

CONSUMPTION PATTERN OF DIFFERENT EDIBLE OILS IN INDIA

Final Report

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Abbreviations:

MT	Million Tonnes
LT	Lakh Tonnes
USDA	U.S. Department of Agriculture
CAGR:	Compound Annual Growth Rate
DGCIS	Directorate General of Commercial Intelligence and Statistics
TMOP	Technological Mission on Oilseeds and Pulses
NFSM	National Food Security Mission
OEO	Other Edible Oils
NSSO	National Sample Survey Organisation
WHO	World Health Organisation
TFA	Trans fatty acids
PHVO	Partially hydrogenated vegetable oil
EU	European Union
CACP	Commission for Agricultural Costs & Prices
Hect.	Hectares
NARS	National Agricultural Research System
KVK	Krishi Vigyan Kendra
NMOOP	National Mission on Oilseeds and Oil Palm
Ltr.	Litre

PREFACE

Oilseeds, after cereals, play an important role in the agricultural economy of India. There exists a gap in demand and supply of edible oils and therefore, understanding the factors that affect consumption is crucial for better implementation of policies and to make India self-sufficient by enhancing production and reducing reliance on imports and also meeting the rising demand of a growing population.

This study is based on both primary and secondary data. The primary data is collected through a survey of 4000 households spread over 6 zones of India namely, North, East, West, North-West, Centre and South, and covering 40 districts across 8 states – Uttar Pradesh, Haryana, West Bengal, Gujarat, Maharashtra, Rajasthan, Madhya Pradesh and Tamil Nadu.

We would like to thank the Ministry of Agriculture and Farmers Welfare (MOA&FW) for funding and supporting the study. Our special thanks to Dr. Ramesh Yadav, Dr Promodita Sathish and other officials for their continuous support and cooperation.

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Consumption Pattern of Different Edible Oils in India

Executive Summary

Institute of Economic Growth

The diverse agro-climatic conditions are favourable for various crops in India and oil seeds are one of them. Oil seeds are very important crop after food grains in India. To achieve self-sufficiency in oil seeds, we have to concentrate on both production and consumption. When the domestic production is not sufficient there is a need for higher imports to meet the growing demand of the consumers. The efforts by the government have led to increase the production of oil seeds in India to 33.42 million tonnes in 2019-20 compared to 31.46 million tonnes in 2017-18. In 2019-20 India imported 14.46 million tonnes of edible oil worth Rs 68,558 crore as the domestic availability was 10.53 million tonnes and the demand was 25 million tonnes.

In India there exist specific preferences for certain edible oils in different regions. They constitute an important component of food expenditure in Indian households. There are nutrients in oil that are vital to our body. Certain oils are high in calories and have a pleasant taste, and therefore become a popular choice for consumption. However, excessive use of oil could contribute to health issues. Sensible consumption of oil is important for good health. Through various awareness programmes people can be educated for optimal use of oil.

Given this background, in order to get an insight into the consumption pattern of different edible oils in India, the objectives are as follows:

1. Analysis of scenario regarding production of oilseeds.
2. Analysis of the difference between international prices and domestic prices of different edible oils.
3. Comparative analysis between rural and urban preferences of edible oils with respect to socio-economic status in different zones of India.
4. Analysis of the trends in the consumption pattern of edible oils and per capita consumption of edible oils in different zones of India.
5. Examine the scenario of consumption and purchase decisions of edible oils in different states and zones of India.

6. Awareness of health and consumption of edible oils.
7. Optimum use of edible oil as per ICMR recommendation.
8. Projection of edible oil requirement on the basis of current study.
9. Policies undertaken by the government regarding edible oils in India.

The main objective of the study is to find out the consumption pattern of various edible oils in selected states of six zones, including both urban and rural population so that proper planning of production and consumption can be done, along with raising consumer awareness for optimum use of edible oils. The study is focused on both primary and secondary data to get a clear picture about the production scenario and consumption pattern in India. The study can contribute to enhance the production of oilseeds by assessing the demand, supply and import of oilseeds in India.

The secondary data information is collected from government data sources. Data related to area, production and yield of various oil seed crops is used. The oil seeds studied are soyabean, groundnut, rapeseed and mustard, sunflower, sesame, safflower and nigerseed. The study also involves the use of primary data which was collected through survey using a structured questionnaire at household level in selected states of India to assess consumption pattern and the factors influencing it. The survey took place in both rural and urban areas in the eight states of the six zones namely, north, south, east, west, northwest and central zones of India. Stratified multistage sampling technique is used to and one district is selected from each zone of a state. In each district, survey is in both rural and urban areas and the ratio of rural and urban is taken according to the population in the district as per census. Various statistical tools have been used to analyse the objectives of the study.

Chapter 1

Introduction

The diverse agro-climatic conditions are favourable for various crops in India and oil seeds are one of them. Oil seeds are very important crop after food grains in India. To achieve self-sufficiency in oil seeds, we have to concentrate on both production and consumption. When the domestic production is not sufficient there is a need for higher imports to meet the growing demand of the consumers. The efforts by the government have led to increase the production of oil seeds in India to 35.95 million tonnes in 2020-21 compared to 31.46 million tonnes in 2017-18 (Directorate of Economic and Statistics). India imported 14.46 million tonnes of edible oil worth Rs 68,558 crore as the domestic availability was 10.53 million tonnes and the demand was 25 million tonnes in 2019-20.

Oilseeds have attracted more attention in recent years with the rising demand as the oil extracted from them have different uses. The vegetable oil is primarily utilized as edible oil, on the other hand, oilseeds are also used as protein meals for livestock, pharmaceuticals, biofuels as well as other industrial uses. The rising interest resulted in the increase in global production of oilseeds by 25% in past seven years. As of 2020-21, the global oilseed production is 593.6 million tonnes (MT) out of which 31% is traded across the globe (CACCP (2021)). Soybean, rapeseed & mustard, sunflower, groundnut and cottonseed are majorly produced oilseeds in the world. On the other hand, palm oil, soybean oil, rapeseed and sunflower oil are majorly produced oils globally, which together accounts for 87% of the total oil production.

India is one of the major producer and importer of edible oils in the world. India's vegetable oil economy occupies the fourth place after USA, China and Brazil. The diverse agro-ecological conditions in India are suitable for growing major oilseed crops in its different agro-climatic zones. Majorly cultivated oilseeds in the nation includes seven edible oils (groundnut, rapeseed & mustard, sesamum, safflower, nigerseed, soybean and sunflower) and two non-edible oilseeds such as castorseed and linseed. According to the report by Directorate of Economics and Statistics, majority of oilseeds which are primary source of edible oils in the country and are mainly grown in rainfed area of about 28 million hectares. In addition to the nine oilseeds,

several oilseeds of tree and forest origin are a significant secondary source of oil. These include cottonseed, rice bran, coconut, oil palm and tree borne oilseeds (TBOs).

The area under oilseeds in India in 2019-20 is 16.2% out of the total cultivated area with a production of about 4.5% in comparison to foodgrains and other commercial crops. As per Directorate of Economics and Statistics, the Fourth Advance estimate of production of oilseeds was 37.696 MT in 2021-22. The country reports 28.8 million hectares of the area under oilseeds with the yield of 1247Kg/hectares in 2020-21 as compared to 27.1 million hectares of the area under oilseeds with the yield of 1224Kg/hectares in 2019-20. The production of nine oilseeds jumped from 9.3 MT in 1980-81 to 35.9 MT in 2020-21 with the compound annual growth rate (CAGR) of area, production and yield was 0.9%, 2.9% and 1.9%, respectively.

The oilseed scenario in India has changed over the years. In 1986, the government launched the Technological Mission on Oilseeds and Pulses (TMOP). Following this, the production of India's oilseeds crossed the target of 18 MT. India shifted from being a net importer in the 1980s to a net exporter during 1989-90. The highest production was 24.75 MT during 1994-95 against 11MT in 1986-87 (Kumar & Tiwari, 2020). The self-sufficiency in oilseeds attained through "Yellow Revolution" during early 1990's could not be sustained beyond a short period as the country began to depend on imports to meet domestic needs since 1997-98.

Oilseed cultivation in India is majorly dependent on rainfall leading in instability in production of oilseeds. There has been a declining trend in area under oilseeds, as compared to other food grain crops such as maize, bajra, rice, wheat, etc. As a result, there has been a change in the cropping patterns. Higher concentration of production of oilseeds is mainly in central and southern states of India. As per Directorate of Economics and Statistics, Rajasthan is the major producer of oilseeds with a share of 22.2% in 2020-21 as compared to 20.4% in 2019-20 of the total production, followed by Gujarat (2020-21: 17.2%; 2019-2020: 20%), Madhya Pradesh (2020-21: 17.6%; 2019-2020: 19.4%) and Maharashtra (2020-21: 18.7%; 2019-2020: 15.6%). Groundnut, soybean and rapeseed & mustard are the major oilseeds cultivated in India and contribute approximately 92% of production in comparison to other oilseeds. Groundnut is mostly grown in Gujarat, whereas Madhya Pradesh and Maharashtra are the leading producer of

soybean. Rapeseed and mustard are grown in Rajasthan, and, on the other hand, Karnataka is the highest producer of sunflower.

