

Chapter 2

Coverage, Sampling Design and Methodology

This study is based on both primary and secondary data pertaining to major edible oilseeds, namely soybean, groundnut, rapeseed-mustard, sesamum and sunflower, grown in the country. In order to provide an overview of oilseed economy of the country, secondary data related to area, production and productivity of major oilseeds have been collected from different published sources such as State-wise Area, Production and Yields Statistics, Agricultural Statistics at a Glance, Land Use Statistics at a Glance, Report on Price Policy for Kharif and Rabi Crops, etc. published by Ministry of Agriculture, Government of India. Besides oilseeds, information on other major crops was also collected. In order to study the growth trends and patterns, the study analyzed a disaggregated time series data for major oilseeds and foodgrains in important states and the country. In order to identify major constraints in edible oilseeds production in the country, primary data from the households growing oilseeds in selected states were collected. The data on the socio-economic profile, operational holding, cropping pattern, area, production and yield of oilseeds and their cultivation aspects, sources of inputs, extension support, credit, marketing, processing and value addition aspects, major constraints in cultivation of oilseeds, etc. were collected from oilseed producers in selected states.

Coverage and Sampling Design

Multi-stage stratified sampling method was used with major states producing selected edible oilseeds as strata and districts, blocks, villages and households as primary, secondary, tertiary and ultimate units of sample, respectively. Figure 2.1 shows the share of major edible oilseeds in total area and production of oilseeds in the country during the TE2011–12. The study covered five major oilseeds, soybean, rapeseed-mustard, groundnut, sesamum and sunflower, which account for over 90% of total acreage and production of nine oilseeds in the country.

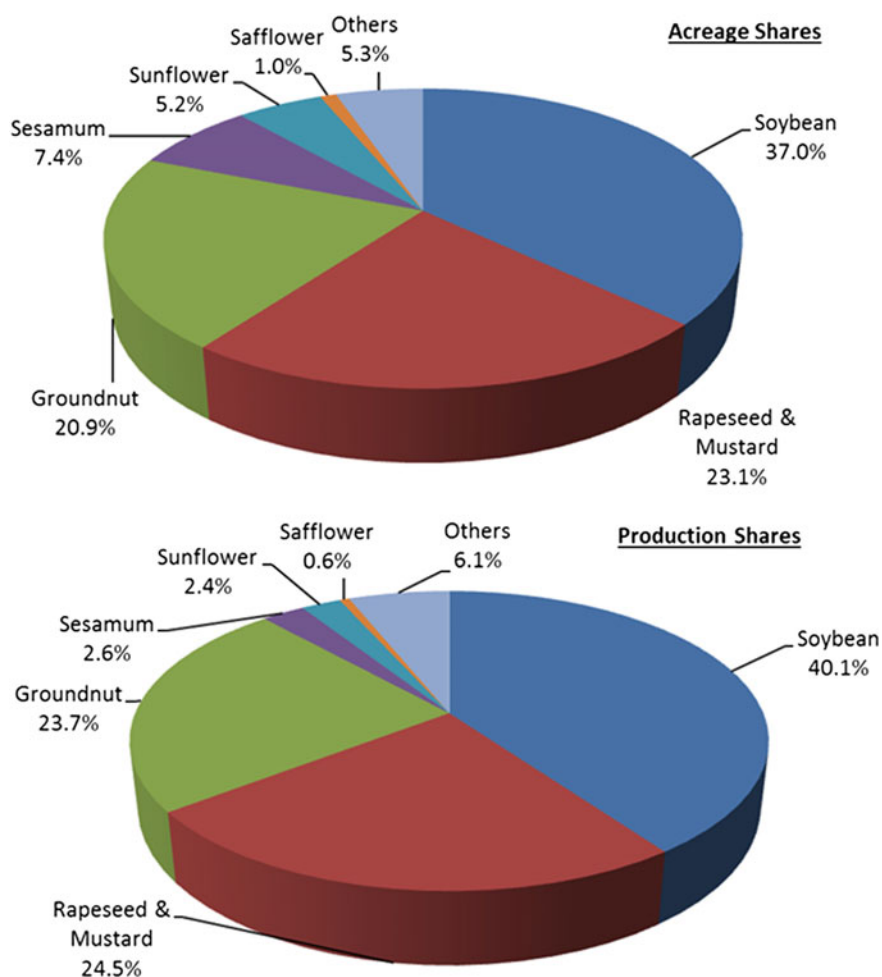


Fig. 2.1 Share of major oilseeds in total acreage and production of oilseeds in India: TE2011–12.
Source GoI (2013)

