower extent of area under irrigation in case of soybean. The available data shows that only 10 percent of the total oilseed area (which is mainly under soybean) is irrigated. In view of increasing demand for edible oil and increasing reliance on import to satisfy the domestic demand, productivity enhancement through provision of assured irrigation would help in maintaining and increase the current level of soybean production.

Problems and Prospects of Oilseeds Production: An Empirical Analysis

Introduction

This chapter analyses primary data collected from the sample households. As is discussed in chapter 2, two districts were selected for the field work - district Kolhapur and district Amravati. Whereas Amravati is the district with highest area under and production of soybean, Kolhapur is the district with highest yield of soybean in the state. The major features of these district are summarized in table 4.1

Located in the southern part of western Maharashtra, Kolhapur is often called as 'Punjab' of Maharashtra agriculture. It contributes around 4 percent to the state population. The share of urban population in this district is around 30 percent. The density of population which is 504 persons per sq.km. is higher than the state average of 365 persons per sq.km. It contributes around 3.4 percent to net state domestic product (NSDP) and ranks 7th in the state as far as the per capita income is concerned. The cropping pattern of Kolhapur is dominated by cereals such as wheat and rice, oilseeds (mainly soybean and groundnut) and sugarcane. It is observed that 26 percent of the GCA is irrigated (as per 2001 figures). The irrigation intensity is seen to be higher than the state irrigation intensity of around 18 percent. Around 4 percent of the total registered working factories in the state are located in the district. All the indicators of development show that Kolhapur is one of the developed districts of the state.

District Amravati is located in Vidarbha i.e.in the eastern part of Maharashtra. It contributes around 3 percent to the state population. The share of population in urban areas is 34 percent. The density of population however is half that of Kolhapur.It ranks 20th as far as per capita income is concerned and contributes 1.82 percent to the state income. Though the GCA of Amravati is higher than that of Kolhapur, the percentage of gross irrigated area to the GCA is only 17.7 percent (2007-08) as against 26 percent of Kolhapur. Kolhapur is also a better industrialized state with more number of registered working factories (1772) than that of Amravati (441).The cropping pattern of this district

is dominated by jowar, wheat, paddy, tur, moong among food grains and cotton and oilseeds among cash crops. Soybean is one one of the major crops of this district.

Table 4 .1: Indicators of Development of the Sample Districts

		Kolhapur	Amravati	Maharashtra
1	Population (000)(20011)*	3874	2888	1,12,373
2	Share of population in the state (%)	3.44	2.57	-
3	Density (per sq.Km.)(2011)	504	237	365
4	Share of urban population (%)	30	34.5	45.2
5	NDDP/NSDP (2004-05 prices) 2009-10 (Rs Cr)	23642	11485	661469
6	Share in NSDP (%)	3.45	1.82	-
7	Per capita income (Rs) (2004-05 prices)(2009-10)	55512	53548	57458
8	GCA(000ha) (2000-01)	581	712 (2007-08)	22454 (2008-09)
9	Gross irrigated area as percentage of GCA 2000-01	26	17.7 (2007- 08)	17.68(08-09)
10	No. of registered working factories (as on December 31, 2009)	1539	705	34060

Note:* second estimate

Source: Economic Survey of Maharashtra various years, District Socio-Economic Abstract, Kolhapur, Amravati, GOM, various years.

4.1 Main Features of the Sample Talukas and Villages

We study the main features of the sample talukas and sample villages in this section. Table 4.2a shows the main characteristics of the talukas chosen in district Kolhapur. It is seen that population wise, Hatkanangle is bigger than Gadhinglaj. The latter has more area under crops. However, the percentage of irrigated area is more in Hatkanangle taluka. In both the talukas, paddy, soybean ground nut, moong are the main kharif crops and jowar, wheat, gram and sugarcane are the rabi crops.

In case of Amravati, taluka Amravati and taluka Dawargaon were the two talukas selected. Population wise, Amravati is a bigger taluka; however, the GCA is more in case of the other taluka (table 4.2b). It is seen that the percentage of area irrigated is very low in case of sample talukas of this district as compared to those in district Kolhapur. Soybean and cotton are the main kharif crops and jowar and gram are the main rabi crops.

Table 4.2a : Kolhapur: Sample Talukas and Villages

	Sample District Kolhapur					
	Taluka Hatkanagle	Village Rukadi	Village Male	Taluka Gadhinglaj	Village Kadgaon	Village Gijavne
Population	3,55,003	16,054	1422	25,357	5810	5128
GCA (ha)	67480 (2001-02)	1280 (latest)	165 (latest)	71579	1120	563
Area under irrigation (ha)	18174.9 (26.9%)	661.94 (51.71%)	110 (66.66%)	9888 (13.8%)	150 (13.39%)	219 (38.9%)
Main Crops	<i>Kharif:</i> Paddy, soybean, groundnut, Jowar, moong, udid, <i>Rabi:</i> Jowar, wheat, gram Cash crop: sugarcane	<i>Kharif:</i> Paddy, Soybean, Jowar <i>Rabi:</i> wheat, gram, Sugarcane,	<i>Kharif:</i> Groundnut Soybean, <i>Rabi:</i> Jowar, wheat, gram, sugarcane, vegetables	<i>Kharif:</i> Paddy, soybean, udid, moong <i>Rabi:</i> Jowar, gram, wheat, sugarcane, chilly	<i>Kharif:</i> Paddy, soybean, <i>Rabi:</i> Wheat, gram, Jowar Sugarcane, banana	<i>Kharif:</i> Paddy, soybean, <i>Rabi:</i> Gram, wheat, Jowar, Sugarcane
Main Fruits	Mango, Sapota, guava, custard apple, banana.	Chikku banana	Mango, coconut	Cashew nut, mango coconut, chikku	banana	banana

Source: Gramsevakhs of the respective villages and District Socio-economic Abstract, Kolhapur (GoM)

Table 4.2b: Amravati: Sample Talukas and Villages

	Sample District Amravati					
	Taluka Amravati	Village Dawargaon	Village Nandura budruk	Taluka Nandgaon Khandeshwar	Village Jamgaon	Village Mangrul Chavla
Population	5,49,510	2500	1957	1,24,604	1405	4200
GCA(ha)	69941	938.35	690.47	68746	498.69	930.00
Area under irrigation (ha)	4161 (5.9)	40 (4.26)	6 (0.87)	2748 (3.4)	35 (7)	115 (12.37)
Main Crops	<i>Kharif</i> Soybean, cotton, tur, moong, jowar, <i>Rabi</i> wheat, gram	<i>Kharif</i> Soybean, cotton, tur, moong, <i>Udid,</i> <i>Rabi</i> wheat, gram	<i>Kharif</i> Soybean, cotton, tur, moong,	<i>Kharif</i> Soybean, cotton, tur, moong, jowar, <i>Rabi</i> wheat, gram	<i>Kharif</i> Soybean, cotton, tur, moong, jowar	<i>Kharif</i> Soybean, cotton, tur, moong, jowar, <i>Rabi</i> wheat, gram
Main Fruits	Orange mango	Orange lemon		Orange mango	Orange Lemon Mosambi	Orange Lemon

Source: Gramsevakhs of the respective villages and District Socio-economic Abstract, Amravati (GoM)

4.2 Main Features of Sample Households: Land Ownership Pattern and Cropping Pattern

Table 4.3 shows socio-economic features of the sample households. The average age of the respondents in various land holding categories (except the medium size category) of farmers is 50 years. Most of the respondents have undergone school education for on an average 8 years. This is higher for the small category and highest for the medium and large categories. In most of the cases, it is observed that the respondents are the heads of the respective households. The average size of the family is five; it is higher for the small and medium category farmers.

Table 4.3: Socio-economic Status of Sample Households

Indicators	<i>Marginal (0>1 ha)</i>	<i>Small (1<2 ha)</i>	<i>Medium (2<10 ha)</i>	<i>Large (10< ha)</i>	<i>All Farms</i>
Age(years)	50.23	50.19	47.61	50.00	50.23
Main Occupation (%)					
Crop farming	82.73	98.57	94.20	100.00	90.40
Service	1.82	0.00	2.90	0.00	1.60
Farm Labour	1.81	0.00	1.45	0.00	1.20
Others	13.64	1.43	1.45	0.00	6.80
Education (years of schooling) Average	8	10	11	11	8
Average Family Size (no)	5	7	6	5	5
Male	2	2	2	3	2
Female	2	2	2	2	2
Social Groups (%)					
General	9.0	2.7	4.8	0	6.0
SC	2.7	1.4	0	0	2.0
ST	31.5	37.8	44.4	0	36.4
OBC	42.3	51.4	38.1	100	44.0
Minority	14.4	6.8	12.7	0	11.6
Head of household (%)					
Male	96.4	100.0	96.8	100.0	97.6
Female	3.6	0	3.2	0	2.4

The caste wise composition of the households shows that overall, 44 percent of the households belong to the OBC category. These are followed by ST households which form 36 percent of the total sample. Similar pattern is noticed for the marginal and small categories. In the medium category, STs are dominating. In the large category, the only farmer belongs to the OBC category. For majority of the households in the small,

medium and large category, farming is the main occupation. In the marginal category, for around 83 percent of the farmers, farming is the main occupation. Around 14 percent seem to be engaged in non farm activities. In these cases, thus, income from smaller size of farm is needed to be supplemented by other sources of income. Overall, the proportion of respondents engaged in service is only 1.6 percent. Proportion of respondents working as farm labourers is also very low.

The land ownership pattern shows the average size of landholding in various land holding categories (table 4.4). It is seen that in all the categories, more than 50 percent of the land is unirrigated. In case of marginal, small and medium category households, total operational holding size is greater than area under cultivation as the households have leased in land in these categories. It is seen that no household has leased out land.

Table 4.4: Land Ownership Pattern on Sample Households (Average, In ha.)

Indicators	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
1. Total owned land	0.82	1.60	3.67	20.00	1.90
Irrigated	0.28	0.79	1.67	10.00	0.85
Un-irrigated	0.53	0.82	2.00	10.00	1.05
2. Area under cultivation	0.78	1.53	3.51	18.00	1.81
Irrigated	0.26	0.75	1.61	10.00	0.81
Un-irrigated	0.51	0.78	1.90	8.00	1.00
3. Leased-in land	0.27	0.72	2.60	0.00	1.72
Irrigated	0.27	0.48	0.97	0.00	0.72
Un-irrigated	0.00	0.24	1.63	0.00	1.00
4. Leased-out land	0.00	0.00	0.00	0.00	0.00
Irrigated	0.00	0.00	0.00	0.00	0.00
Un-irrigated	0.00	0.00	0.00	0.00	0.00
5. Total Operational holding (2+3-4)	1.05	2.25	6.11	18.00	3.53
Irrigated	0.53	1.23	2.58	10.00	1.53
Un-irrigated	0.51	1.02	3.53	8.00	2.00

Table 4.5 shows the details of the terms of lease. In all, 10 percent of the households have leased in land. This constitutes 8.7 percent of the total land owned. The percentage of land leased in as well as the percentage of households leasing in land is increasing with the size class of landholding. All the farmers in the marginal category and 60 percent and 57 percent in small and medium categories respectively have entered into share cropping agreement. It is also seen that majority of such tenant households are sharing 50 percent of the produce with the landowner. In case of fixed money contracts,

75 percent of the households are paying rent upto Rs.25000 and the rest between Rs.25000-Rs.50000. This pattern is observed for all the categories.