Growing population and urbanization along with rising income has increased per capita demand for oil consumption in recent years in respect of both edible as well as industrial usages. According to NSSO reports, the overall consumption of edible oil per capita per month has been increasing in rural population from 0.48 kg per capita per month in (2004-05) to 0.67 kg per capita per month during the 68th round (2011-12) as compared to 0.66 kg per capita per month in urban population to 0.85 kg per capita per month during same period. Despite of decent growth in domestic production (2% per annum), it could not match the rising demand of oil (6% per annum).

Rising per capita consumption have led India to rely highly on imports of edible oil to meet domestic demand. India is a leading player in edible oils, being the largest importer followed by China. India majorly imports palm oil, sunflower oil, soybean oil and rapeseed and mustard oil in nation, whereas the exports are limited to groundnut and soybean meal. Palm oil and sunflower oil comprise more than half of India vegetable oil food consumption. However, restriction by Indonesia on palm oil trade and disruption in sunflower oil trade as a result of Russian- Ukraine conflict has led to reduced imports in the country. This along with increasing demand along with uncertain productivity leads to higher prices of edible oils.

As per 68th round of NSSO in 2011-12, mustard oil is the most consumed oil in both rural and urban areas. In a diverse nation like India, specific preferences for edible oils exist in different regions. For example, people in the South and the West, there is preference for groundnut oil while in the East and North mustard seed/rapeseed oil is used. Similarly, in the South coconut and sesame oil are preferred.

Edible oils and fats constitute an integral part of life and are known to have numerous health benefits. It is the major source of energy and a carrier of essential nutrients which are vital for growth and metabolism, protecting brain cells, reducing the risk of heart diseases, etc. Rapeseed& mustard oil is used mainly in cooking and it is a rich source of Monosaturated Fatty Acids (MUFA), making it a healthier option. However, excessive use of oils could contribute to health problems. Dietary habits with high trans-fats, saturated fats, sugar and salt are associated

with increased risk of cardiovascular diseases, diabetes, and hypertension. In urban India, high intake of trans-fatty acid (TFA) is a cause of concern and needs attention.

Growing domestic demand for edible oils and the production not being able to keep pace with it, the government relies on imports. Recently, various measures have been taken by government to close the gap between demand and supply in India. For example, National Food Security Mission (NFSM) was implemented from 2018-19 to enhance the production of oilseeds. A support scheme known as Pradhan Mantri AnnadataAaySanrakshan Abhiyan (PMAASHA), announced in 2018, intends to provide remunerative returns to farmers for their crops through – Price Support Scheme, Price Deficiency Payment Scheme and Private Procurement and Stockist Scheme. Another scheme – National Edible Oil Mission-Oil Palm (NMEO-OP) has been launched for self-reliance in edible oil and it involves investment of over Rs. 11,000 crores so that dependence on Malaysia for palm oil is limited. Focus will be given to India's north-eastern states and the Andaman and Nicobar Islands due to the conducive weather conditions in the regions.

Edible oils constitute an integral part of life. The preference for newer oils and overall increase in per capita consumption of edible oils will likely continue in the coming years at a faster pace. With this background, in order to achieve self-sufficiency in oilseeds, it is important to understand the production, consumption and proper utilisation of edible oils in India. Thus, the main purpose of the study is to analyse the trends in consumption patterns of various edible oil in Indian states. The study aims to examine the scenario regarding the production, consumption and purchase decisions of edible oils in different states of India and assess the difference between rural and urban preferences of oil with respect to socio-economic status. The difference between international and domestic prices of different edible oils is also studied.

The subsequent chapter, Chapter 2, of the report reviews the existing literature on edible oil consumption patterns and implications in terms of health and policies. Chapter 3 describes data and methodology related to analysis of secondary data as well as the primary data. Chapter 4 contains the analysis of trends and pattern of oilseeds and edible oils in India and the world. This chapter also studies the relationship of domestic prices, international prices and minimum support price (MSP) of major oilseeds produced in India. The past trends of per capita consumption of edible oil in India is also analysed in this chapter. Chapter 5 provides the

detailed analysis of consumption pattern of edible oils in selected Indian states, along with their socio-economic status. Purchase decisions along with awareness of health and consumption of edible oils is also discussed. The demand projection of edible oils for the selected states of the study is estimated and presented in Chapter 6. In Chapter 7 the policies undertaken by government is discussed. The report ends with, Chapter 8 which is the conclusion of the study.

Chapter 2

Literature Review

Various outstanding studies conducted on trend pattern of edible oils, consumer behaviour in choice of brands and health implication in respect of edible oil products were thoroughly examined in the literature review. The main reason of these studies is to understand the past behaviours which are very valuable for the future researchers in understanding the consumption patterns of edible oils which will help in future policy formation and implementation.

Demand and Supply

According to National Sample Survey organisation (NSSO) reports, the overall per capita consumption of edible oils in India has increased by 40% in rural areas and by 29% in urban areas from the period of 2004-05 to 2011-12 (calculated from NSSO). The consumption of mustard oil has increased by 36% in rural areas as compared to 20% in urban areas. On the other hand, consumption of groundnut oil, vanaspati and other edible oils (OEOs) have decreased.

A study by Jha et al. (2012) projected the demand and supply of edible oil in India based on 66th round of NSSO, considering the base year of 2009-10 and expenditure elasticity as 0.55. The report suggests that the total demand of edible oil in India would be 16.34 Mt in 2016-17 and 20.36 Mt in 2020-21, with the supply of 10.55Mt in 2016-17 and 13.23 Mt in 2020-21. Similarly, a report by Niti Ayog projected the total demand of edible oil in India by assuming expenditure elasticity of 0.88 of rural and 0.37 of urban. The report suggests that the total demand of edible oil in India will rise from 9.55 Mt in 2011-12 to 33.36 Mt by 2033-34 (NITI Aayog, 2018).

Rural and urban patterns

Kumar et al., (2009) projected demand for foodgrains in India for the year 2011-12, 2016-17 and 2021-22 by considering various factors such as, urbanization, regional variation in consumption pattern, income distribution and change in diet pattern. Also changes in taste and preference of variety of food, energy requirements factors were considered in the study. Govindarajet al., (2012) attempted to understand the dynamics of edible oil in rural and urban household in Tamil Nadu, India. The study hypothesized that the consumption pattern of edible oil has remained static over the years in Tamil Nadu state. The secondary data published by

NSSO and primary data from households were utilised in the study. The markov chain model was employed to capture net effect of changes in the consumption pattern of edible oils.

The study revealed that there is perceptible shift in edible oil consumption from traditional groundnut oil to Other Edible Oils (OEO). The possible reason for these shifts can be increased income levels of rural and urban households with changing lifestyle patterns, increased awareness and availability of oils in packet form in varied quantities. The results also point that presently, the dominant edible oil consumed is sunflower oil in both the rural and urban regions of Tamil Nadu. The second most consumed oil in rural Tamil Nadu was palm oil whereas, in urban areas groundnut is the next major oil. The groundnut oil, which was traditionally consumed by households, has been replaced by sunflower oil, implying the need for appropriate changes in the production front. Another study by Godvindaraj et al., (2015) analysed the demand and supply gap of major edible oils consumed in Tamil Nadu state of India. Almost Ideal Demand System (AIDS) model technique is utilised for projection of demand. The results conclude that there will be 66% demand for groundnut oil by 2020 and also demand of sesame, coconut and other oils will increase.

Pandey et al. (2020) studied the impact of urbanization on food consumption in India. The study examined the variations in food consumption at the household, district, and state levels. The findings suggest that there is no difference in average consumption between urban and rural residents. Much of the variation in average quantities consumed is due to income differences, with a limited role of urbanization. On the other hand, infrastructure, market access, percentage of working women in urban areas, norms and institutions have a statistically significant influence on diet diversification in India. Also, there is a link between urbanization and income increase in India, where rising income translates into an increased per capita demand for more diverse, convenient, and safe foods.