In the next stage, about 2–3 states were selected with a significant share in production/acreage of respective oilseeds as well as having the potential for additional production. The shares of major states in total production of selected oilseeds as well as in total acreage are given in Tables 2.1 and 2.2. Based on production/acreage shares, we selected Madhya Pradesh and Maharashtra for soybean, Rajasthan, Madhya Pradesh and Uttar Pradesh for rapeseed-mustard, Gujarat and Andhra Pradesh for groundnut, West Bengal for sesame and Karnataka and Andhra Pradesh for sunflower crop.

From each selected state, 2–3 districts were selected on the basis of joint consideration of the area sown under selected oilseed crop and the productivity level of

Table 2.1 Share of major states in oilseeds production in India: TE2011–12

Oilseed	Major producers
Soybean	Madhya Pradesh (55.4%), Maharashtra (30.0%), Rajasthan (9.8%), Others (4.8%)
Rapeseed-Mustard	Rajasthan (46.2%), Haryana (12.2%), Madhya Pradesh (12.0%), Uttar Pradesh (11.8%), West Bengal (5.6%), Gujarat (4.9%), Others (7.3%)
Groundnut	Gujarat (38.0%), Andhra Pradesh (16%), Tamil Nadu (13.8%), Rajasthan (8.9%), Karnataka (8.4%), Maharashtra (5.7%), Others (9.3%)
Sesamum	West Bengal (21.3%), Rajasthan (21.2%), Madhya Pradesh (16.8%), Gujarat (14.1%), Uttar Pradesh (7.6%), Andhra Pradesh (2.9%), Others (11.1%)
Sunflower	Karnataka (37.3%), Andhra Pradesh (27.2%), Maharashtra (14.6%), Punjab (4.4%), Bihar (3.9%), Haryana (3.0%), Others (9.5%)

Source GoI (2013)

Table 2.2 Share of major states in total area under oilseeds in India: TE2011–12

Oilseed	Major states
Soybean	Madhya Pradesh (56.3%), Maharashtra (29.7%), Rajasthan (8.3%), Others (5.7%)
Rapeseed and Mustard	Rajasthan (46.2%), Madhya Pradesh (12.6%), Uttar Pradesh (10.1%), Haryana (8.4%), West Bengal (6.7%), Gujarat (3.5%), Others (12.4%)
Groundnut	Gujarat (32.0%), Andhra Pradesh (25.5%), Karnataka (14.1%), Rajasthan (7.6%), Tamil Nadu (7.1%), Maharashtra (5.9%), Others (7.7%)
Sesamum	Rajasthan (28.0%), Uttar Pradesh (17.1%), Madhya Pradesh (13.3%), Gujarat (12.8%), West Bengal (9.3%), Andhra Pradesh (4.8%), Others (14.7%)
Sunflower	Karnataka (50.5%), Andhra Pradesh (23.4%), Maharashtra (16.7%), Bihar (1.7%), Punjab (1.6%), Haryana (1.1%), Others (5.0%)

Source GoI (2013)

the crop. The selection of districts was based on association between acreage and yield as per the classification presented in Table 2.3.

All districts were categorized into four groups, such as high area-high yield (HH), high area-low yield (HL), low area-high yield (LH), and low area-low yield (LL). Since HH, HL and LH categories of districts have the potential for further increase in production of crops, it was decided to select one district each from these three categories for household survey. The state-wise distribution of selected districts is given in Table 2.4.

Table 2.3 Criteria for selection of districts

Area	Yield	
	High	Low
High	High Area – High Yield (HH)	High Area – Low Yield (HL)
Low	Low Area – High Yield (LH)	Low Area – Low Yield (LL)

Table 2.4 List of selected districts

Oilseed	Selected state	Selected districts
Soybean	Madhya Pradesh	Chhindwara, Narsingpur, Khandwa
	Maharashtra	Amravati, Kolhapur
Rapeseed and Mustard	Rajasthan	Bharatpur, Kota, Tonk
	Madhya Pradesh	Mandla, Chhatarpur, Morena
	Uttar Pradesh	Agra, Etah, Lakhimpur
Groundnut	Gujarat	Junagadh, Rajkot, Porbandar
	Andhra Pradesh	Mahaboobnagar, Srikakulam, Anantapur
Sesamum	West Bengal	Nadia, North 24 Parganas, Bankura
Sunflower	Karnataka	Bagalkot, Belgaum, Bijapur, Shimoga
	Andhra Pradesh	Kurnool, Prakasam and West Godavari