Table 4.5: Terms of Lease

Farm Size	Incidence of lease (%)		Terms of Leasing (%)		Terms of Lease (Rent/amount) (In Rs.)			
	% area leased-in (with Total Owned Land)	% HHs leasing in (with total HH)	Share Cropping	For fixed money	Share Cropping		For fixed money	
					1 / 4	50-50	0-25000	25000-50000
<i>Marginal</i>	1.50	5.45 (110)	5.45 (100.00)	0 (0)	0.91 (16.70)	4.54 (83.30)	0 (0)	0 (0)
<i>Small</i>	3.21	7.14 (70)	4.28 (60.00)	2.86 (40.00)	1.43 (33.33)	2.86 (66.67)	2.86 (100)	0 (0)
<i>Medium</i>	14.38	20.29 (69)	11.59 (57.12)	8.7 (42.88)	5.8 (50.0)	5.8 (50.0)	5.8 (66.67)	2.9 (33.33)
<i>Large</i>	0.00	0.00 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
<i>All farms</i>	8.70	10 (250)	21.33 (64.9)	11.56 (35.1)	8.14 (38.13)	13.21 (61.87)	8.66 (74.91)	2.9 (25.09)

Table 4.6 shows the share of area under irrigation. In all, 44 percent of the total cropped area is irrigated. It is low i.e. 33 percent for the marginal farmers and is higher for the higher size categories. In majority of the cases, in all size groups, the source of irrigation is personal i.e well.

Table 4.6: Sources of Irrigation

Indicators	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Area under irrigation (% to total cropped area)	33.90	49.22	45.75	55.56	44.73
Sources of irrigation (%)					
Boar well	8.00	2.17	4.55	0.00	4.96
River Lift Irrigation	12.00	13.04	0.00	0.00	8.51
Well	78.00	67.39	68.18	100.00	71.63
Well and River	0.00	17.39	27.27	0.00	14.18
Well-Boar	2.00	0.00	0.00	0.00	0.71

Average area under various crops considering the sample farmers is shown in table 4.7. For marginal, small and medium categories, most of the total cropped area is under kharif crops which in turn is contributed by soybean. Apart from soybean, cotton, pulses and sugarcane are the major crops grown by the sample farmers. In case of the large category, sugarcane is the most important crop with 44 percent of the area under it. Soybean contributes 22 percent to the GCA.

Table 4.7: Area under Various Crops

Season/Crop	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Kharif					
Rice	2.7 (2.81)	4.75 (3.85)	6 (1.96)	1 (5.56)	14.45 (2.66)
Maize	0 (0)	0.1 (0.08)	2.1 (0.69)	0 (0)	2.2 (0.41)
Coarse Cereals	0.5 (0.52)	1.6 (1.3)	2.4 (0.79)	0 (0)	4.5 (0.83)
Pulses	6.31 (6.57)	5.36 (4.35)	19.24 (6.3)	0 (0)	30.91 (5.69)
Groundnut	3.26 (3.39)	4.58 (3.71)	7.1 (2.32)	2 (11.11)	16.94 (3.12)
Sesamum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sunflower	1 (1.04)	0 (0)	0 (0)	0 (0)	1 (0.18)
Soybean	57.94 (60.32)	60.02 (48.68)	160.38 (52.48)	4 (22.22)	282.34 (52)
Other Oilseeds	0 (0)	0.2 (0.16)	2.4 (0.79)	0 (0)	2.6 (0.48)
Cotton	5.27 (5.49)	10.29 (8.35)	22.18 (7.26)	0 (0)	37.74 (6.95)
Vegetables	0.8 (0.83)	0.3 (0.24)	0.2 (0.07)	0 (0)	1.3 (0.24)
Other Crops	0.95 (0.99)	2.95 (2.39)	3.2 (1.05)	0 (0)	7.1 (1.31)
Rabi					
Wheat	4.13 (4.3)	4.4 (3.57)	14.4 (4.71)	0 (0)	22.93 (4.22)
Rice	0 (0)	0.2 (0.16)	0.1 (0.03)	0 (0)	0.3 (0.06)
Coarse Cereals	1.2 (1.25)	6.05 (4.91)	3.3 (1.08)	0 (0)	10.55 (1.94)
Pulses	2.3 (2.39)	3.2 (2.6)	9.5 (3.11)	1 (5.56)	16 (2.95)
Ground nut	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Safflower.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sunflower	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Other Oilseed	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Vegetable	0.9 (0.94)	0.8 (0.65)	0 (0)	0 (0)	1.7 (0.31)
Other Crops	0.4 (0.42)	0.7 (0.57)	2 (0.65)	2 (11.11)	5.1 (0.94)
Perennial					
Sugarcane	8.04 (8.37)	16.6 (13.46)	40.36 (13.21)	8 (44.44)	73 (13.44)
Fruit	0.35 (0.36)	1.2 (0.97)	10.76 (3.52)	0 (0)	12.31 (2.27)
Total	96.05 (100)	123.3 (100)	305.62 (100)	18 (100)	542.97 (100)

Note: Bracketed values indicate percentage to total

The next table, table 4.8 shows average area under each crop in various land size categories. The average land size per crop is varying as per the size of landholding category and is very low being an average of all the sample farmers. It is seen that most

of the kharif crops are rain fed and percentage of area under irrigation is lower than that of the unirrigated area. Cropping pattern of various categories appears to be quite diversified probably to tide over various risks.

Table 4.8: Average Area under Each Crop (ha)

Season/Crop	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Kharif					
Rice	0.025 (100)	0.067 (100)	0.087 (100)	1 (100)	0.058 (100)
<i>Irrigated</i>	0.006 (24.07)	0.018 (27.37)	0.052 (60)	0 (0)	0.022 (38.41)
<i>Unirrigated</i>	0.019 (75.93)	0.049 (72.63)	0.035 (40)	1 (100)	0.036 (61.59)
Maize	0 (0)	0.001 (100)	0.03 (100)	0 (0)	0.009 (100)
<i>Irrigated</i>	0 (0)	(100)	0.006 (19.05)	0 (0)	0.002 (22.73)
<i>Unirrigated</i>	0 (0)	0 (0)	0.025 (80.95)	0 (0)	0.007 (77.27)
Coarse Cereals	0.005 (100)	0.022 (100)	0.034 (100)	0 (0)	0.018 (100)
<i>Irrigated</i>	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
<i>Unirrigated</i>	0.005 (100)	0.023 (100)	0.034 (100)	0 (0)	0.018 (100)
Pulses	0.057 (100)	0.077 (100)	0.279 (100)	0 (0)	0.124 (100)
<i>Irrigated</i>	0.007 (12.84)	0.011 (14.93)	0.02 (7.28)	0 (0)	0.012 (9.74)
<i>Unirrigated</i>	0.05 (87.16)	0.065 (85.07)	0.259 (92.72)	0 (0)	0.112 (90.26)
Oilseeds					
Groundnut	0.029 (100)	0.065 (100)	0.103 (100)	2 (100)	0.068 (100)
<i>Irrigated</i>	0.001 (6.13)	0.041 (63.32)	0.033 (32.39)	2 (100)	0.03 (43.68)
<i>Unirrigated</i>	0.027 (93.87)	0.024 (36.68)	0.07 (67.61)	0 (0)	0.038 (56.32)
Sunflower	0.009 (100)	0 (0)	0 (0)	0 (0)	0.004 (100)
<i>Irrigated</i>	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
<i>Unirrigated</i>	0.009 (100)	0 (0)	0 (0)	0 (0)	0.004 (100)
Soybean	0.528 (100)	0.84 (100)	2.324 (100)	4 (100)	1.125 (100)
<i>Irrigated</i>	0.127 (24.2)	0.296 (35.19)	0.592 (25.49)	0 (0)	0.303 (26.89)
<i>Un-irrigated</i>	0.4 (75.8)	0.545 (64.81)	1.732 (74.51)	4 (100)	0.823 (73.11)
Others oilseeds	0 (0)	0.003 (100)	0.035 (100)	0 (0)	0.01 (100)
<i>Irrigated</i>	0 (0)	0 (0)	0.035 (100)	0 (0)	0.01 (92.31)
<i>Unirrigated</i>	0 (0)	0.003 (100)	0 (0)	0 (0)	0.001 (7.69)
Cotton	0.047 (100)	0.147 (100)	0.321 (100)	0 (0)	0.151 (100)
<i>Irrigated</i>	0.027 (57.31)	0.038 (26.14)	0.14 (43.64)	0 (0)	0.062 (40.78)
<i>Unirrigated</i>	0.02 (42.69)	0.109 (73.86)	0.181 (56.36)	0 (0)	0.089 (59.22)
Vegetables	0.007 (100)	0.004 (100)	0.003 (100)	0 (0)	0.005 (100)
<i>Irrigated</i>	0.004 (62.5)	0.004 (100)	0 (0)	0 (0)	0.003 (61.54)
<i>Unirrigated</i>	0.002 (37.5)	0 (0)	0.003 (100)	0 (0)	0.002 (38.46)
Other crops	0.008 (100)	0.042 (100)	0.046 (100)	0 (0)	0.028 (100)
<i>Irrigated</i>	0.001 (15.79)	0.003 (6.78)	0.023 (50)	0 (0)	0.008 (27.46)
<i>Unirrigated</i>	0.007 (84.21)	0.039 (93.22)	0.023 (50)	0 (0)	0.021 (72.54)

Season/Crop	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Rabi					
Wheat	0.038 (100)	0.063 (100)	0.209 (100)	0 (0)	0.092 (100)
<i>Irrigated</i>	0.038 (100)	0.063 (100)	0.209 (100)	0 (0)	0.092 (100)
<i>Un-irrigated</i>	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rice	0 (0)	0.003 (100)	0.001 (100)	0 (0)	0.001 (100)
<i>Irrigated</i>	0 (0)	0.003 (100)	0.001 (100)	0 (0)	0.001 (100)
<i>Un-irrigated</i>	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Coarse Cereals	0.011 (100)	0.086 (100)	0.048 (100)	0 (0)	0.042 (100)
<i>Irrigated</i>	0.003 (29.17)	0.055 (63.64)	0.045 (93.94)	0 (0)	0.029 (69.19)
<i>Un-irrigated</i>	0.008 (70.83)	0.031 (36.36)	0.003 (6.06)	0 (0)	0.013 (30.81)
Pulses	0.021 (100)	0.046 (100)	0.138 (100)	1 (100)	0.064 (100)
<i>Irrigated</i>	0.01 (47.83)	0.043 (93.75)	0.081 (58.95)	0 (0)	0.039 (60.63)
<i>Un-irrigated</i>	0.011 (52.17)	0.003 (6.25)	0.057 (41.05)	1 (100)	0.025 (39.38)
Oilseeds					
Vegetables	0.008 (100)	0.011 (100)	0 (0)	0 (0)	0.007 (100)
<i>Irrigated</i>	0.008 (100)	0.011 (100)	0 (0)	0 (0)	0.007 (100)
<i>Un-irrigated</i>	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Other rabi crops	0.004 (100)	0 (0)	0.023 (100)	2 (100)	0.016 (100)
<i>Irrigated</i>	0.002 (50)	0 (0)	0.009 (37.5)	0 (0)	0.003 (20)
<i>Un-irrigated</i>	0.002 (50)	0 (0)	0.014 (62.5)	2 (100)	0.013 (80)
Summer crops					
Sugarcane	0.073 (100)	0.237 (100)	0.585 (100)	8 (100)	0.292 (100)
<i>Irrigated</i>	0.073 (100)	0.237 (100)	0.565 (96.53)	8 (100)	0.286 (98.08)
<i>Un-irrigated</i>	0 (0)	0 (0)	0.02 (3.47)	0 (0)	0.006 (1.92)
Fruits	0.003 (100)	0.017 (100)	0.156 (100)	0 (0)	0.049 (100)
<i>Irrigated</i>	0.003 (100)	0.017 (100)	0.156 (100)	0 (0)	0.049 (100)
<i>Un-irrigated</i>	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Others	0 (0)	0.009 (100)	0.019 (100)	0 (0)	0.008 (100)
<i>Irrigated</i>	0 (0)	0.006 (69.23)	0.019 (100)	0 (0)	0.007 (89.74)
<i>Un-irrigated</i>	0 (0)	0.003 (30.77)	0 (0)	0 (0)	0.001 (10.26)

Note: Bracketed values indicate percentage to total

Average yield of the crops grown by the sample farmers is reported in table 4.9. The sample farmers have been mainly cultivating food grains, oilseeds, cotton, sugarcane and vegetables. The only farmer under 'large' category is cultivator mainly of soybean and sugarcane. The yield of all the crops which are under irrigation is higher than the yield of the same crop on the unirrigated land. In case of kharif crops like rice, coarse cereals and pulses, it is observed that the yields are higher on the smaller size farms probably indicating inverse farm size efficiency relationship. However, it is observed that

for commercial crops like soybean and sugarcane, the yield is increasing with the size class possibly indicating usage of quality inputs that would step up yield of the crop.