Consumption and preferences:

A survey was conducted by Chepkwony (2011), to understand factors that influence consumer's edible oil choice in Kenya. The study reports that prices of edible oils, its quality and ease of pouring of oil are significant factors in consumption of edible oils. However, finding also suggests that the least driving force in consumption was label of the product and re-usage of containers. Another study was about brand preference and consumption pattern of edible oils in

Maharashtra state of India by Sarwade (2011). Data of 1000 respondents from urban states of Maharashtra is collected and compiled to study the market trends from consumer's view. The study suggests that health consciousness and quality of a particular brand are major driving forces in decision making. Sunflower oil is the popular oil preference by most of the respondents. Majority of participants consume 2-4 litres of oil per month with the package size choice of mostly 1 litre and 5 litres. Similar results are reported by survey based on Chennai city of India (Elayaraja and Rajamohan, 2018).

According to study conducted by Chandni and Srivastava (2021), the majority of people in Lucknow preferred Saffola brand oil for consumption. Another study from Hisar district of Haryana included 200 respondents with majority belonging to age groups 30 to 40 years. The study reports that soyabean and sunflower oil is consumed by most of the villagers. The cluster analysis proves that health factor plays a predominant role in selecting the brands of oils. On the other hand, local brands are more popular among people (Arya *et al.*, 2020).

Health and Consumer Awareness

In the human body, low-density lipoprotein can be raised following excessive consumption of saturated fats and cholesterol. Trans fatty acids (TFA) which are obtained from hydrogenation of saturated fats increase the risk of coronary heart disease (CHD) (Ghafoorunissa, 2008). TFA may also compromise fetal and early infant growth and development. High levels of fatty acids, present in some edible oils, like erucic acid or trans isomers of linolenic acid can be harmful for human health. Ghafoorunissa (2008) also studied the role of trans fatty acids in health and challenges to their reduction in Indian foods. The results implicate that Vanaspati, partially hydrogenated vegetable oil (PHVO), provides up to 40% TFA which is majorly used in Indian cooking and in the preparation of commercially fried, processed, bakery, ready-to-eat and street foods. TFA in biscuits and sweets range 30-40 and 6-26% of total fatty acids respectively.

Basuet *et. al.*, (2013) constructed a mathematical model incorporating nationally representative data on cardiovascular disease risk factors, palm oil consumption and substitution of palm with other oils was used to investigate the potential effect of an excise tax on palm oils in India. The results suggest that palm oil taxation modestly reduce hyperlipidaemia and

cardiovascular mortality, but men and urban population may benefit more than women and urban rural population.

Dorni et al., (2018) studied the fatty acid profile on edible oils consumed in India. The results shows that pure safflower oil exhibited the highest total polyunsaturated fatty acids (TPUFA) (76.78%). Coconut oil had about 90% of the total saturated fatty acids (TSFA). High level of erucic acid in the range of 48.5 to 54.2% was observed in mustard oil. Groundnut and rice bran oils showed TPUFA/TSFA ratio closer to World Health Organisation (WHO) recommended value. Several vanaspati samples exhibited trans fatty acid beyond the permitted limit while trace amount of the same was also detected in ghee. Another study shows that Punjab have highest consumption of hydrogenated vegetable oil with 1.09-fold higher TFA intake than the WHO recommendation, which is alarming and may be one of the factors for high cardiovascular disease mortality rate that needs further elucidation (Dixit and Das, 2018). A study based on Iran reports that 42% of the studied households do not read the oil container labels before making a purchase. This suggests the need of awareness programmes about appropriate use of edible oil container labels (Aalipanah et al., (2021)).

Ambujakshi (2016) throws an insight into the Consumer Awareness with reference to Edible oil in Bangalore. The study shows strong relationship between increasing income level and preference of branded edible oil. So, it is important to examine the composition of edible oils in dietary intake across the world. Ghafoorunissa (2008) emphasizes on consumer education about negative effects of TFA and providing food-based guidelines to reduce TFA consumption in the entire population. The study also suggests that steps are needed to insist the restaurants and fast-food joints to disclose the use of PHVO in the served meals. In response to growing evidence linking intake of TFA to heart disease, the WHO in 2019 has called for elimination of industrially produced TFAs from global food supply by 2023. WHO in 2020 also announced certification programme for trans-fat elimination.

On the other hand, the study by Jumrani and Meenakshi (2020) looks into the impact of a negative tax policy- of providing subsidised farm oil- on the intake of edible oils that has been implemented in three states- Tamil Nadu, Maharashtra and Andhra Pradesh. Consumer expenditure survey data and differences-in-differences approach was utilised in the study. The results indicate the substantial increase in the consumption of palm oil in rural areas. The subsidy

induced a substitution away from groundnut and coconut oil and increased consumer spending on ghee and butter in rural areas.

Chapter 3

Data and Methodology

The objective of the study is to understand the present consumption pattern of edible oil of rural and urban population of India. The study is based on both secondary and primary data. The secondary data is collected from various government sources such as, U.S. Department of Agriculture (USDA), Directorate of Economics and Statistics (DES), Agricultural Statistics at Glance and Commission of Agricultural Cost and Prices (CACP). Also, the data on per capita consumption of edible oil is compiled from various rounds of NSSO.

For primary data, a survey was carried out to collect the information on different edible oils consumed by rural and urban households of various states of India. Stratified multistage random sampling method was used to collect the household consumption data. Six zones have been selected to geographically represent the country – North, South, East, West, Centre and North-West. From these eight states are selected, Uttar Pradesh and Haryana in the North, Gujarat and Maharashtra in the West, Rajasthan in North-West, Madhya Pradesh in Centre, Tamil Nadu in South and West Bengal in the East zone. The percentage share of production of each selected state in total production of oilseeds in 2019-20 is as follows – Rajasthan (20.4%), Gujarat (20%), Madhya Pradesh (19.4%), Maharashtra (15.6%), Haryana (3.5%), Uttar Pradesh (3.5%), Tamil Nadu (3.2%) and West Bengal (3.1%).

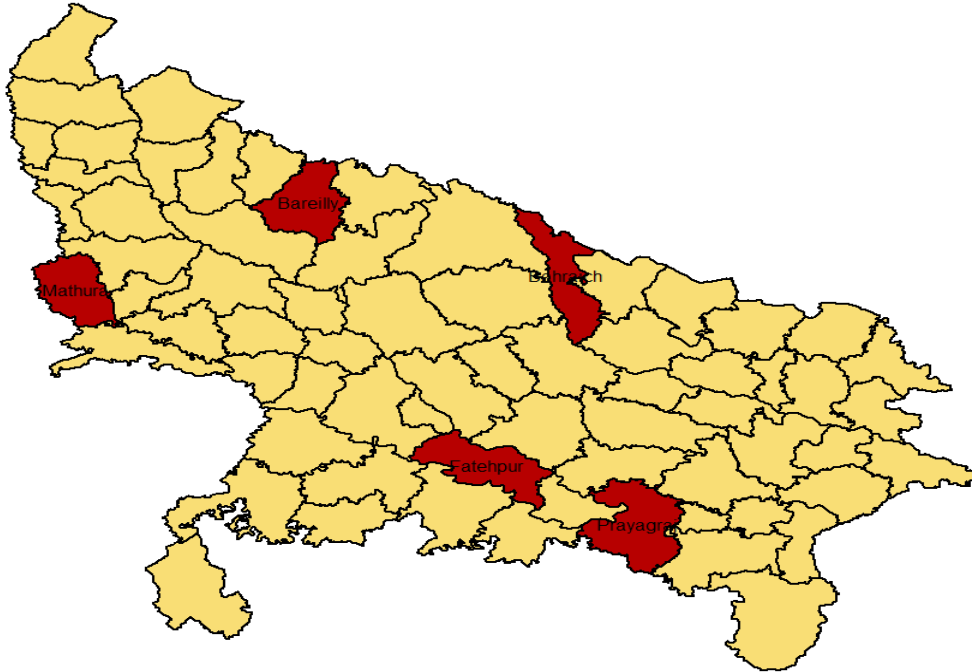
Further, each state is divided into zones - North, South, East, West and Centre and from each zone, one district is randomly chosen and 100 households are selected. Therefore, from each state 500 households were surveyed. In total 4000 households were surveyed across eight states. In each district, survey was done for both urban and rural population. The ratio of rural and urban was according to the population in the district as per census. The urban and rural households selected were interviewed using a structured questionnaire developed for this study. In Table 3.1, the selected states, districts and number of households from both urban and rural areas are mentioned.