Source Field Survey

At the next stage, a list of major oilseed producing talukas/blocks in each selected district was prepared, and an appropriate number of talukas/blocks were selected for the study. From each selected taluka/block an appropriate number of villages were selected for the household survey. Finally, from each selected village, an appropriate number of farmers growing oilseeds and representing different farm categories (Marginal 0–1 ha, Small 1–2 ha, Medium 2–10 ha; Large >10 ha) were selected based on probability proportional to size distribution at district/taluka level and with a condition that in each district a sufficient number of households in each category was obtained. The final sample consisted of 30 districts, and about 2000 households spread over eight states. Table 2.5 presents the details of various categories of households selected from various states for the selected oilseed. The reference year of the study for the household survey was 2011–12. The household data were collected by participating Agro-Economic Research Centres/Units from selected states (Table 2.6).

Conceptual Framework and Theoretical Model of the Study

As discussed earlier, the main objectives of the study were (i) to examine spatial and temporal trends and patterns of growth of important edible oilseeds and sources of growth in edible oilseeds output; and (ii) to identify major constraints in edible oilseed cultivation and suggest policy options to increase oilseeds production and productivity in the country.

In order to meet the first two objectives of the study, secondary data on state-wise area, production, and yield of major edible oilseed crops/crop groups, irrigated area under oilseeds, farm-harvest prices of selected oilseeds and competing crops, etc. were analysed using compound annual growth rates (CAGR), averages, coefficient of variations, Cuddy-Della Valle Index, etc. The analysis on trends and patterns of

Table 2.5 List of selected crops, states and farm category-wise sample size

Oilseed	Selected state	Marginal	Small	Medium	Large	Total
Soybean	Madhya Pradesh	62	47	93	38	240
	Maharashtra	110	70	69	1	250
	<i>Total</i>	<i>172</i>	<i>117</i>	<i>162</i>	<i>39</i>	<i>490</i>
Rapeseed and Mustard	Rajasthan	19	38	116	27	200
	Madhya Pradesh	23	34	46	17	120
	Uttar Pradesh	55	68	61	12	196
	<i>Total</i>	<i>97</i>	<i>140</i>	<i>223</i>	<i>56</i>	<i>316</i>
Groundnut	Gujarat	15	66	161	8	250
	Andhra Pradesh	31	78	130	11	250
	<i>Total</i>	<i>46</i>	<i>144</i>	<i>291</i>	<i>19</i>	<i>470</i>
Sesamum	West Bengal	165	43	42	–	250
Sunflower	Karnataka	72	110	66	72	320
	Andhra Pradesh	9	37	91	13	150
	<i>Total</i>	<i>81</i>	<i>147</i>	<i>157</i>	<i>85</i>	<i>470</i>

Source Field Survey

Table 2.6 List of participating agro-economic research centres/units in the study/field survey

Oilseed	Selected states	Participating AERCs
Soybean	Madhya Pradesh	Agro-Economic Research Centre, J. N. Krishi Vishwa Vidyalaya, Jabalpur
	Maharashtra	Gokhale Institute of Politics and Economics, Pune
Rapeseed and Mustard	Rajasthan	Agro-Economic Research Centre, Sardar Patel University, Vallabh Vidyanagar (Gujarat)
	Madhya Pradesh	Agro-Economic Research Centre, J. N. Krishi Vishwa Vidyalaya, Jabalpur
	Uttar Pradesh	Agro-Economic Research Centre, University of Allahabad, Allahabad
Groundnut	Gujarat	Agro-Economic Research Centre, Vallabh Vidyanagar (Gujarat)
	Andhra Pradesh	Agro-Economic Research Centre, Andhra University, Visakhapatnam, A.P.
Sesamum	West Bengal	Agro-Economic Research Centre, Visva-Bharati, Santiniketan (WB)
Sunflower	Karnataka	Agricultural Development and Rural Transformation Centre (ADRTC), Institute for Social and Economic Change (ISEC), Bangalore
	Andhra Pradesh	Agro-Economic Research Centre, Andhra University, Visakhapatnam, A.P.