Table 4.9: Average Yield of Major Crops on Sample Households (Qtl/Per ha)

Season/Crop	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Kharif					
Rice	38.33	35.58	29.50	15.00	32.15
Irrigated	41.54	43.85	34.17	-	37.30
Unirrigated	37.32	32.46	22.50	15.00	28.93
Maize	-	20.00	12.38	-	12.73
Irrigated	-	20.00	12.50	-	14.00
Unirrigated	-	-	12.35	-	12.35
Coarse Cereals	8.00	11.88	6.25	-	8.44
Irrigated	-	-	-	-	-
Unirrigated	8.00	11.88	6.25	-	8.44
Pulses	13.31	13.43	11.85	-	12.42
Irrigated	24.69	11.25	12.86	-	15.61
Unirrigated	11.64	13.82	11.77	-	12.08
Oilseeds					
Groundnut	14.88	17.58	12.25	5.00	13.34
Irrigated	30.00	18.28	15.65	5.00	14.19
Unirrigated	13.89	16.37	10.63	-	12.68
Sunflower	15.00	-	-	-	16.00
Irrigated	-	-	-	-	-
Unirrigated	15.00	-	-	-	15.00
Soybean	12.67	15.19	13.04	25.00	13.58
Irrigated	16.47	18.53	18.40	-	18.07
Un-irrigated	11.45	13.38	11.21	25.00	11.93
Other Oilseeds	-	70.00	25.00	-	28.46
Irrigated	-	-	25.00	-	25.00
Un-irrigated	-	70.00	-	-	70.00
Cotton	14.14	9.43	11.64	-	11.38
Irrigated	14.24	10.04	14.46	-	13.65
Un-irrigated	14.00	9.21	9.45	-	9.83
Vegetables	122.75	167.50	10.00	-	115.73
Irrigated	190.00	167.50	-	-	181.56
Un-irrigated	10.67	-	10.00	-	10.40
Other crops (including fodder)	473.16	83.47	79.06	-	133.63
Irrigated	300.00	500.00	73.75	-	134.87
Un-irrigated	505.63	53.18	84.38	-	133.16
Rabi					
Wheat	16.22	24.05	24.17	-	22.71
Irrigated	16.22	24.05	24.17	-	22.71
Un-irrigated	-	-	-	-	-

Season/Crop	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Rice	-	20.00	20.00	-	20.00
<i>Irrigated</i>	-	20.00	20.00	-	20.00
<i>Un-irrigated</i>	-	-	-	-	-
Coarse Cereals	10.83	16.12	20.15	-	16.78
<i>Irrigated</i>	14.29	20.00	20.65	-	20.00
<i>Un-irrigated</i>	9.41	9.32	12.50	-	9.54
Pulses	6.74	11.56	11.26	6.00	10.34
<i>Irrigated</i>	5.00	11.33	12.32	-	11.19
<i>Un-irrigated</i>	8.33	15.00	9.74	6.00	9.05
Oilseeds					
Vegetables	435.56	287.50	-	-	365.88
<i>Irrigated</i>	435.56	287.50	-	-	365.88
<i>Un-irrigated</i>	-	-	-	-	-
Other Crops	4.50	-	10.63	5.00	7.20
<i>Irrigated</i>	4.00	-	15.00	-	12.25
<i>Un-irrigated</i>	5.00	-	8.00	5.00	5.94
Summer crops					
Sugarcane	3260.57	1756.63	1747.77	5625	2341.30
<i>Irrigated</i>	3260.57	1756.63	1796.71	5625	2379.53
<i>Un-irrigated</i>	-	-	385.71	-	385.71
Fruits	28.57	233.33	345.72	-	325.75
<i>Irrigated</i>	28.57	233.33	345.72	-	325.75
<i>Un-irrigated</i>	-	-	-	-	-
Others	-	122.22	75.38	-	87.43
<i>Irrigated</i>	-	122.22	75.38	-	87.43
<i>Un-irrigated</i>	-	-	-	-	-
Summer crops					
Sugarcane	3260.57	1756.63	1747.77	5625	2341.30
<i>Irrigated</i>	3260.57	1756.63	1796.71	5625	2379.53
<i>Un-irrigated</i>	0.00	0.00	385.71	0.00	385.71
Fruits	28.57	233.33	345.72	0.00	325.75
<i>Irrigated</i>	28.57	233.33	345.72	0.00	325.75
<i>Un-irrigated</i>	0.00	0.00	0.00	0.00	0.00
Others	0.00	122.22	75.38	0.00	87.43
<i>Irrigated</i>	0.00	122.22	75.38	0.00	87.43
<i>Un-irrigated</i>	0.00	0.00	0.00	0.00	0.00

4.3 Production, Retention and Marketed Surplus Pattern of Oilseeds

Table 4.10 shows the production and retention of soybean and also the price received by the farmers.

Table 4.10: Total Average Oilseeds production, Retention and Sale Pattern
(In Quintals)

Category	Soybean			
	Production	Retention	Sold	Price (Rs/q)
<i>Marginal</i>	6.94	0.08(1.53 %)	6.83	2108.09
<i>Small</i>	12.76	0.15(1.8 %)	12.66	2064.30
<i>Medium</i>	30.32	0.28(0.92 %)	29.30	2115.22
<i>Large</i>	100.00	0.00(0.00)	100.00	2000.00
<i>All</i>	15.40	0.15(0.97%)	15.04	2097

Note: Figures in the bracket indicate percentage of retention to soybean production

The average production of soybean is increasing with size class of holding. The average production of large holdings is around 14 times that of the marginal holdings. Soybean being a cash crop, the households have retained only a marginal quantity- 1-2 percent of the total produce possibly to be used as seed for the next year. The price received by the farmers ranges between Rs.2000 and Rs.2108 and does not exhibit much variation. It is above the MSP declared for the year 2011-12 which was Rs.1690 per quintal.

4.4 Comparative Economics/Profitability of Soybean vis-à-vis Competing Crops

The data on area and production of soybean and the cropping pattern at the state level indicates relative profitability of soybean in the state. Data from sample households in soybean growing area was collected for finding out the extent of profitability of this crop. Table 4.11 presents cost and income of various categories of soybean sample farmers. It is seen that for most of the cost items, generally, cost per ha. has been increasing with the land size. Shares of various cost items were found out. It is seen that around 30 percent of the total per hectare expenditure is on human labour. The next important items of expenditure are fertilizers and manures and machine labour. The share of machine labour and bullock labour is higher in case of large category farmer than the other category farmers. In absolute terms, the large category farmer has incurred comparatively more expenditure on fertilizers and manure, hired labour, machine labour and bullock labour. The per hectare costs are higher for the large category farmer; similarly the yield is also very high- almost double that of the small and medium category farmers. As a result, the total value of output of the large farmer far exceeds the other category farmers. The net income per hectare for this category is around Rs.14,000 per

ha. as well as per quintal and is more than double that of the other category farmers. The net income per hectare is positive for all the land size categories.

Table 4.11: Profitability of Soybean (Rs/per ha.)

Cost items	Soybean				
	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Operational costs (Rs)					
Seed	2404.61 (11.02)	2632.70 (11.11)	2622.23 (11.91)	2625.00 (7.30)	2625.00 (11.61)
Fertiliser and manure	3734.55 (17.12)	4690.62 (19.79)	4068.62 (18.49)	5500.00 (15.30)	4101.52 (18.13)
Insecticides & pesticides	1475.69 (6.77)	836.13 (3.53)	872.14 (3.96)	1000.00 (2.78)	1128.13 (4.99)
Human labour	6675.28 (30.60)	7224.11 (30.48)	5991.93 (27.22)	10487.50 (29.18)	6655.60 (29.43)
Family	3454.72	3718.30	1788.95	0.00	3054.95
Hired	3220.56	3505.82	4202.98	10487.50	3600.65
Machine labour	5145.77 (23.59)	5693.41 (24.03)	5951.95 (27.04)	10875.00 (30.26)	5615.83 (24.82)
Bullock labour	2196.10 (10.07)	2475.28 (10.44)	2199.48 (9.99)	5450.00 (15.17)	2288.22 (10.12)
Irrigation charges	179.66 (0.82)	149.38 (0.63)	302.87 (1.38)	0.00 (0.00)	204.47 (0.90)
Total Operational Costs per ha.	21811.66	23701.64	22009.23	35937.50	22618.76
Cost of Production/q	1721.52	1560.35	1687.82	1437.50	1665.59
Yield (Quintals) per ha.	12.67	15.19	13.04	25	13.58
Price of the produce sold	2122.90	2052.77	2108.41	2000.00	2071.020
Total Value of Production	26897.17	31181.57	27493.64	50000.00	28124.45
Net income hectare	5085.51	7479.93	5484.41	14062.50	5505.69
Net returns per quintal	401.38	492.42	420.59	562.5	405.43
Minimum Support Price 2011-12(Rs./qtl)	1690				

Note: Values of interest on working capital and of by-product were not reported.

The MSP for soybean in the year 2011-12 was Rs 1690 which is lower than the average price received by the sample farmers. In fact the secondary data on annual average wholesale prices of soybean and on MSP of soybean shows that the former have always been higher than the latter indicating that at least the paid out costs are covered by the farmers. This can be seen from table 4.12.

Table 4.12: Average Annual Wholesale Price and MSP of Soybean

	Production (00 tonnes)	Average annual (July to June) wholesale price (Rs./qtl)	MSP(Rs./qtl)
2001-02	13855	1071.04	885
2002-03	15755	1335.92	885
2003-04	22192	1411.27	930
2004-05	18924	1312.90	1000
2005-06	25273	1147.02	1010
2006-07	28919	1345.62	1012
2007-08	39762	1893.60	1050
2008-09	18399	2184.01	1390
2009-10	21971	2087.56	1390
2010-11	43158	2119.87	1440
2011-12	NA	2509.17	1690
2012-13	NA	3495.87	-

Source: 1. Same as in table 4.1, 2.GoI, 2010.

The production of soybean is increasing rapidly; however due to the pressure from the demand side, the average annual price of soybean is also increasing at the rate of 8.3 percent per quintal as mentioned in chapter III. It is seen that the respective prices received by the sample farmers for the reference year 2011-12 (table 4.11) are lower than average annual wholesale price mentioned in table 4.12 as the latter is annual average of the monthly prices.

As per the CACP report (GoI,2010), the returns per hectare in case of soybean in 1990-91 were Rs.3612 and Rs.15624 in the year 2008-09. Returns thus registered percentage change of 332.5 percent during this period. In real terms, it was found that at 2004-05 prices, this translated into net returns of Rs.9154 in 1990-91 and Rs.12254 in 2008-09 thereby registering a percentage change of 33.86 percent. Thus, the available secondary data also indicates increasing profitability in soybean cultivation over the years.