Table 3.1: Name of selected states, districts and number of households surveyed in both urban and rural areas

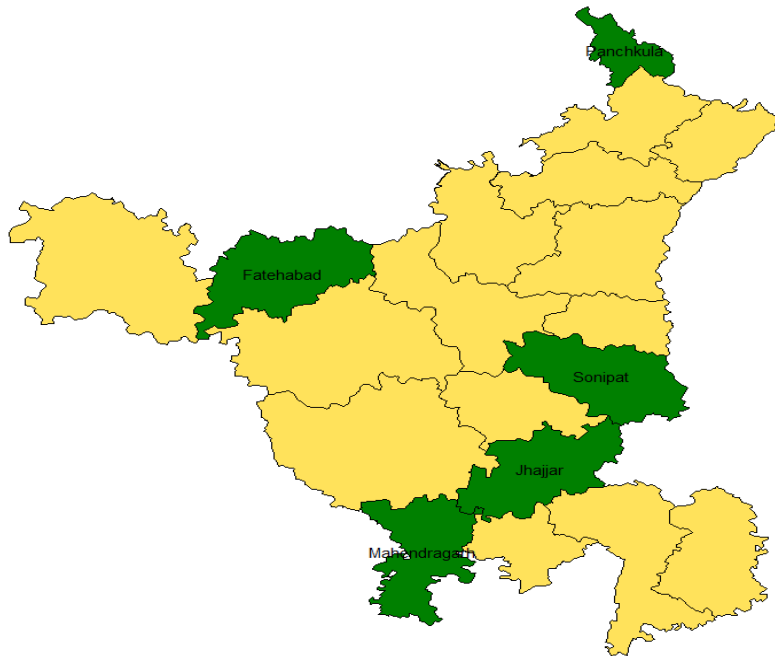
State	District	Number of households		
		Urban	Rural	Total
Uttar Pradesh	Prayag Raj	25	75	100
	Fatehpur	13	87	100
	Bareilly	35	65	100
	Mathura	30	70	100
	Bahraich	8	92	100
Haryana	Fatehabad	19	81	100
	Jhajjar	25	75	100
	Mahendragarh	14	86	100
	Panchkula	56	44	100
	Sonipat	32	68	100
Maharashtra	Ahmednagar	24	76	100
	Jalgaon	33	67	100
	Nagpur	70	30	100
	Pune	60	40	100
	Sindhudurg	13	87	100
Rajasthan	Alwar	20	80	100
	Hanumangarh	23	77	100
	Jodhpur	35	65	100
	Tonk	23	77	100
	Udaipur	23	77	100
Gujarat	Anand	30	70	100
	Banaskantha	4	96	100
	Kutch	23	77	100
	Rajkot	56	44	100
	Surat	80	20	100
Madhya Pradesh	Betul	40	60	100
	Jabalpur	40	60	100
	Ratlam	40	60	100
	Satna	40	60	100
	Sheopur	44	56	100
Tamil Nadu	Coimbatore	76	24	100
	Kanchipuram	64	36	100
	Nagappattinam	23	77	100
	Namakkal	40	60	100
	Tirunelveli	49	51	100
West Bengal	Dakshin Dinajpur	14	86	100
	Darjeeling	42	58	100
	Nadia	28	72	100
	Paschim Bardhaman	82	18	100
	Purba Medinipur	12	88	100