growth of different edible oilseeds over time and across states was done for the last three decades with a special focus on post-reforms period. To measure the relative contribution of area and yield towards the total output change, decomposition

analysis was used. The analysis helped in identifying the sources of growth in output by decomposing the changes in production into three effects, i.e., area effect, yield effect and interaction effect. The decomposition analysis was carried out on the major oilseeds mainly for the following three periods, i.e., Period I (TE1983–84 to TE1993–94) Period II (TE1993–94 to TE2003–04) and Period III (TE2003–04 to TE2011–12). During Period I, the expansion of area under oilseeds was encouraged by introduction of Technology Mission on Oilseeds (TMO) in 1986 by Government of India. During Period II, opening up of imports of edible oils as part of economic reforms and signatory to WTO had considerable impact on domestic production and consumption pattern of major oilseeds in the country. Phase III witnessed a revival in oilseeds production and reached a record level of 32.5 million tonnes in 2010–11. In order to measure the relative contribution of area and yield towards total output change, component analysis model has been used. The quantity of output of a crop i (Q_i) is the product of yield (Y_i) and acreage allocated to its production (A_i). Decomposition can thus take the following approximate form:

$$\Delta Q_i \cong A_i \Delta Y_i + Y_i \Delta A_i$$

The decomposition reveals the relative contribution of changes in acreage and changes in yield to the overall change in the quantity of output. This is a policy-relevant issue to the extent that acreage and yield changes reflect government interventions in the sector. However, the decomposition formula stated above is an approximation of the actual change in output in which the interaction between the sources of change is not accounted. In order to capture this interaction effect, we used the following formula:

$$Q_n - Q_0 = A_0(Y_n - Y_0) + Y_0(A_n - A_0) + (A_n - A_0)(Y_n - Y_0)$$

$$\Delta P = A_0 \Delta Y + Y_0 \Delta A + \Delta A \Delta Y$$

Change in production = Yield effect + Area effect + Interaction effect

where,

- Q_n Production in the current year
- Q_0 Production in the base year
- A_n Acreage in the current year
- A_0 Acreage in the base year
- Y_n Yield in the current year
- Y_0 Yield in the base year
- ΔQ Change in production ($Q_n - Q_0$)
- ΔY Change in yield ($Y_n - Y_0$)
- ΔA Change in area ($A_n - A_0$)

Identification and Prioritization of Major Constraints Faced by Oilseeds Producers

Household data were collected through direct interviews with the respondents conducted by the staff of participating centres/units using a pre-tested questionnaire. Most questions were close-ended with predetermined response options among which respondents could choose. Therefore, the households chose more than one answer, and it gave multiple responses. Descriptive statistics showing key features of the selected indicators relating to land use and cropping pattern, oilseeds production, productivity, profitability and marketing, was carried out. For questions with more than one response, multiple response frequencies were used, and percentages of valid cases (less or more than 100%) were reported.

The yield gap and production potential of major oilseeds were also estimated to assess the scope for increasing its production. The yield gap analysis was conducted to ascertain the gap between the potential yield and actual yield, and between experimental yield and actual yield. Three types of yield gaps have been calculated, yield gap-I (often known as technology gap) measures the gap between the experimental yield and potential yield, whereas yield gap-II measures the gap between the actual yield and potential yield. The yield gap-III, also known as extension gap, measures the gap between the experimental yield and actual yield.

The productivity level of edible oilseeds is relatively low, due to various technological, institutional, infrastructure and socio-economic constraints or a combination of these factors. The major limiting factors as perceived by the selected households in the selected states was identified and prioritized. In order to identify and prioritize major constraints facing oilseeds production, appropriate analytical techniques were used in the study. Each household was asked to rank major constraints affecting their oilseed crop. The responses of the sample farmers on the extent of severity of various constraints faced by them have been ranked by using ordinal scores from 4 to 1 (Severe = 4, Moderate = 3, Minor = 2, Not important = 1). The major constraints considered for the study were technological (non-availability of suitable varieties, poor crop germination, lack of irrigation facilities, weeds infestation etc.), agro-climatic factors (drought at critical stages of crop growth, excessive rains, extreme variations in temperature etc.), economic and institutional (high-input cost on diesel, fertilizers, agrochemicals, shortage of human labour, low and fluctuating prices, problem of timely availability of seed, non-availability of other inputs, lack/poor extension services etc.), and post-harvest, marketing and value addition (availability of marketing infrastructures and transportation facilities, high transportation costs, exploitation by market intermediaries etc.).

Reference

GoI (2013), “*State Wise Area Production and Yields Statistics (Major Crops, 2012–13)*”, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi.



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