For finding out the relative profitability of soybean cultivation, profitability of the competing crops was to be found out. The farmers were asked about the competing

crops for soybean. Following table shows frequency distribution of the competing crops as reported by the respondents. It is seen that according to 87 i.e. around 35 percent of the respondents, their soybean crop does not have any competing crop and that they would continue to grow this particular crop. The responses in the table show that cotton, groundnut and moong are the important competing crops. Hence an attempt was made to find out profitability of these crops for comparison with soybean.

Table 4.13: The Competing Crops of Soybean as Reported by the Sample Farmers

	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>Total</i>
Bhendi	0	0	1	0	1
cotton	28	18	14	0	60
Ground nut	26	21	16	1	64
Jawar	1	1	1	0	3
Moong	5	3	4	0	12
Rice	4	5	2	0	11
Sugarcane	5	2	0	0	7
Tur	2	0	1	0	3
Udid	0	1	1	0	2
No Competing Crop other than soybean	39	19	29	0	87
Total	110	70	69	1	250

It is observed that the net income per hectare of cotton is negative for all the classes (table 4.14). This is in spite of the higher than the state average yield (2.78 quintal) for the year 2011-12. Net income per hectare as well as per quintal was found out by deducting costs imputed to family labour from total operational charges. Still, the net income per hectare as well as per quintal is found to be negative. It is possible that for some of the farmers, who are not yet cultivating this crop, have overestimated the costs and hence income per hectare and per quintal is negative. However, it can be concluded that for the concerned farmers, soybean is more profitable than cotton.

In case of the other major competitive crop groundnut also, it is found that net income per hectare and per quintal is negative for all the categories except for the small size category (table 4.15). After deducting family labour charges from the operational costs, the net income per hectare and per quintal for all farms taken together is still negative.

Table 4.14: Profitability of Cotton

(In Rs)

Cost items	Cotton				
	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Operational costs					
Seed	3757.57	3736.84	4778.76	0.00	4091.06
Fertiliser & manure	4215.07	4938.09	3566.10	0.00	4239.75
Insecticides & pesticides	4015.42	3678.90	1909.41	0.00	3201.24
Human labour	9446.61	9365.62	8072.95	0.00	8961.73
Family	4672.92	4442.14	3206.64	0.00	4107.23
Hired	4773.69	4923.48	4866.31	0.00	4854.49
Machine labour	2230.18	2266.67	2191.48	0.00	2229.44
Bullock labour	1487.37	1659.66	1899.46	0.00	1682.16
Irrigation	142.86	83.33	285.71	0.00	170.63
Total Operational Costs per ha.	25295.08	25729.11	22703.87	0.00	24576.02
Total Operational Cost of per ha. without family labour charges	20622.16	21286.96	19497.23	0.00	20468.79
Cost of Production per quintal	4966.17	4857.94	5460.07	0.00	5067.94
Total Operational Cost of per ha. without family labour charges	4048.74	4019.22	4688.90	0.00	4220.97
Yield per ha.(qtl)	5.09	5.30	4.16	0.00	4.85
Price	3832.14	3730.56	3737.14	0.00	3766.61
Value Per ha .of the main-product	19518.92	19758.13	15539.65	0.00	18265.48
Net income per hectare	-5776.157	-5970.980	-7164.221	0.000	-6310.536
Net returns per quintal	-1134.03	-1127.39	-1722.93	0.00	-1328.12
Net income per ha without considering family input	-1103.24	-1528.84	-3957.58	0.00	-2203.30
Net Return per quintal without considering family input	-216.60	-288.66	-951.76	0.00	-454.35
MSP for H4 variety	3150				

Note: Values of interest on working capital and of by-product were not reported.

Table 4.15.: Profitability of Groundnut

(In Rs)

Cost items	Groundnut				
	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
<i>Operational costs</i>					
Seed	6155.59	5637.90	7329.38	6000.00	6280.72
Fertiliser & manure	4330.87	6590.20	7248.17	750.00	4729.81
Insecticides & pesticides	398.81	301.59	346.46	750.00	449.21
Human labour	13352.12	9891.75	11547.94	12875.00	11916.70
<i>Family</i>	6553.99	5186.19	4717.82	0.00	4114.50
<i>Hired</i>	6798.13	4705.56	6830.13	12875.00	7802.20
Machine labour	5198.54	3206.35	6133.57	6250.00	5197.11
Bullock labour	2389.75	2766.87	2461.26	1250.00	2216.97
Irrigation	44.23	57.14	68.75	0.00	42.53
Total Operational Costs per ha	31869.91	28451.79	35135.52	27875.00	30833.06
Total Operational Cost of per ha. without family labour charges	25315.93	23265.60	30417.71	27875.00	26718.56
Cost of Production/qtl	3128.67	3038.07	4218.33	0.00	3510.66
Cost of Production/qtl without considering family labour charges	2485.27	2484.29	3651.92	0.00	3042.19
Yield (Quintals) per ha.	10.19	9.37	8.33	7.25	8.78
Price of the produce sold	2842.31	3123.81	2868.75	2700.00	2883.72
Value of Per ha. of the main-product	28952.89	29254.72	23894.53	19575.00	25326.77
Value of by-product	0	0	0	0	0
Net income per hectare	-2917.02	802.93	-11240.99	-8300.00	-5506.28
Net Income per quintal	-286.36	85.74	-1349.58	-1144.83	-626.95
Net income per ha without considering family input	3636.97	5989.13	-6523.18	-8300.00	-1391.79
Net Return per quintal without considering family input	357.04	639.52	-783.17	-1144.83	-158.47
MSP	2700				

In the case of moong also, similar pattern is found (table 4.16). Though net returns (without considering family labour charges) are positive in case of small and medium categories, for all the farms taken together, it is negative. The exercise highlights profitability of the soybean crop.

Table 4.16: Profitability of Moong

(In Rs)

Cost items	Moong				
	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Operational costs					
Seed	560.00	550.00	906.93	0.00	504.23
Fertiliser & manure	2725.00	963.33	870.19	0.00	1139.63
Insecticides & pesticides	725.00	1111.11	187.50	0.00	505.90
Human labour	6320.00	5231.11	2243.96	0.00	3448.77
Family	3190.00	2297.78	1768.96	0.00	1814.18
Hired	3130.00	2933.33	475.00	0.00	1634.58
Machine labour	2175.00	3861.11	2706.10	0.00	2185.55
Bullock labour	2850.00	1333.33	150.00	0.00	1083.33
Irrigation	0.00	0.00	0.00	0.00	0.00
Total Operational Costs per ha.	15355.00	13050.00	7064.68	0.00	8867.42
Total Operational Cost of per ha. without family labour charges	12165.00	10752.22	5295.73	0.00	7053.24
Cost of Production/q	3232.63	3559.09	1879.86	0.00	2913.38
Cost of Production/q without considering family labour charges	2561.05	2932.42	1409.15	0.00	2317.33
Yield (Quintals) per ha.	4.75	3.67	3.76	0.00	3.04
Price	3120.00	2850.00	2750.00	0.00	2180.00
Value of Qnt. and Per ha. main-product	14820.00	10450.00	10334.77	0.00	6635.25
Value of by-product	0	0	0	0	0
Net income per hectare	-112.63	-709.09	870.14	0.00	-733.38
Net Income on Overall Cost for per quintal (2+3)	-535.000	-2600.000	3270.090	0.000	-2232.173
Net income per ha without considering family input	2655.00	-302.22	5039.05	0.00	-417.99
Net Return per quintal without considering family input	558.95	-82.42	1340.85	0.00	-137.33
MSP	3500				

Table 4.17 shows the C.V. of the acreage, yield, price received and the yield realized for soybean and its competing crops for various categories. As there is only one farmer in the large category, C.V. could not be found for this category. It is seen that variation is higher as far as net income is concerned in each crop group. This is probably due to cost as well as price considerations involved for arriving at net income figures.

Costs may vary from farm to farm. Similarly, yields also may vary. It ranges between 0.52 to 0.68 for various crops and is highest i.e. 0.68 for groundnut. The variation in price is found to be very low in case of all the crops indicating comparative prices received by the farmers.

Table 4.17: Coefficient of Variation of Acreage, Yield, Price and Net Income of Soybean and Competing Crops

Indicators	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Main Crop Oilseed	Soybean				
Acreage variability	1.41	0.60	0.69	-	1.11
Yield Risk	0.61	0.58	0.55	-	0.60
Price Risk	0.32	0.08	0.14	-	0.23
Net Income Risk	2.25	1.83	1.37	-	1.80
Main Competing Crop	Cotton				
Acreage variability	0.38	0.42	0.79	-	1.06
Yield Risk	0.61	0.43	0.35	-	0.52
Price Risk	0.09	0.08	0.11	-	0.09
Net Income Risk	2.20	1.32	2.52	-	2.06
Main Competing Crop	Groundnut				
Acreage variability	0.50	0.54	1.07	-	1.48
Yield Risk	0.76	0.66	0.50	-	0.68
Price Risk	0.22	0.32	0.33	-	0.28
Net Income Risk	1.32	1.49	1.79	-	1.49
Main Competing Crop	Moong				
Acreage variability	0.72	0.87	1.05	-	1.39
Yield Risk	0.29	0.33	1.11	-	0.59
Price Risk	0.21	0.26	0.18	-	0.20
Net Income Risk	1.05	0.52	1.32	-	1.02

4.5 Access to Improve Technology and Market for Soybean

Technology being one of the important drivers of yield, the responses of the respondents regarding their access to improved technology were analysed (table 4.19).

Table 4.19: Access to Improved Technology (%)

	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Use of HYV					
Yes	98.18	98.57	92.75	100.00	96.80
No	1.82	1.43	7.25	0.00	3.20
Area under HYV (% to total area under soybean)	97.16	99.33	93.63	100.00	95.72
Source of Seed					
Own	1.82	1.43	7.25	0.00	3.20
Market purchased	98.18	98.57	92.75	100.00	96.80
Use of recommended doses of fertilizers					
Yes	13.64	14.29	17.39	0.00	14.80
No	36.36	30.00	31.88	0.00	33.20
Don't know	50.00	55.71	50.72	100.00	52.00
Awareness about MSP					
Yes	4.55	4.29	1.45	0.00	3.60
No	95.45	95.71	98.55	100.00	96.40
MSP (Rs/q) – 2011-12					
Soyabean (Averq.)	1620	1933	2300	0	1800
Price realization					
≥MSP	0.91	0.00	1.45	0.00	0.80
<MSP	4.55	4.29	1.45	0.00	3.60
=MSP	3.64	1.43	2.90	0.00	2.80
Unknown	90.91	94.29	94.20	100.00	92.80
Marketing problems					
Yes	65.45	72.86	63.77	0.00	66.80
No	34.55	27.14	36.23	100.00	33.20

The table shows that most of the farmers have been using HYV seeds and area under these seeds is more than 90 percent in each category. Mostly, the seeds are market purchased and in all, only 3 percent of the respondent farmers have used their own seeds. Though the farmers have used HYV seeds, 50 percent or more of them are not aware whether they are using recommended doses of fertilizers. Only around 15 percent of them have applied fertilizer doses in recommended quantities. This highlights need for a strong extension machinery. It is also noted from the table that the awareness about MSP for soybean is very poor. This may be because of higher (than MSP) prices of soybean prevailing in the market. Therefore it was observed that majority of the farmers were unaware of the price realization in comparison with the MSP. When asked about marketing problems, more than 60 percent in each category reported that they faced marketing problems.