Figure 3.1: Districts selected from each state

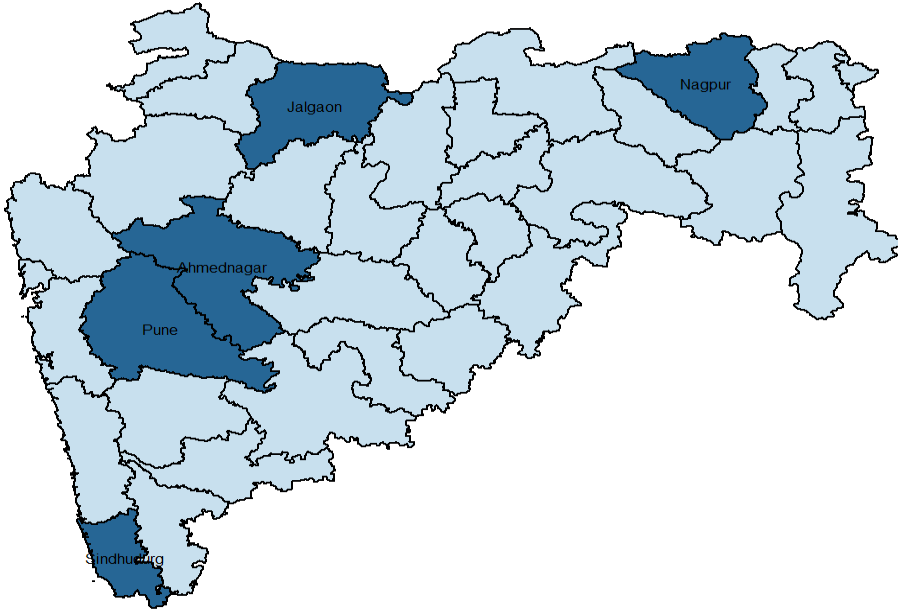
Districts selected in Uttar Pradesh



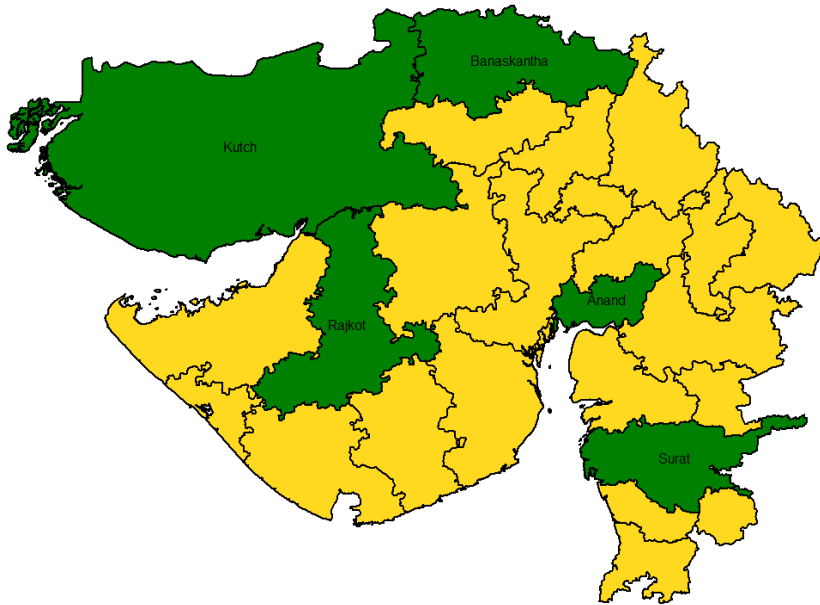
Districts selected in Haryana



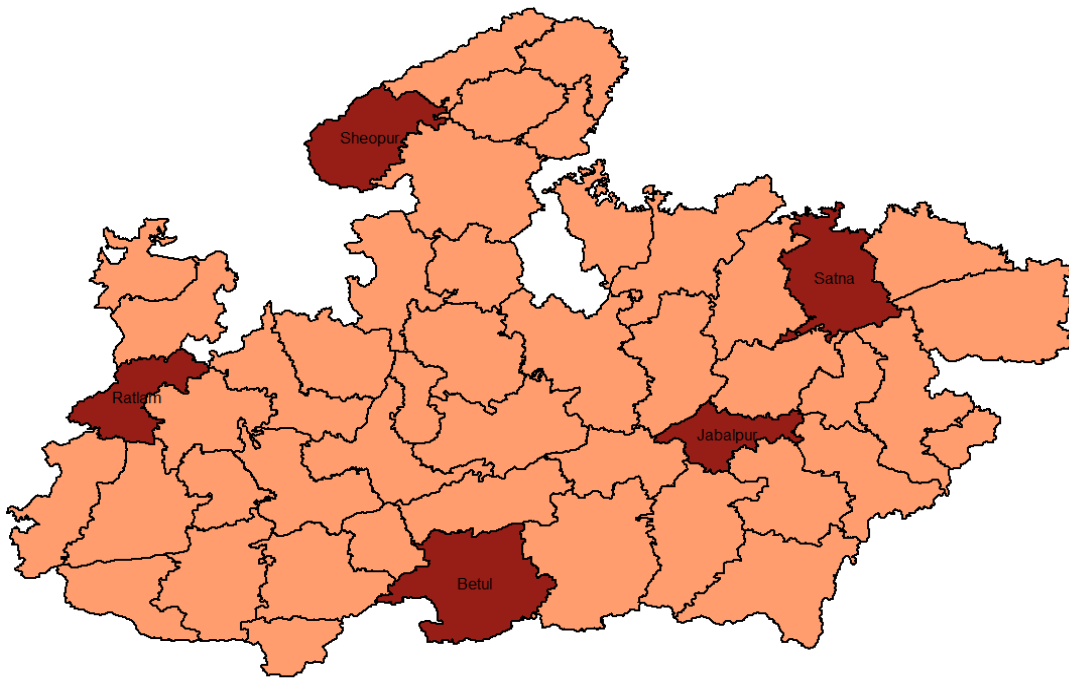
Districts selected in Maharashtra



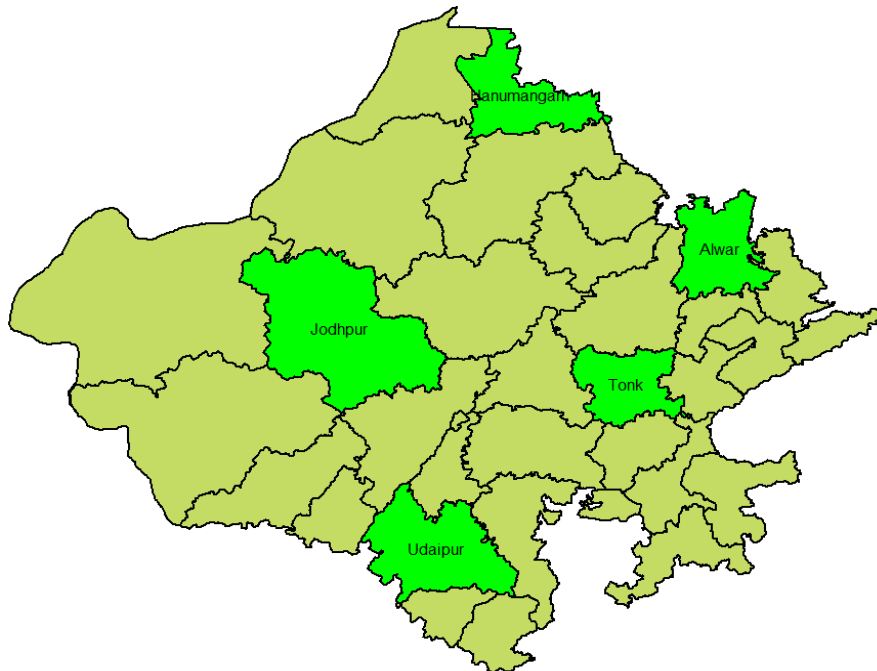
Districts selected in Gujarat



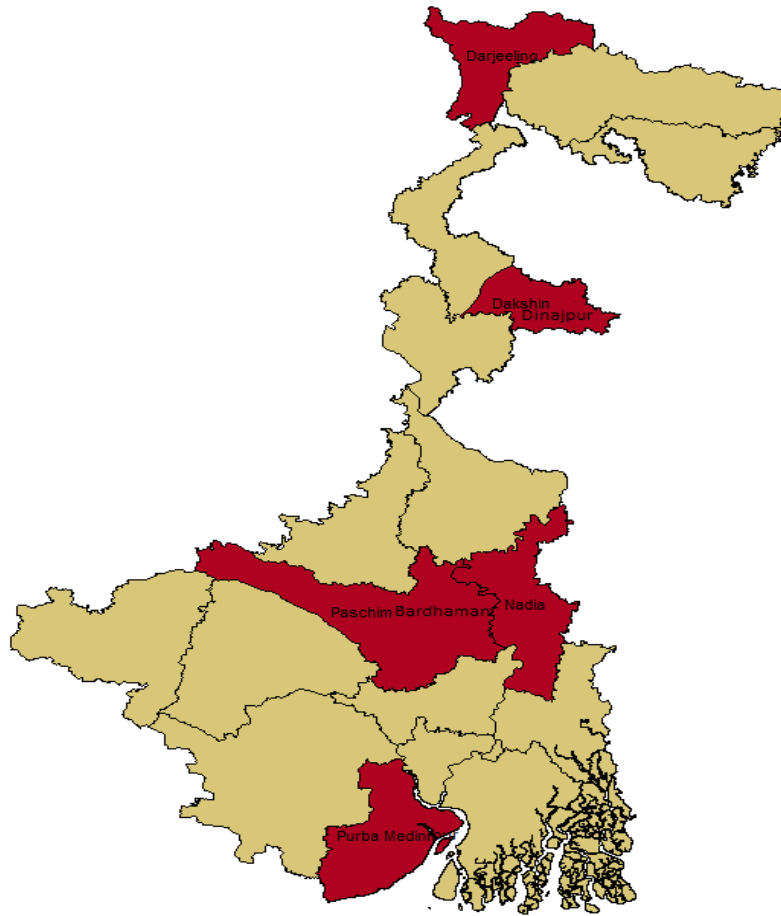
Districts selected in Madhya Pradesh



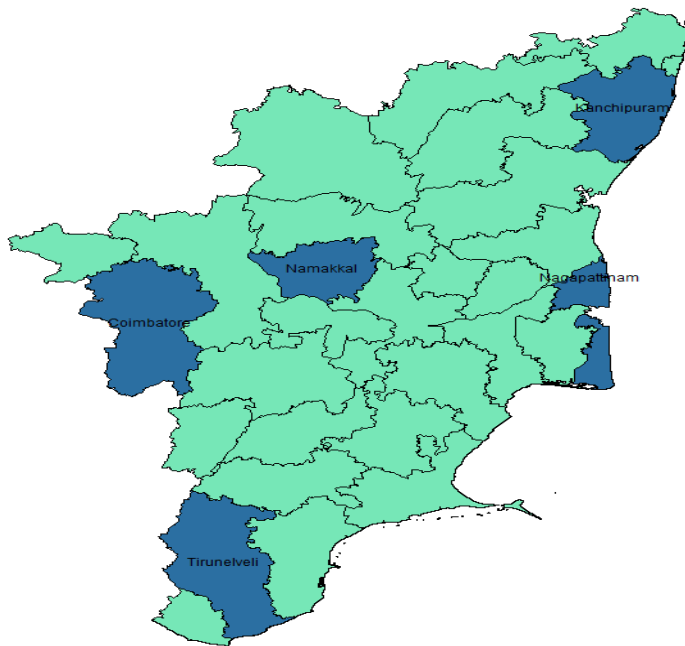
Districts selected in Rajasthan



Districts selected in West Bengal



Districts selected in Tamil Nadu



Various statistical and analytical tools were used in this study which are as follows:

The Annual compound growth rate (CAGR) model for estimating the growth in area (in '000 hectares), production (in'000 tonnes) and yield (kgs/hect.) were estimated using the exponential time trend equation of the form:

$$y = ab^t \quad (3.1)$$

Where, y = area / production/ yield of oilseed crops; a = intercept and b = regression coefficient of y on time t . It becomes linear when converted to ln form, i.e.,

$$\ln(y) = \ln(a) + t \ln(b) \quad (3.2)$$

$$Y = A + Bt \quad (3.3)$$

where, $Y = \ln(y)$, $A = \ln(a)$ and $B = \ln(b)$. Equation (3.3) is then fitted by using the method of least squares and the coefficients are estimated. Then, the compound growth rate is given in percent (%) = antilog (B -1) * 100.

Analysis of variance (ANOVA) is performed to study the influence of socioeconomic variables on the expenditure on edible oil by the households. The logistic regression model is another statistical technique that is utilized to show the comparative analysis of preference of edible oil in urban and rural households of India. The general mathematical equation for logistic regression is:

$$\log\left(\frac{p(x)}{1-p(x)}\right) = \beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_px_p \quad (3.4)$$

where, $p(x)$ is the probability characteristic of interest. In our case, oil used; x_j is the j^{th} predictor and β_j is the regression coefficient. The following equation can be utilised to estimate the probability that the given equation takes the value 1 as:

$$p(x) = \frac{1}{(1 + e^{-(\beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_px_p)})} \quad (3.5)$$

For assessing the demand projections, behaviouristic approach is used which is based on growth of population and changing behaviour of consumer according to changing per capita income in the economy. For supply projection, the compound annual growth rate of production of oilseeds in India was used.

Chapter 4

Scenario of Oilseeds and Edible Oils in India and the World

The present chapter investigates the global and Indian scenario of oilseeds and edible oil. These are examined through secondary information and the chapter is divided into four subsections. The first section focuses on the global outlook of oilseeds and edible oil. In the next section, Indian scenario of oilseeds is discussed. Trends in trade and prices of oilseeds and edible oil is investigated to understand the stand of India in the global market. Finally, the past consumption trends of edible oil by Indian households are discussed to assess the demand trends of different edible oils.

4.1 Global outlook of oilseeds and edible oil:

According to USDA report, the global production of oilseeds has increased from 474.6 million tonnes (MT) in 2013-14 to 593.6 MT in 2020-21. As of 2020-21, 31% of the produce have been traded increasing from 25% during 2013-14. In 2019-20, Brazil bypassed USA to become the leading producer of oilseeds, with India being the fourth largest producer of oilseeds. Brazil is the largest exporter of oilseeds, followed by USA, Canada and Argentina, whereas China is the major importer (53.4%) followed by EU, Mexico and Japan (Table 4.1).