With the objective of knowing the gap between the experimental farm yield and potential farm yield on one hand and actual yield on the sample farms on the other, yield gap was calculated. According to the officials of the Commissionerate and scientists and technicians of the College of Agriculture, Pune, the potential yield is different in different agro-climatic zones. However, discussions with the government officials, scientists of the Agricultural College, Pune, district level and village level officials revealed that the yield on irrigated land can go up to 28 quintals per hectare. Assuming this figure as the potential yield in case of Maharashtra, yield gap was found.

Table 4.20: Yield Gap Analysis (Quintals)

Yield / Yield Gap	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
1. Experimental Farm Yield	30				
2. Potential farm Yield	28				
3. Actual Farm Yield	12.67	15.19	13.04	25	13.58
Yield Gap I (1-3)	2				
Yield Gap II (2-3)	15.33	12.81	14.96	3	14.42

Source: 1.For experimental farm yield GoM, 2011, 2.For potential farm yield, Discussions with various officials, field survey.

It is observed that the yield gap I is not very high and if ideal conditions are provided, it can equalize the experimental yield. It is observed that yield gap II is very low for the large farmer and comparatively higher for the marginal farmers. More than 75 percent of the land under soybean on sample farms is unirrigated. It is likely that provision of irrigation to these farms would increase the yield leading to reduction in yield gap.

4.6 Marketing Pattern of Oilseeds

Table 4.21 shows the sale pattern of soybean. It is observed that 71 percent of all the respondent farmers have sold the produce to the commission agent through Agricultural Produce Marketing Committee (APMC). 20 to 30 percent of the farmers have sold the produce to local village traders. The percentage of respondents selling the produce to processing mills/ private company is negligible. However, it is observed that the average price received by the farmers by selling the produce to the APMC may not always be the highest. In fact for all the farms, the average price paid by the processing mill is found to be highest.

Table 4.21: Sale Pattern of Major Oilseeds

	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Agency to whom sold (% share)					
Local village trader	26.4	20.0	30.4	0.0	25.6
Processing mill	0.9	1.4	0.0	0.0	0.8
Commission agent (APMC)	71.8	75.7	65.2	100.0	71.2
Private company (contract arrangement)	0.9	2.9	4.3	0.0	2.4
Average Price Received (Rs/q)					
Local village trader	2334	2086	2212	0	2210.71
Processing mill	2400	2000	0	0	2200
Commission agent	2025	2057	2071	2000	2038.23
Private company (contract arrangement)	1800	2150	2100	0	2016.67
Average Distance to sale point (km)	15	16	11	25	17

4.7 Source of Technology and Market Information

Seed is an important technological input. The spurious nature of seed affects the production and increases cost of cultivation of the farmers. Hence it is important to know the source of seeds the farmers buy. Table 4.22 shows that most of the farmers buy the seed from Krushi Seva Kendra and /or the universities indicating that the seeds may be of good quality. Another major input is extension service provided by different agencies. The table highlights the role played by the state agricultural department. More than 50 percent of the respondents in various categories have reported state agency as the main source of extension. For around one fourth of the respondents, major source is the input dealer. As for the market information, the fellow farmers and commission agents are seen to be important sources of information.

Table 4.22: Sources of Technology and Market Information (In percent)

	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Seeds					
Krushi Seva Kendra	92.73	95.71	86.96	100.00	92.00
Krushi Vidyapeeth	92.73	95.71	86.96	100.00	92.00
Mahabij	0.91	0.00	0.00	0.00	0.40
CO-operative Society	3.64	0.00	2.90	0.00	2.40
Extension Services					
State Dept. of Agri.	61.90	55.86	60.40	100.00	59.84
Private company	1.79	3.60	0.99	0.00	2.10
Input dealer	25.60	24.32	24.75	0.00	24.93

	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
SAU/ICAR/KVK	9.52	11.71	11.88	0.00	10.76
Others (specify)	1.19	4.50	1.98	0.00	2.36
<i>Market Information</i>					
Radio/TV	7.92	7.41	8.27	0.00	7.83
Print media	11.66	10.49	8.96	50.00	10.75
Fellow farmer	31.24	27.15	31.03	50.00	30.05
APMC mandi	15.41	17.90	15.86	0.00	16.21
Commission agent/ Ahrtiya	22.08	20.98	19.99	0.00	21.13
Private company	6.67	9.87	8.27	0.00	8.01
Others (specify)	5.02	6.20	7.61	0.00	6.01

4.8 Perceived Constraints in the Cultivation of Soybean Crop

Table 4.23 reports the constraints in cultivation of soybean crop. The constraints are classified as technological, agro-climatic, economic, institutional and those relating to post-harvest, marketing and value-addition. The households were asked about the severity of the particular constraint and accordingly, the constraint was ranked as severe/moderate/minor or as not important for each category and a composite index was constructed based on weights (severe=4, moderate=3, minor=2, not important=1) and number of households in each category. The pattern of responses relating to the perceived constraints is observed to be similar across the categories.

Among the technological factors, lack of irrigation was found to be the important constraint. Incidence of pests and diseases are also seen to be important factors. The index values of most of the technological factors are found to be more than two. Among the agro-climatic factors, no factor appears to be severely constraining the cultivation as per the ranking reported by the farmers. Drought at critical stages of crop growth appears as comparatively the most important factor. As far as economic factors are concerned, high input costs, shortage of human labour, price related risks are observed to be important constraints for all types of farmers as for more than 50 percent of the farmers, these are severe and moderate constraints. Responses relating to the question on oilseeds show that soybean crop is relatively definitely profitable as the index value of the constraint constructed for this regard is only 1.75. Responses also show that this crop is relatively less risky. The index value for this particular economic factor is one of the lowest i.e. 1.61 for all farms. In case of institutional factors, around 30 to 40 percent of

the respondents are of the opinion that institutional factors moderately constrain the soybean cultivation. A similar response pattern is observed for post harvest and marketing related questions. As per the responses, economic factors turn out to be important constraints on soybean cultivation.

A combined composite index is presented in table 4.24. It is observed that the index values of 'Economic' constraints are higher than those of other constraints indicating that the farmers are more concerned about price related factors that directly affect their profitability of cultivating soybean. Economic factors are followed by technological and institutional constraints in terms of their severity. Analysis of the data shows that agro-climatic factors that take value of 2.03(all farms) are the least important factors.

Table 4.23 Constraints in Cultivation of Oilseeds Crops: Composite Indices

<i>Constraints</i>	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Technological					
Non-availability of suitable varieties	2.35	2.01	2.17	2.00	2.20
Poor crop germination	2.23	1.91	2.09	2.00	2.10
Lack of irrigation facilities	2.88	2.81	2.70	2.00	2.81
Incidence of diseases	2.51	2.44	2.52	2.00	2.49
Incidence of insect pests	2.12	2.23	2.22	2.00	2.18
Weeds Infestation	2.24	2.09	2.29	2.00	2.21
Poor quality of soils	2.13	1.93	1.96	2.00	2.02
Agro-climatic Factors					
Drought at critical stages of crop growth	2.25	2.19	2.20	2.00	2.22
Excessive rains	2.15	2.03	1.99	2.00	2.07
Extreme variations in temperature	2.05	1.97	2.01	2.00	2.02
Poor pod/grain setting	1.87	1.87	1.90	2.00	1.88
Risk of crop failure/yield variability due to biotic & a biotic stresses	1.96	1.91	1.97	2.00	1.95
Economic					
High-input cost (diesel, fertilizers, agrochemicals)	2.97	2.87	2.77	3.00	2.89
Shortage of human labor	3.25	3.06	2.91	4.00	3.11
Low and fluctuating prices	3.01	3.10	2.93	2.00	3.01
Price risks – Fear of glut leading to low price	2.65	2.60	2.65	2.00	2.64
Oilseeds less profitable compared with other crops	1.74	1.77	1.75	2.00	1.75
Oilseeds more risky compared with other crops	1.61	1.59	1.64	2.00	1.61
Institutional					
Problem of timely availability of seed	2.41	2.20	2.28	3.00	2.32
Non-availability of other inputs	2.45	2.20	2.29	3.00	2.34
Poor quality of inputs	2.15	2.16	2.07	2.00	2.13

<i>Constraints</i>	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Lack/Poor extension services	2.18	2.19	2.25	3.00	2.20
Non-availability of institutional credit	1.86	1.94	1.83	0.00	1.88
Inadequate knowledge about disease and pest management	2.22	2.09	2.07	2.00	2.14
Irregular supply of power/electricity	2.72	2.50	2.57	0.00	2.62
Lack of awareness of improved oilseed technologies	2.62	2.56	2.57	0.00	2.59
Post-harvest, Marketing and Value-addition					
Poor marketing system and access to markets	2.78	2.83	2.70	2.00	2.77
Lack of information about prices and markets	2.43	2.44	2.36	2.00	2.41
Exploitation by market intermediaries	2.91	2.94	2.83	0.00	2.90
Lack of processing facilities in the area	2.59	2.61	2.54	2.00	2.58
Lack of appropriate transport means	1.75	1.74	1.77	2.00	1.75
Inadequate storage facilities	2.00	1.93	1.90	2.00	1.95
Poor road infrastructure	1.73	1.50	1.52	2.00	1.61
High transportation costs	2.08	1.70	1.77	2.00	1.89

The analysis also reveals that the constraint wise indices are higher for the marginal farmers. This is clear from table 4.24. This indicates that the severity of the constraints is highest for the marginal farmers and lowest for the large category farmers.

Table 4.24: Combined Composite Index

<i>Constraints</i>	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Technological	2.35	2.20	2.28	2.00	2.29
Agro-Climatic	2.06	1.99	2.01	2.00	2.03
Economic	2.87	2.83	2.78	2.83	2.84
Institutional	2.33	2.23	2.24	1.63	2.28
Post-harvest, Marketing and Value-addition	2.28	2.21	2.17	1.75	2.23
Combined Composite Index	2.38	2.29	2.30	2.04	2.33

4.10 Suggestions for Improving Production and Productivity of Oilseeds

The respondent farmers were asked their suggestions for improving production and yield (table 4.25). More than one third of the farmers in all the categories (except that in the large category) demanded that agricultural inputs should be provided by the government at lower rates. This particular suggestion is in response to the rising prices of inputs and poor quality inputs supplied in the market which affect the profitability adversely. More over more than 20 percent of the farmers in all the categories felt that irrigation facilities should be provided. This suggestion was in view of extent of irrigation

available for the soybean cultivators. It can be noted here that only around 25 percent of the land under soybean was irrigated.

Table 4.25: Suggestions for Improving Production and Productivity of Oilseeds (In percent)

Suggestion/ provision	<i>Marginal</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>All Farms</i>
Timely provision of Inputs	0.91	1.43	1.45	0.00	1.20
Provision of Marketing Channel	0.91	0.00	2.90	0.00	1.20
Higher MSP	14.55	10.00	11.59	0.00	12.40
Provision of subsidy on inputs	1.82	0.00	0.00	0.00	0.80
Irrigation facilities needed	21.82	22.86	24.64	0.00	22.80
Provision of continuous power supply	0.00	0.00	1.45	0.00	0.40
Provision of agri input by Govt. at lower rate	32.73	41.43	33.33	100.00	35.60
Assistance Programme for soybean cultivators	2.73	5.71	4.35	0.00	4.00
Provision of credit for to purchase livestock	0.91	0.00	0.00	0.00	0.40
Provision credit at lower interest rate	1.82	1.43	0.00	0.00	1.20
Provision of godown facility	0.00	0.00	2.90	0.00	0.80
No comment	21.82	17.14	17.39	0.00	19.20
	100	100	100	100	100

Concluding Remarks

The chapter has analysed the data collected from the field survey. It is observed that in all the categories, more than 50 percent of the land is unirrigated. As a result, most of the land is under kharif crops. Apart from soybean, cotton, sugarcane, moong are the major crops in the overall cropping pattern. The major source of irrigation is well. 71 percent of the irrigated land is under well irrigation indicating personal source of irrigation.

The analysis of the field level information collected from the sample households has revealed relative profitability of the soybean cultivation. The net income per hectare as well as per quintal is positive for all the land size categories. It is observed that the per hectare costs are higher for the large category farmer; similarly the yield is also very high- almost double that of the small and medium category farmers. As a result, the total value of output of the large farmer far exceeds that of the other category farmers. The net income per hectare for this category is around Rs.14, 000 and is more than double that of

the other category farmers. The net returns from soybean cultivation were also found to be higher than those of the competing crops indicating relative profitability of the crop. The minimum support price for soybean in the year 2011-12 was Rs 1690 which is lower than the average price received by the sample farmers. The available secondary data also indicates increasing profitability in soybean cultivation over the years.

It is also observed that most of the farmers have been using HYV seeds and area under these seeds is more than 90 percent in each category. However, 50 percent or more of them are not aware whether they are using recommended doses of fertilizers thus highlighting need for a strong extension machinery. It is also noted from the table that the awareness about MSP for soybean is very poor (though farmers indicate state dept. as the main source of extension). This may be because of higher (than MSP) prices of soybean prevailing in the market. Therefore it was observed that majority of the farmers were unaware of the price realization in comparison with the MSP. When asked about marketing problems, more than 60 percent in each category reported that they faced marketing problems.

As per the responses, economic factors (high input costs, shortage of human labour, price related risks) turn out to be important constraints on soybean cultivation. The analysis also reveals that the constraint wise indices are higher for the marginal farmers. This indicates that the severity of the constraints is highest for the marginal farmers and lowest for the large category farmers.

The respondent farmers were asked their suggestions for improving production and yield. More than one third of the farmers in all the categories (except that in the large category) demanded that agricultural inputs should be provided by the government at lower rates. This particular suggestion is in response to the rising prices of inputs and poor quality inputs supplied in the market which affect the profitability adversely. More over more than 20 percent of the farmers in all the categories felt that irrigation facilities should be provided. It can be noted that only around 25 percent of the land under soybean was irrigated. This suggestion therefore was in view of extent of irrigation available for the soybean cultivators.

Discussions with the soybean cultivators reveals that soybean cultivation is indeed profitable. However, given the fact that the growth rates of production and productivity of soybean in Maharashtra are declining, the profitability of soybean cultivators needs to be maintained. Provision of irrigation and a strong extension machinery may lead to an increase of the yield and reduce yield gap especially in case of the marginal farmers.

Summary, Concluding Observations and Policy Implications

Introduction

The technological breakthrough achieved in case of rice and wheat during the 1960s lead to remarkable increase in yield of these crops making the country self sufficient in food grains. From a food deficit and stagnant sector at the time of independence, the agricultural sector reached the stage of being a surplus food sector satisfying the domestic as well as foreign demand. With the success of these crops, the government started looking for such varieties of other crops also. Oilseeds was one such crop, demand for which outpaced the supply and India had to import edible oil (Chand, 2007). The TMO was launched in 1986 with the objective of increasing production of oilseeds. As a result of this, the oilseeds production increased gradually. It was observed that after the launch of TMO and during 1986-87 until 1996-97, oilseeds production performed much better than the cereals. The area under oilseeds grew rapidly. This particular phenomenon was called 'yellow revolution' wherein the crop pattern showed changes - area under coarse cereals got replaced by oilseeds and pulses (Gulati, 1999). Today India contributes around 8 percent to the world production of oilseeds (fao.org/fileadmin/templates/est/COMM_MARKETS_MONITORING/Oilcrops/Documents/Food_outlook_oilseeds/Food_outlook_Nov_12.pdf).

Increasing area and production of the oilseeds indicates increasing importance of oilseeds i.e. the oils – in the consumption basket of the population. The NCAER elasticity estimates show that the per capita demand for edible oils would rise to 16 kg in 2014-15 (Damodaram and Hegde 2000). Consumption of edible oil in India has been growing faster than its production. It is observed that though net domestic availability has been increasing it has not been able to satisfy domestic demand and the year wise data on imports shows that around 34 to 52 percent of the total availability is attributed to imports.

The gap between demand and production of edible oil in India has increased sharply in recent years. Since 2000-01, production of oilseeds grew at the rate of 4.7 percent per annum, but edible oil consumption increased at the rate of 6.5 percent per annum (<http://www.business-standard.com/article/press-releases/>, February 20, 2013). Net domestic

availability has increased in 2010-11 and has led to slight reduction in imports. However, due to increasing demand and consumption of edible oils, India still is the world's top vegetable oil importer. This certainly highlights the need to increase the oilseed production.

Our demand for edible oils is mainly satisfied by palm oil, soybean oil and mustard oil. As mentioned earlier, with the technological breakthrough in wheat and rice, attention was focused on other crops and soybean was one such oilseed crop. New varieties of soybean were introduced for commercial usage in India in 1970s. There was a marked increase in the area as well as production of this crop. Today soybean or the 'miracle bean' has come to occupy an important position as a global crop. The world area under cultivation of this crop is growing continuously. The world soybean production has increased two and half times from 24.7 million tonnes in 1981-82 to 220.81 million tonnes in 2007-08 (<http://www.sopa.org/st8.htm>). Its importance as an oilseed crop is revealed from its share in the total world oilseed production which was as high as 56 percent in 2011 (<http://www.soystats.com/2012/Default-frames.htm>). The major players in the world production viz. the U.S.A., Argentina, Brazil and China produce around 85 percent of the world soybean production. India occupies fifth position after China in this regard.

Groundnut, rapeseed-mustard and soybean are the major oilseeds that together contribute 80 percent to the area and 90 percent to the total oilseeds production in the Indian context. The share of soybean in area and production of major oilseeds increased very rapidly after it was introduced in 1970s. In 2010-11 around 35 percent of the area and 39 percent of the production of major 9 oilseeds at all India level was contributed by soybean. For the year 2011-12, the 4th advance estimate shows that the area under soybean was 10.18 million hectares and the production was 12.28 million tones. It is observed that area under this crop has been increasing continuously since 2001-02. Share of area under and production of groundnut is declining continuously whereas that of rapeseed and mustard is fluctuating and was around 25 percent in 2010-11.

Madhya Pradesh and Maharashtra are the two major soybean producing states and currently contribute more than 80 percent to the total area and production of soybean in India. In the year 2010-11, Madhya Pradesh, the highest producing state contributed more than 50 percent to the total area under and production of soybean. It is followed by

Maharashtra which occupies around one third area under soybean and contributes 33 percent to the total soybean production. It can be noted that the per hectare yield in case of Maharashtra is higher than that in Madhya Pradesh. Maharashtra being one of the major soybean producing states with higher productivity, this study attempts to analyse the status of soybean cultivation in Maharashtra and studies the problems and prospects of soybean cultivation in the state.

The state of Maharashtra is the second largest state in India in terms of area and population. It houses the financial capital of India i.e. Mumbai and contributes 14.4 percent to the the per capita GSDP at factor cost per annum in 2011-12 was Rs.1,05,623 and was higher than the per capita GDP at factor cost which was Rs. 69,497. The state has growing secondary and tertiary sectors which contribute almost 87.1 percent to the state income. Only around 12.9 percent of the state income is contributed by the agricultural sector. In spite of its progress in the industrial sector, the state still can be called as an agrarian state as almost 57 percent of the state population is still dependent on this sector for its livelihood. It can be noted that the share of agricultural and allied activities in the GSDP has been declining continuously. However, there has been no commensurate decline in the labour force in agriculture as per Census as well as NSSO estimates.

The major constraining factor for this sector is the scanty rainfall in several parts of the state and the extent of irrigation which covers only 18 percent of the land under cultivation as against 44.5 percent at all India level. During 2009-10, average per hectare yield of food grains in the state was 1074 kg. which was far below the national average of 1798 kg per hectare. This explains the lower productivity of several crops grown in the state.

Around 54 percent of the area under cultivation is occupied by food grains as of now and gradually the cropping pattern is shifting towards commercial crops. The area under food crops has declined to 54 percent from 69 percent in TE 1973-74. This is mainly due to a decline in area under the staple cereals- jowar and bajra. Area under pulses (except gram) has almost remained stagnant. The crops that have recorded increase in area and production are the oilseed crops. These mainly include soybean along with sunflower. Area under crops like sugarcane, cotton, has also increased. Area under fruits and vegetables has recorded an impressive growth, though in absolute terms, area under these crops is less. The cropping pattern is thus gradually shifting towards non food crops. This indicates preference of the

consumers for high value crops with gradually increasing incomes. The gross cropped area in the state has increased only marginally indicating limits to area expansion.

The growing importance of oilseed cultivation in Maharashtra's agriculture is clear from the increasing trend in area under oilseeds which was around 15 lakh ha in 1970-71 and 36 lakh ha in 2010 -11 and which registered an increase of more than 140 percent. The share of oilseeds in the GCA which was around 8 percent in TE 1973-74, increased to 17 percent in TE 2009-10. The major oilseed crop of Maharashtra was groundnut till mid 1980s. However the data shows that since then, the farmers have started cultivating the non-conventional oilseed crop- such as soybean and sunflower. Soybean which contributed 7 percent to the total oilseed area and 10 percent to the oilseed production initially, now occupies 75 percent of the total oilseed area and 85 percent of the production. The area under this crop picked up at a fast rate primarily in the north east region of the state where the climatic conditions were suitable for soybean cultivation. The shorter duration of the crop (i.e. 3 to 3.5 months- from July to September /October) allows the cultivators to take the second crop on the same piece of land and add to their income/profits, which is not possible for a kharif crop like cotton. Being a purely commercial crop, it is not retained for home consumption. Similarly, it is not retained for the purpose of expulsion also as the processing requires a large operation unit and sophisticated technology. One time harvest of the crop makes the harvesting operation comparatively easier. Easy cultivation of the crop and benefits in terms of improvement in fertility also prompted farmers to undertake soybean cultivation. Soybean crop has been found to be very profitable as compared to other kharif crops (Kajale, 2002). Cultivation of this crop is concentrated in two regions of Maharashtra, viz: Vidarbha and Marathwada. Around 80 percent of the soybean production of the state is contributed by these regions. The area under the crop is highest in the former regions specifically in Nagpur district. However, yield is seen to be higher for Kolhapur region, which receives irrigation on large scale.

Though Maharashtra is a major soybean producing state and though the yield of this crop is higher than that of many other major soybean growing states including Madhya Pradesh, the major problem faced by the cultivators is lack of irrigation facilities for the crop. In fact most of the crop is grown under rain fed conditions. In view of the growing demand for edible oils and growing dependence on imports for satisfying domestic demand, it is

important to sustain and increase production of this crop. As there are limits to area expansion, the production has to increase through yield increase. Lack of irrigation to this crop seems to be one of the main constraints in increasing its production. Besides this factor, other economic, technological, agro-climatic and institutional factors are there, which can boost the production in a favourable policy environment.

Objectives of the Study

Considering the growing importance of the soybean crop in the cropping pattern and edible oils in the consumption basket, the basic objective of this study is to analyse the performance and potential of soybean crop sector and identify major problems/ constraints facing the sector in the state of Maharashtra. The specific objectives are as follows-

1. To examine trends and pattern of growth of soybean over time and across districts of Maharashtra and locate the sources of growth.
2. To calculate income and costs of the soybean cultivation on sample farms and compare the profitability of soybean crop with its competing crops.
3. To identify major constraints in soybean cultivation and suggest policy options to improve production and yields.