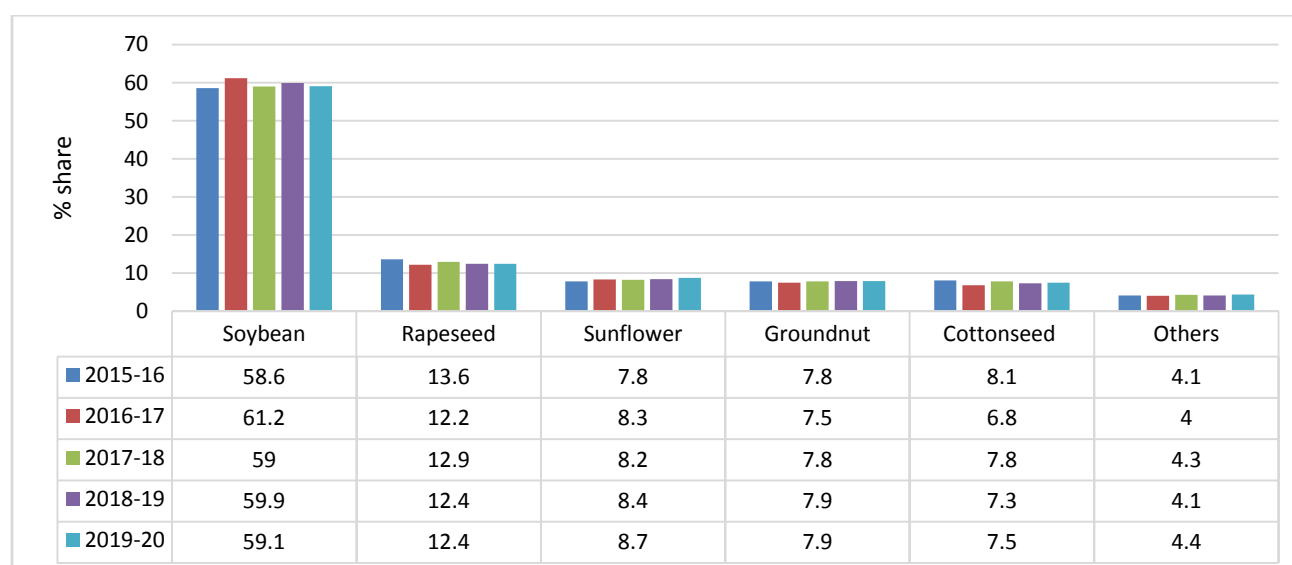
Table 4.1: Global scenario of oilseeds

Global	Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Production	(MT)	474.6	505.4	521.1	541.6	557.1	585.7	586.6	593.6
Traded	(%)	25	25.7	27.6	28.5	29.9	29.3	29.9	31
Producers (%)	USA	19.8	20.4	21.2	22.1	22.9	22.3	18.5	22.2
	Brazil	17.3	18	18.7	19.3	21.1	20.3	22.7	22.5
	Argentina	11	-	11.7	11.6	-	10.2	9.6	9.3
	China	12.5	11.6	10.9	10.3	10.5	10	10.9	10.6
	India	7.8	7.3	6.4	6.1	6	5.8	6.1	6.2
Exports (%)	Brazil	34.2	34.6	36.5	35.9	42	45.6	48.7	45.3
	USA	33.1	34.1	33.5	34.6	32.8	27.5	25.1	28.4
	Canada	-	9.2	9.1	9.1	9.7	9.3	7.5	7.8
Importer (%)	China	56.7	58.1	57.9	57.5	58.2	52.6	55.4	53.4
	EU	14.5	13.8	12.2	12.5	11.3	12.6	12.6	12
	Mexico	4.5	4.4	4	3.9	3.9	4.2	4.2	4.1
	Japan	4.6	4.4	4	3.8	-	-	3.2	3.2

Source: CACP reports, USDA reports.

In terms of type of seeds, the major oilseeds produced around the world are soybean, rapeseed, sunflower, groundnut and cottonseeds. Soybean alone has the largest share (59.1%) in world's oilseed production, followed by rapeseed (12.4%), sunflower (8.7%), groundnut (7.9%) and cottonseed (7.5%) during 2019-20. Since 2015-16, soybean and sunflower production has increased from combined share of 66.4% to 67.8% till 2019-20. On the other hand, rapeseed and cottonseed production has been declining while an increase in other oilseed production has been witnessed (Figure 4.1).

Figure 4.1: Global oilseed production



Source: CACP reports, USDA reports.

The global production of vegetable oil has increased from 162.2MT in 2013-14 to 206.1 MT in 2020-21, out of which 42% has been traded (Table 4.2). Indonesia has been the leading producer of vegetable oil increasing its share of production from 20.2% to about 23.4% from the period of 2013-14 to 2020-21. Whereas China (13.7% to 13.4%), Malaysia (13.1% to 10.5%) and EU (10.3% to 8.6%) witnessed the drop in total production in the same period. Indonesia and Malaysia are the major exporters of vegetable oil with a combined share of about 56% of the global exports in recent years. On the other hand, India, EU, China and USA are the major importers of vegetable oil. India alone is the major importer of edible oil in the world,

accounting for about 17.4 percent of the total imports of the world during 2020-21, peaking to 21.8 percent of global imports in 2017-18.

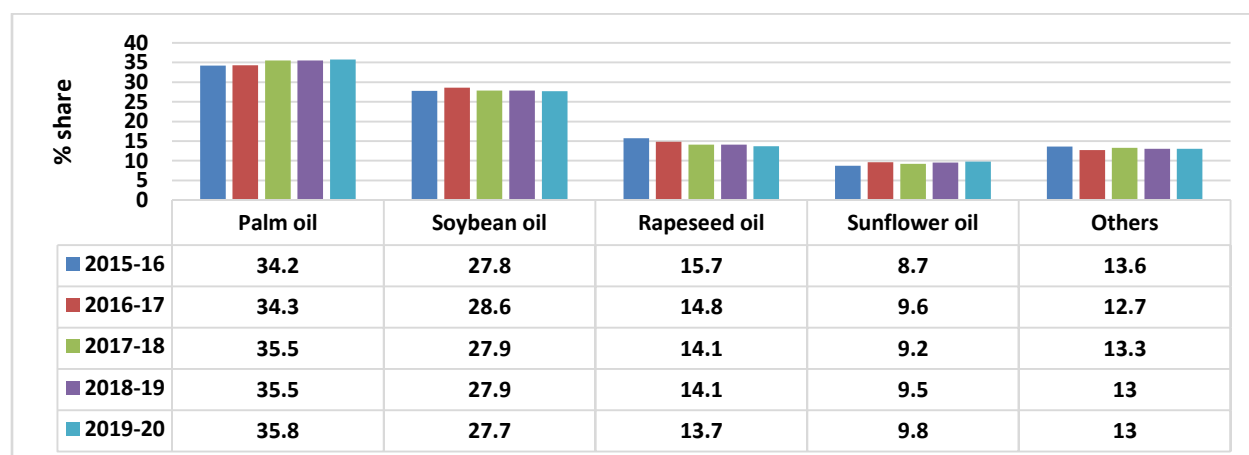
Table 4.2: Edible oil global scenario

Global	Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Production	(MT)	162.2	169.2	176.3	180	188.2	197	202.2	206.1
Traded	(%)	41.1	41.1	42.2	41	41.5	40.3	40.1	42
Producers (%)	Indonesia	20.2	20.8	20.9	20.9	22.1	23.2	23.6	23.4
	China	13.7	13.8	14.2	14.4	14.8	13.2	13.2	13.4
	Malaysia	13.1	13.1	12.7	11.8	11.6	11.3	10.1	10.6
	EU	10.3	10.2	10.2	10.1	9.6	9.2	8.9	8.6
Exports (%)	Indonesia	32.8	34.2	35.5	35.6	37.4	37.1	35.5	34.6
	Malaysia	28.6	27.4	25.4	24.1	22.7	21.9	20.8	21.6
Importer (%)	India	16.8	17.7	19	20.6	21.8	20.7	18.8	17.4
	EU	14.8	14.8	13.7	13.8	13	13.5	13.6	13.6
	China	15.7	14.2	12.5	11.4	10.2	12.8	14	15
	USA		5.9	5.9	6.3				

Source: CACP reports, USDA reports.