Methodology

It was decided to select major soybean producing districts that occupy at least 10 percent of the total state soybean area. The selection of districts was to be based on acreage and yield as per the following classification:

Criterion for Selection of Sample Districts

Area	Yield	
	<i>High</i>	<i>Low</i>
<i>High</i>	High area - High yield (HH)	High area – Low yield (HL)
<i>Low</i>	Low area – High yield (LH)	Low are – Low yield (LL)

Since HH, HL and LH districts have potential for increasing production of oilseeds; it was proposed to select at least one district each from these three categories for household survey. Analysis of the data relating to area under soybean in Maharashtra revealed that HH and LH districts could be easily located; however, it was not possible to find districts in the HL category thus revealing that wherever yields are low (lower than the state average), area would not expand to a large extent. Based on the TE 2010-11 data, districts were ranked as per area under cultivation and yield and only 2 districts (one

in each category) could be selected. Accordingly, district Kolhapur (LH) and district Amravati (HH district) were selected.

At second stage two major soybean producing talukas in each district and two villages in each of the talukas were selected on the basis of discussions with the district level and village level officials. From each selected village farmer households representing different farm categories (Marginal 0-1 ha, Small 1-2 ha, medium 2-10 ha; and Large >10h) based on probability proportional to size based on size distribution at the state level were selected. A total of 250 households had to be selected from two districts.

Table 5.1: The Sampling Design

District	Taluka	Villages	No. of sample households
Kolhapur	Hatkanangle	Rukadi	25
		Male	25
	Gadhinglaj	Kadgaon	25
		Gijavane	25
		Total households	100
	Amaravati	Amaravati	Dawargaon
Nandura budruk			38
Nandgaon Khandeshwar		Jamgaon	37
		Mangarul Chavala	38
		Total households	150
Grand total			

The 2005-06 data available at the time of the survey on landholding size depicted that around 44 percent of the households belonged the marginal category, 30 percent to the small category, around 25 percent to the medium category and less than one percent to above 10 hectares category. Given the number of households available at the time of survey in the villages, an attempt was made to select households in various categories in conformity with the state level classification of operational holdings. This is depicted in table 5.2 The landholding pattern of Maharashtra is dominated by marginal and small landholdings. The table shows that more than 70 percent of the farmers selected belong to marginal and small categories. Only one farmer having a large landholding could be located.

The field work was conducted in the above mentioned villages for the reference year 2011-12.

Table 5.2 : Land Size wise Village wise Sample Households Selected

District	Block	Village	Land_Group_				
			Marginal	Small	Medium	Large	All
Kolhapur							
	Hatkanangle	Rukadi	7	7	11	0	25
	Hatkanangle	Male	8	10	6	1	25
	Gadhinglaj	Kadgaon	14	8	3	0	25
	Gadhinglaj	Gijavane	12	7	6	0	25
		All	41	32	26	1	100
Amravati	Amravati	Dawargaon	14	1	22	0	37
	Amravati	Nandura khurd	20	9	9	0	38
	Nandgoan_ Khandeshwar	Jamgoan	12	14	10	0	36
	Nandgoan_ Khandeshwar	Mangrul chawala	23	14	2	0	39
		All	69	38	43	0	150
Total			110	70	69	1	250

5.1 Major Findings of the Study

Major findings emerging from analysis of the secondary data are as follows:

1. The analysis of the secondary data highlights the changing cropping pattern of the state 1970s onwards till date. The analysis reveals that area under rice, wheat and pulses has increased over the concerned period. However, area under total cereals has declined due to a decline in area under coarse cereals by 23 percent which in turn is due to decline in area under jowar-the staple food crop of the state. As a result, there has been a net decline in area under food grains by 2.55 percent. In case of non food grain crops, there is a marked increase in the area under total oilseeds which is contributed by soybean and sunflower. Apart from oilseeds, cotton as well as sugarcane have registered an area increase. In relative terms, share of food grains has declined from 69 percent to around 54 percent and that of total oilseeds has increased from 9 percent to 17 percent over the concerned period
2. It is observed that the net increase in area is negligible, only 3 lakh ha during TE 1973-74 to 2009-10. In fact, the net sown area has declined during last two decades. The data reveals limits to area expansion. The net irrigated area has increased by 17 lakh ha, more than the NSA as the percentage of area irrigated is very low to begin with. It is seen that

area irrigated more than once has not increased by the same extent as area sown more than once.

3. The area under soybean has increased in majority of the districts. The area under other major oilseed- groundnut has declined throughout the period. During the concerned period, the area under soybean crop has gone up by more than 25 lakh hectares and by 685 percent, which is the highest among the individual crops of the state. The incremental area under soybean is greater than that in total oilseeds, which again indicated diversion of area from crops other than oilseeds to soybean. Besides soybean, sugarcane, cotton, fruits and vegetables have emerged as important crops in the cropping pattern and consumption baskets.
4. It is observed that the decade wise average area under soybean increased continuously and by around 108 percent during 1971-1981 and 2001-2010. The average production increased by 216 percent. However, the yield increased by only around 51 percent during the period and has been fluctuating through the period. Thus, the dominant area expansion effect is clearly observed. This underlines the need for stepping up yield of the oilseeds.
5. For the state as a whole, whereas in TE 1993-94, 68 percent of the area was under kharif oilseeds, it increased to 87 percent in TE 2009-10. This indicates area expansion of oilseeds that are rain fed and contraction of area under rabi oilseeds. Soybean is grown mainly in the rain fed regions. Hence area under kharif oilseeds has been growing throughout the period.
6. It is seen that at the state level, irrigated area under oilseeds has almost stayed constant during TE 1993-94 and TE 2000 and it is only 10 percent of the total area under oilseeds.
7. The district wise and state level analysis of the secondary data reveals dominant position the soybean crop has come to occupy in the cropping pattern of the state. In TE 1993-94, only 1.78 percent of the GCA was under this crop, in 2009-10, it has come to occupy almost 13 percent of the GCA. The area and production of the crop have grown by 20 percent and 14 percent respectively during 1984-85 and 2009-10. 78 percent of the acreage under total oilseeds is contributed by soybean. Studies have noted shift of area under kharif crops such as jowar, paddy, ground nut as well as cotton and sugarcane over the years towards this crop.

8. It is observed that soybean is grown mainly in the Vidarbha (Amravati and Nagpur divisions) and Marathwada (Latur and Aurangabad division) of the state. Nagpur was the dominant district and the division in early 1990s. This was followed by Kolhapur and Amravati divisions. However, share of Nagpur division declined continuously and that of Amravati increased. District Amravati is the district with highest share of area under soybean followed by Yavatmal and Nagpur. Share of Kolhapur division, which contributed around 18 percent to the state acreage in TE 1993-94, declined to around 5 percent in TE 2009-10. A similar pattern is observed as far as production of soybean is concerned. The share of districts in Kolhapur and Nagpur divisions has been reducing over a period of time. Currently, districts in Amravati division are major contributors – around 36 percent to the state soybean production. Amravati is the highest contributor to production and is followed by districts Nagpur and Buldhana.

Amravati and Nagpur are also the regions wherein share of soybean in district edible oilseed acreage and production is very high- more than 90 percent. At the state level, around 78 percent of the edible oilseed area and 81 percent of edible oilseed production is contributed by soybean. Soybean is thus the dominant oilseed of the state.

9. The decadal growth rates of area and production of soybean are higher in the 1990s than the latter decade. It is also noted that growth rate of area is higher than that of production. As a result, growth rate of yield is very low and is negative during 2000-01 to 2009-10. Decade wise coefficient of variation was found for all the major oilseeds of the state. It is seen that the values of C.V. are higher than those of other oilseeds as area and production of soybean expanded at a high rate. It is also observed that the C.V. of soybean production is highest as compared to that of area and yield and variability is higher during the decade 1991-2000 when the growth rates in area, production and productivity are comparatively higher. Variability in area, production and productivity of soybean was compared with that of the competing crops. It is seen that for soybean and the competing crops, the variability in production is higher than that in area as well as yield. Variability in area, production and yield of soybean is very high in 1990s as the crop expanded rapidly in this decade.
10. For the state as a whole, growth rate of area under soybean was higher (19.31 percent) in 1990s than in the post 2000 period (13.61 percent). It is also observed that growth rates of

the leading districts in soybean cultivation such as Nagpur, Amravati, Yavatmal, Sangli, Kolhapur were relatively lower in post 2000 period than in the 1990s. In fact, Kolhapur and Sangli experienced negative growth rate in the post 2000 period. However, it is observed that area under soybean has been expanding in other districts also in the post 2000 period. As a result, more number of districts have experienced significant positive growth rate as compared to the earlier decade. As mentioned earlier, districts like Osmanabad, Nanded and Latur have exhibited significant growth in post 2000 period. For the period as a whole, Buldhana has exhibited highest growth rate and Beed has registered lowest growth rate of 5.67 percent.

11. As against in case of area, it is noted that in majority of the districts, growth rates of production are lower in the post 2000 period than the earlier decade. As a result, growth rate for the state as a whole was 26.31 percent for the 1990s and has come down to 7.71 in the post 2000 period. It is also observed that the growth rates of production are lower than that of area in the post 2000 period.
12. The exercise revealed that the growth rates of productivity are for most of the districts lower than those of area and production. This is because area has been expanding at a higher rate than production for most of the districts. In 1990s, all districts have registered a positive yield growth, which though is less than the area and production growth rate. However, it is observed that the growth rates of area and production – district wise as well as at the state level have slowed down in the post 2000 period. Similarly, the growth rate of productivity is negative / very low in most of the districts in the post 2000 period. Only three districts have registered positive and higher growth rate than that at the all India level.
13. It is seen that the prices of soybean have been gradually increasing through out the period. Prices of solvent extracted soybean oil and of solvent extracted refined soybean oil available for Indore and Mumbai market respectively also have been increasing gradually throughout the period. The pattern of increase in price of soybean and soybean oil is similar. Thus, change in the input price i.e. soybean- seems to have reflected in that of the final product-soybean oil. The available data on international prices of soybeans and soybean oil shows that international prices also are gradually increasing; with higher prices in 2007 and 2008 followed by a decline.

Following were the major findings that emerged from the analysis of the primary data.

14. It is observed that in all the farmer categories, more than 50 percent of the land is unirrigated. As a result, most of the land is under kharif crops. Apart from soybean, cotton, sugarcane, and moong are the major crops in the overall cropping pattern. The major source of irrigation is well. 71 percent of the irrigated land is under well irrigation indicating personal source of irrigation.
15. The analysis of the field level information collected from the sample households has revealed relative profitability of the soybean cultivation. The net income per hectare as well as per quintal is positive for all the land size categories. It is observed that the per hectare costs are higher for the large category farmer; similarly the yield is also very high- almost double that of the small and medium category farmers. As a result, the total value of output of the large farmer far exceeds the other category farmers. The net income per hectare for this category is around Rs.14, 000 and is more than double that of the other category farmers. The net returns from soybean cultivation were also found to be higher than those of the competing crops indicating relative profitability of the crop. The minimum support price for soybean in the year 2011-12 was Rs 1690 per Quintal which is lower than the average price received by the sample farmers. The available secondary data also indicates profitability in soybean cultivation.
16. It is also observed that most of the farmers have been using HYV seeds and area under these seeds is more than 90 percent in each category. However, 50 percent or more of them are not aware whether they are using recommended doses of fertilizers thus highlighting need for a strong extension machinery. It is also noted from the table that the awareness about MSP for soybean is very poor. This may be because of higher (than MSP) prices of soybean prevailing in the market. Therefore it was observed that majority of the farmers were unaware of the price realization in comparison with the MSP. When asked about marketing problems, more than 60 percent in each category reported that they faced marketing problems.
17. Most of the farmers have bought the seed from Krishi Seva Kendra and /or the universities indicating that the seeds may be of good quality. Another major input is extension service provided by different agencies. More than 50 percent of the respondents in various categories have reported state agency as the main source of extension. However,

in view of the responses relating to MSP and recommended doses of fertilizer, it is felt that the outreach of the extension services needs to be strengthened. For around one fourth of the respondents, major source of extension is the input dealer. As for the market information, the fellow farmers and commission agents are seen to be important sources of information.

18. It is observed that the yield gap I(experimental yield-actual yield) is not very high and if ideal conditions are provided, it can equalize the experimental yield. It is seen that yield gap II(potential yield- actual yield) is very low for the large farmer and comparatively higher for the marginal farmers. More than 75 percent of the land under soybean on sample farms is unirrigated. It is likely that provision of irrigation to these farms would increase the yield leading to reduction in yield gap.
19. As per the responses, economic factors (high input costs, shortage of human labour, price related risks) turn out to be important constraints on soybean cultivation. The analysis also reveals that the constraint wise indices are higher for the marginal farmers. This indicates that the severity of the constraints is highest for the marginal farmers and lowest for the large category farmers. Responses relating constraints also show that soybean is comparatively a less risky and more profitable crop.
20. The respondent farmers were asked their suggestions for improving production and yield. More than one third of the farmers in all the categories (except that in the large category) demanded that agricultural inputs should be provided by the government at lower rates. This particular suggestion is in response to the rising prices of inputs and poor quality inputs supplied in the market which affect the profitability adversely. More over more than 20 percent of the farmers in all the categories felt that irrigation facilities should be provided. It can be noted that only around 25 percent of the land under soybean was irrigated. This suggestion therefore was in view of extent of irrigation available for the soybean cultivators.

Discussions with the soybean cultivators reveals that soybean cultivation is indeed profitable. However, given the fact that the growth rates of production and productivity of soybean in Maharashtra are declining, the profitability of soybean cultivators needs to be maintained. Provision of irrigation and a strong extension machinery may lead to an increase of the yield and reduce yield gap especially in case of the marginal farmers.

5.2 Conclusions

The study reveals that in view of the supply side as well as demand side factors, area under soybean and its production are increasing in all the major soybean growing districts and hence at the state level. However, the growth rate of yield is declining revealing that growth rate of area expansion is more than that of production. This calls for a strategy for arresting the decline in yield observed for the post 2000 period i.e. during 2001-02 to 2009-10.

The primary data analysis highlights relative profitability of soybean, which is also supported by findings of the CACP at all India level. However, the farmers face several constraints, economic constraints being the important ones.

5.3 Policy Implications

Following are the policy suggestions that emerge from the study.

1. The secondary data analysis has revealed greater role of area expansion in comparison with yields enhancement. There is an urgent need to increase productivity of soybean through provision of irrigation, quality seeds and extension regarding correct mix of quality inputs. The analysis of the data relating to the sample households has also revealed that only 44 percent of the GCA was under irrigation and the major source of irrigation was personal i.e. well. It is felt that to sustain the current level of production at the state level, productivity needs to be stepped up and provision of irrigation is one of the important measures that can be taken up.
2. The major constraints faced by the soybean cultivators are the economic constraints. This includes high input costs, shortage of human labour and price related risks. It is also found that the severity of the constraints is higher for the marginal farmers. It is therefore felt that the existing government schemes relating to provision of inputs/ input subsidies should be implemented properly.
3. The farmers also reported that they faced problems as far as supply of inputs, their timely availability and quality is concerned. Though it may be difficult to control the open market prices of inputs, the government should ensure that good quality inputs are provided in time.

4. Responses of the farmers show that more than 50 percent of the farmers do not know if they are using recommended doses of fertilizers and whether the price received by them is greater than or lower than the MSP declared for soybean. The former information is important for the farmers for increasing yield whereas the latter is needed for maintaining market information. The extension machinery of the state needs to be strengthened.
5. Incidence of diseases, incidence of pests and weeds infestation was a moderate constraint the respondents. This again calls for a strong extension machinery for dissemination of information regarding diseases and pests.
6. More than 60 percent of the farmers reported that they faced problems relating to marketing. Lack of proper marketing facilities, exploitation by the intermediaries, lack of information about market prices were some other constraints. In view of this, dissemination of market information by state agencies and private agencies assumes great significance.

Soybean is on its road to become the most important crop in the cropping pattern of Maharashtra. Hence sustaining its growth would be beneficial not only for the farmers but also for the consumers and the agricultural sector as a whole.

References

- Damodaram, T. And D. M. Hedge (2000), *Oilseeds Situation: A Statistical Compendium - 2000*, Directorate of Oilseeds Research, Indian Council of Agricultural Research, Hyderabad.
- Khare, M.P: (1994), *Pulses and Oilseeds Scene in Maharashtra*, GIPE Monograph Series 39, Agro- Economic Research Centre, Gokhale Institute of Politics and Economics, Pune
- Government of Maharashtra (various years), *Agricultural Statistical Information of Maharashtra*, Part II, Ministry of Agriculture, GOM, various issues.
- (2011), *Comprehensive State Agricultural Plan: Maharashtra State (2007-2011-12)*, Prepared by Commissioner Agriculture, GoM and Gokhale Institute of Politics and Economics, Pune.
- (2009), *District Socio-economic Abstract: Amravati, Kolhapur*, Directorate of Economics and Statistics, Mumbai.
- (various years), *Economic Survey of Maharashtra*, Directorate of Economics and Statistics, Mumbai.
- (various years), *Season and Crop Reports*, Office of the Commissioner of Agriculture, Pune.
- Government of India (2012), *'Agricultural Statistics at a Glance*, Directorate of Economics and Statistics, Ministry of Agriculture, New Delhi.
- (2011), *Indian Horticulture Database*, National Horticulture Board, Ministry of Agriculture, New Delhi.
- Government of India (2010), *Report of the Commission for Agricultural Costs and Prices*, Department of Agriculture and Co-operation, Ministry of Agriculture, Government of India, New Delhi.
- Gulati, Ashok and Tim Kelly (1999), *Trade Liberalisation and Indian Agriculture*, Oxford University Press, New Delhi
- Kajale, Jayanti (2002), *'Likely Impact of Liberalised Imports and Low Tariffs on Edible Oil Sector in India: A Quick Survey of Soybean in Maharashtra'* unpublished report, Agro-Economic Research Centre, Gokhale Institute of Politics and Economics, Pune

Websites

www.agmark.nic.in

www.seaofindia.com

<http://www.soystats.com/2012/Default-frames.htm>

<http://www.sopa.org/st8.htm>

http://www.abhaycotex.com/Investor_IndiaOutlook.html

www.fao.org/fileadmin/templates/est/COMM_MARKETS_MONITORING/Oilcrops/Documents/Food_outlook_oilseeds/Food_outlook_Nov_12.pdf

http://www.abhaycotex.com/Investor_IndiaOutlook.html

<http://www.business-standard.com/article/press-releases/>, February 20, 2013

<http://www.sopa.org/st8.htm>

<http://www.soystats.com/2012/Default-frames.htm>

Review Report

1. Title of the Draft Study Report Examined:

Problems and Prospects of Soybean Cultivation in Maharashtra

2. Date of Receipt of the Draft Report:

July 2013

3. Date of Despatch of Comments:

Sep. 5, 2013

4. Comments on the Objectives of the study:

The study analyses trends and pattern of growth of soybean crop in terms of acreage, production and yield over time and across districts, computes profitability of soybean vis-à-vis competing crops, identifies major constraints in soybean cultivation and suggest policy options to improve soybean production and productivity in the State. The objectives of the study are well articulated and comprehensive and address major issues related to problems and prospects in soybean cultivation in the State.

5. Comments on the Methodology:

Appropriate sampling technique has been used by the authors for selection of district(s), talukas, villages and sample households. The study gives fairly a good representation to various farm categories. The study is based on primary household data and also uses secondary data. The study uses simple analytical tools like averages, percentages, annual compound growth rates, coefficient of variations, etc. for meeting the stated objectives.

6. Comments on the Presentation, Get up etc.:

After a brief discussion on role of agriculture and oilseeds sector in the state economy and objectives of the study in Chapter 1, second chapter discusses issues related coverage of the study, sampling design, and analytical framework of the study. Chapter 3 gives an overview of the oilseeds sector in general and soybean in particular in the State and analyzes its current status and growth behaviour in terms of acreage, production and productivity over time using secondary data. An empirical analysis of problems and prospects of soybean production and costs and returns of soybean and main competing crops in the State are discussed in Chapter 4 using primary household data. The last chapter summarizes the major findings of the study and suggests policy implications for addressing the problems.

The report is nicely presented but there are some editorial/grammatical mistakes in the text, which need to be taken care of while finalizing it. In addition, authors may wish to consider the following suggestions while finalizing the report:

- i. In Table 1.3 and 1.5, rather than using a single year data for computing acreage/production shares, it may be advisable to use average of 3/5 years to

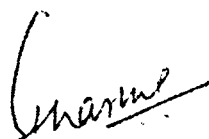
neutralize the effect of yearly fluctuations, which are quite common in oilseeds

- ii. In table 3.1 unit of area may be changed from '00 ha to '000 ha to make Table more compact and readable.
- iii. If recent data on share of irrigated area under oilseeds is available, authors may revise it.
- iv. In section 3.2, it may be desirable to do some analytical analysis to examine various factors influencing crop pattern changes in the State and particularly for soybean, which has been a major beneficiary of these changes (depending upon data availability).
- v. In Table 4.9, some of figures are zeros, and it may be that you did not have farm households in the category. Authors may mention that data is not available rather than putting zero in the column as yield can't be zero.
- vi. In Table 4.15 and 4.16, profitability of cotton and groundnut is shown as negative in lost cases; it is desirable to explain reasons for negative profitability and why farmers are cultivating these crops if net returns (even based on operational costs Cost A2 or Cost A2+FL) are negative.
- vii. In Table 4.17, please mention whether the indicator of risks is CV and if so is it percentage or absolute value.
- viii. Table 4.20, experimental farm yield is typically higher than potential farm yield. You may wish to check it with local SAU or Directorate of Soybean Research for more accurate and reliable data to compute yield gaps. Otherwise these numbers looks a bit misleading.
- ix. In table 4.23, there is no need to give distribution of scales (severe Not important). Please give composite index (category-wise) to make table more readable.

The last chapter needs to be compressed and sharpened to bring out clear messages/policy recommendations.

Overall View on Acceptability of the Report:

The report may be accepted for publication and authors may wish to address some of the points suggested above.



(Vijay Paul Sharma)
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Ahmedabad

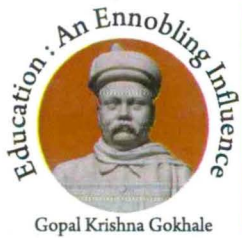
Appendix-II

Action Taken Report

1. Table 1.3: revised as per suggestions. In case of Table 1.5 figures already depict three years average in case of area and production.
2. Table 3.1 : revised as per suggestions
3. Recent data on irrigated area under the crops is not being made available by Commissionerate Agriculture, Pune, GOM due to controversies in the irrigation sector.
4. Section 3.2 :Revised as per suggestions.
5. Table 4.9: revised as per suggestions
6. As has been already explained in the report, the negative profitability of the competing crops may be because of overestimation of the costs by some of the famers who have not cultivated the competing crop in the concerned year.
7. Table 4.17 carries the title as per the guidelines and the dummy table format sent to us. However, as per the comments, the title of the table has been changed and the desired change has been incorporated.
8. Table 4.20:revised as per suggestions
9. Table 4.23: revised as per the suggestions.

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