In terms of type of oil, as of 2019-20, palm oil had the largest share in total vegetable oil production (35.8%) followed by soybean oil (27.7%), rapeseed oil (13.7%) and sunflower oil (9.8%) (Figure 4.2). It can be observed that since 2015-16, the share of palm oil production and sunflower oil is increasing at the global scale whereas the production of rapeseed, soybean and other oils have declined.

Figure 4.2: Global edible oil production



Source: CACP reports, USDA reports

4.1.1 Trends in major oilseeds and their oils

4.1.1.1 Soybean

Soybean has an important place in world's oilseed cultivation scenario due to its high productivity and profitability. In 2019-20, the global production of soybean was 346.8 MT as compared to 264.4 MT during 2013-14 (Table 4.3). Of the total produce about 45 percent was traded during the period of 2019-20. The soybean sector is also highly concentrated, with cultivation mainly focused in the United States, Brazil, and Argentina, with India ranking a distant fifth. USA has been the major producer of soybean till 2018-19, after which Brazil surpassed USA, contributing about 35.5% of total production of soybean in 2019-20. India contributes about 2.8% in global soybean production. Brazil and USA are the major exporter of soybean with the combined share of 84.4% of total exports. China and EU, on the other hand, are the largest importers of soybean.

About 84% of the world's soybean was processed into soybean meal and soybean oil in 2019-20. Approximately 98% of the soybean meal is crushed and further processed into animal feed with the balance used to make soy flour and proteins. Of the oil fraction, 95% is consumed as edible oil; the rest is used for industrial products such as fatty acids, soaps and biodiesel¹.

Table 4.3: Global trends of Soybean during 2013-20

Soybean		2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Production	In (MT)	264.4	290.3	305.3	328.3	335.1	349.9	346.8
Traded	(%)	38	39	41	42	43	42.4	45
Producer (%)	USA	33	32.3	33.3	33.3	35.4	34.1	32.4
	Brazil	30	30.4	30.6	32.5	25.4	33.7	35.5
	Argentina	18	18.9	18.7	16.5	11.1	14.1	13.6
	China		4.3			4.5	4.3	4.7
	India		3.5	2.8	3.3	2.5	2.9	2.8
Exporter (%)	Brazil	41	41	40.9	43	49.8	47.7	52
	USA	39	38.5	39.7	40	37.8	36.7	32.4
Importer (%)	China	63	63.3	62.6	65	61.3	61	59.2
	EU	13	11.8	11.4	9.3	9.5	9.7	9.7

Source: CACP reports, USDA reports.

According to USDA, as of 2019-20, production of soybean oil was about 56.3MT and that of soybean meal was 236.3MT (Table 4.4 and 4.5). Soybean oil is majorly produced by

China contributing 28.3% in global produce followed by USA, Brazil, Argentina and India. On the other hand, Brazil, Argentina and India were the major producers of soyabean meal. Brazil has been one of the major producer and exporter of soyabean oil and soyabean meal. On the other hand, India which is the fifth largest producer of soybean, soybean oil and meal is also the largest importer of soybean oil in world with a share of 30.3% of the global imports in 2019-20.

Table 4.4: Soybean oil global outlook

Soyabean oil	Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Production	(MT)	43.4	45.7	48.8	51.6	53.5	54.9	56.3
Traded	(%)	20	22	22	21	20.5	19.9	20
Producer (%)	China	27	27.2	27.5	29.3	29.2	28.6	28.3
	USA	21	20.3	19.7	18.6	19.5	19.3	19.6
	Brazil	16	15.7	15.4	14.6	15.5	14.8	14.9
	Argentina	15	15.2	15.6	15.6	13.2	14.3	13.5
	India			2.7	3.1	2.5	2.9	2.8
Exporter (%)	Argentina	45	45.1	46.1	47.5	40	45.1	65
	Brazil	17	13.9	13.7	10.9	14.5	11.7	
	USA	9	9.2		10.2	10.6	9.6	
Importer (%)	China	17	12.7	8.8			6.3	7.1
	India	16	20.6	28.7	32.3	30.3	30.7	30.3
	Bangladesh				7.6	7.9	8.7	8

Source: CACP reports, USDA reports.

Table 4.5: Soybean meal global outlook

Soyabean meal	Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Production	(MT)	183.2	192.7	205.2	217	225	230.7	236.3
Traded	(%)	32	31	31	28.5	28	28.4	28
Producer (%)	China	28	28.6	28.9	31		30.1	29.8
	USA	20	19.7	19.2	18	19.2	18.7	19.1
	Brazil	15	15	14.7	14	14.8	14.2	14.3
	Argentina	15	14.7	14.9	14.7	12.1	13.4	12.6
	India	4	3.5	2.9	3.3	-	-	-
Exporter (%)	Argentina	42	42.5	43.9	48.5	39	43.9	41.3
	Brazil	24	22.9	22.9	21.3	25	23.3	24.8
	USA	17	17.9	17.4	16.3	21	18.1	18.8
Importer (%)	EU	33	31.6	31.6	31.5	30.4	30.4	29.1
	Indonesia	6	6.5	6.7	7.1	7.7	7.2	7.4
	Vietnam	5	6.1	7	7.7	8	8.3	8.1

Source: CACP reports, USDA reports.

4.1.1.2 Groundnut

Groundnuts, or peanuts are a legume, root crop. They are native to South America but are cultivated in many parts of the world. Groundnut is consumed as snacks, processed as food ingredients and crushed for oil but has been increasingly used for direct consumption as it is the cheapest among all nuts². As per USDA, global production of groundnuts during the period 2019-20 was 46.6 MT, out of which 8.4% was traded (Table 4.6). China, India, Nigeria and USA together produce about two-third of global groundnut during 2018-19. India is the second largest producer of groundnut in the world after China with a share of 13.2% in global production in 2018-19. India, China, Argentina and USA are the major exporters of groundnut in the world.

Table 4.6: Global outlook of groundnut during 2013-20.

Groundnut		2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Production	(MT)	39.4	40.3	40.5	41.21	43.5	46.2	46.6
Traded	(%)	0.07	7	8	8.5	8	7.2	8.4
Producer (%)	China	42	42.4	41.1	40	38.1	36.4	
	India	13	13.1	13	15.7	14.8	13.2	
	Nigeria	8	7.7	7.3	7	7.1	8.8	
	USA	6	6.2	5.7	5.9	7.2	6	

Source: CACP reports, USDA reports.

Groundnut oil is the major derivative of groundnut. According to USDA report, the global production of groundnut oil during 2019-20 was 6MT out of which only 5.2% is traded. This suggests that most of the groundnut oil is produced for self-consumption. China (49.7%) and India (19.5%) produce nearly 70 percent of the total world production. Despite being the largest producer, China is the largest importer of groundnut oil followed by EU and USA, constituting more than 90 % of global imports, whereas India and China export in small quantities of groundnut oil (Table 4.7).

Table 4.7: Global scenario of groundnut oil

Groundnut oil		2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Production	(MT)	5.4	5.5	5.5	5.6	5.7	5.8	6
Traded	(%)	3	4	4	4.2	4.4	4.6	5.2
Producer (%)	China	49	49	50.2	48.8	48.1	48.5	49.7
	India	22	21.4	18.8	21.1	21.6	20.4	19.5

Source: CACP reports, USDA reports.

4.1.1.3 Rapeseed & Mustard (R&M)

Rapeseed & Mustard (R&M) are grown all over the world, but their cultivation is mainly confined to India, China, Canada, Germany, France, Austria and USA. Globally, the production of R&M oilseeds in 2020-21 have been 71MT out of which nearly one-fifth (22.3%) was traded (Table 4.8). India ranks fourth in the global production of R&M oilseeds after Canada, EU and China. Canada accounts for about 27.7% of the global R&M oilseeds production followed by EU (24.2%), China (19%) and India (11.2%). Canada alone constitutes 63.1% of the global export of the oilseeds. EU, China and Japan together account for 69.7% of the global import of oilseeds.

Table 4.8: Global outlook of R&M oilseeds

USDA		2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Production	(MT)	65.3	68.9	70.4	70.1	71.9	72.3	71.8	71
Traded	(%)	20	20	20.7	21.1	21.7	21.7	21	22.3
Producer (%)	Canada	23.7	22.9	24.7	20.5	28.9	29	27.9	27.7
	EU	30.6	31.5	32.1	31.8	29.8	27.6	24.7	24.2
	China	21.3	20.9	20.6	25.3	19.4	17.7	19.2	19
	India	10.4	10.3	8.6	8.5	7.9	11	11.3	11.2
Exporter (%)	Canada	61.1	60.1	63.2	66.8	69.1	66.1	62.6	63.1
Importer (%)	China	24.6	29.9	31.9	27.6	27.7	26	18.3	19.5
	EU	26.3	23.1	20	22.3	26.5	29.2	39.3	35.6
	Japan	18.4	17.4	16.9	16.6	14.9	15.9	14.9	14.6

Source: CACP reports, USDA reports.

The global production of R&M oil, on the other hand, in 2020-21 is 28.2 MT of which 20% is traded as compared to 25 MT in 2013-14. EU is the major producer of R&M oil followed by China, Canada and India. However, EU has witnessed decline in the percentage share of production from 37.1% in 2013-14 to 33% in 2019-20. India and Canada on the other hand have increased share in production of R&M seeds. Canada and EU are the major exporter of the oil constituting about 66% of the global export. India, on the other hand has remained the third largest importer of R&M oil after China and EU (Table 4.9).

Table 4.9: Global outlook of R&M oil during 2013-20

R&M oil		2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
MT	Production	25	26.2	27.4	27.8	28.3	27.9	27.8	28.2
(%)	Traded	15.7	15	15	15.1	15.6	16.6	17.7	20
Producer (%)	EU	37.1	37.5	37.3	36.9	36.4	34.8	34.5	33
	China	24	24.3	25.4	25.1	25.1	23.4	21.9	22.1
	Canada	12.2	11.5	12	13.1	-	14.8	15.8	15.3
	India	9.5	9.3	7.1	6.8	-	9.2	9.7	9.6
Exporter (%)	Canada	65.1	62.4	62.6	65.6	68.8	65.7	63.4	58.9
	EU	8.9	9.3	8.4	8.1	6	4.5	5	7.1
Importer (%)	China	33.2	29.1	20.8	17.6	15.9	27.8	32.7	34.5
	EU	9.4	6.8	6.8	4.9	3.4	5.1	5.1	6.3
	India	-	3.7	8.3	9.7	8.4	5.1	0.8	1.3

Source: USDA reports and CACP annual reports.

4.1.1.4 Sunflower

Sunflower seeds are one of the most nutritious and healthy foods. Due to source of high-quality edible oil, sunflower oil is used as cooking oil in different recipes. Its importance increases as sunflower oil is considered as a heart friendly oil³. According to USDA, global production of sunflower seeds during 2019-20 was 51.1 MT as compared to 39.8 MT in 2013-2014 (Table 4.10).

Table 4.10: Global production of sunflower during 2013-14 to 2019-20

Sunflower	Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
(MT)	Production	39.8	39.3	40.5	43.9	45.2	48.8	51.1
(%)	Traded	4	4	4.7	5.1	4.8	5	6
Producer (%)	Ukraine	26	26	27.6	32	28.9	30	29.5
	Russia	24	23.2	23	22.8	21.9	23.2	25
	EU	20	21.1	21	18	20.4	19.3	19.1
	Argentina	7	7	6.4	7.1	7.5	7.5	6.9
Exporter (%)	EU	33	34.7	29.5	14.2	25.3	20	18.3
	Russia	9	4.5	5.3	14.8	3.8	10	18.3
	Ukraine	9	4.8	3.5	7.7		4.2	
Importer (%)	Turkey	45	39.7	30.6	27.8	33.4	33.9	37.5
	EU	18	18.8	25.5	31.8	23.7	25.4	25.2

Source: CACP reports, USDA reports.

Ukraine, Russia and EU contribute in three-fourth production of the global sunflower seeds and are also the largest exporters. Argentina produces about 6.9% of the total produce. Turkey accounted for 37.5% and EU 25.2% of the total imports. The global production of the sunflower oil, on the other hand, in 2019-20 increased to 19.8MT as compared to 14.8MT in 2013-14 (Table 4.11). Ukraine, Russia and EU remained the major producer of the sunflower oil too with Ukraine and Russia accounting for 78% of the global export. EU and Turkey are the major importers of the sunflower oil since 2013 but in 2015-16, India reported to have imported about 23.1% of the global imports of sunflower oil.

Table 4.11: Global scenario of sunflower oil from 2013-2020

Sunflower oil		2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
(MT)	Production	14.8	14.7	15.3	16.8	17.3	18.7	19.8
(%)	Traded	43	47	50	55	51	52.1	58
Producer (%)	Ukraine	28	28.7	30.7	34.9	32.3	33.2	-
	Russia	24	23.9	23.2	23	22.7	23.6	-
	EU	20	20.2	20.4	18.3	19.9	19.3	-
Exporter (%)	Ukraine	54	54.8	54	56.2	55.1	54.8	52.5
	Russia	21	20.3	20.6	20.9	23.8	22.7	25.5
Importer (%)	EU	-	-	16.4	20.3	17.9	19.6	20
	Turkey	-	-	11.4	8.8	5.9	6.8	6.6

Source: CACP reports, USDA reports.

4.2. Indian scenario of oilseeds

4.2.1 Trends in Area, production and yield of oilseeds in India

In India, oilseeds occupy a major position after foodgrains. As per the recent estimates by Directorate of Economics and Statistics, the area, production and yield of oilseeds is 28.8 million hectares, 35.9 million tonnes and 1247 kg/Hect. in 2020-21 as compared to 27.1 million hectares, 33.2 million tonnes and 1224 kg/Hect. in 2019-20, respectively. The percentage share of oilseeds' area, production and yield in comparison of food grains and other crops grown are presented in Table 4.12. It is evident that in 2000-01, the share of oilseeds' area was 14.4% with production of about 3.5% and yield of 24%. The country accounts for about 15.7 % of oilseeds area and 4.4% of oilseeds production as compared to total area and production under food grains, oilseeds and other crops during 2019-20. It is observed that even though overall area and production in the country is rising continuously, the period of 2005-06 records the maximum area (17.1%) and production (5.1%) under oilseeds.

Table 4.12: Percentage share of oilseeds in area, production and yield of total crops grown in India during 2000-01 to 2019-20

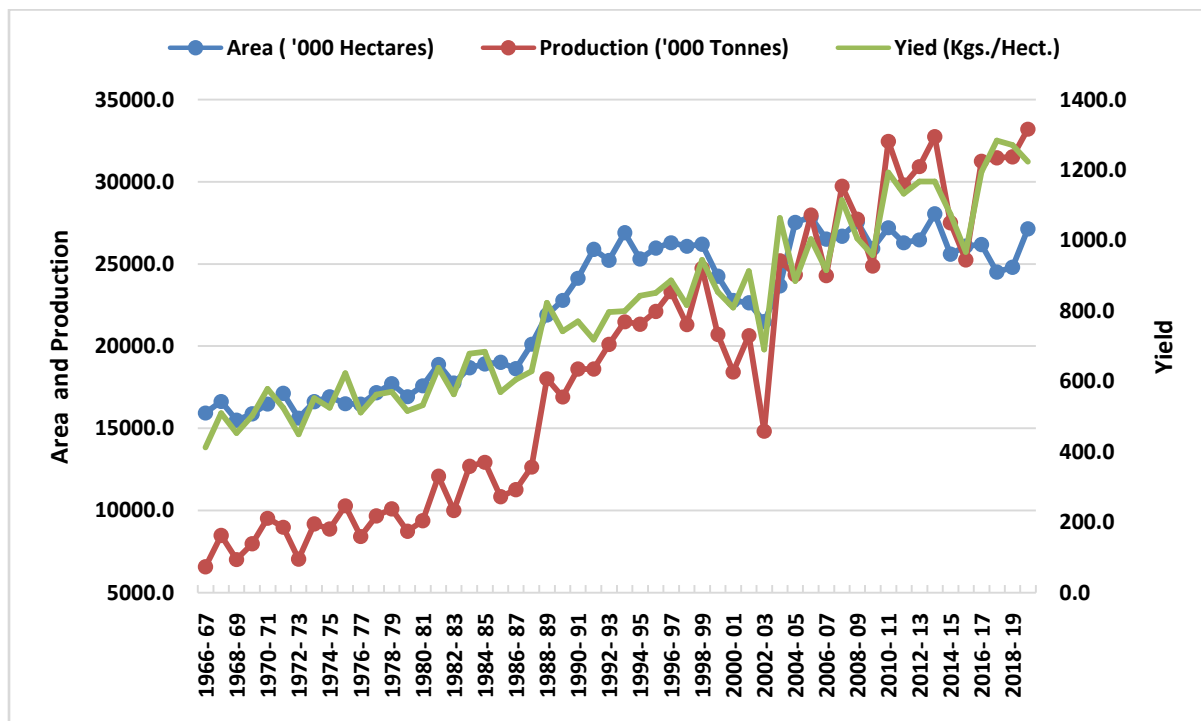
Area ('000 hectares)					
Year	Food grains	Oilseeds	Others	Total	% Share of oilseeds
2000-01	121048	22770	13868	157686	14.4
2005-06	121600	27863	13777	163239	17.1
2010-11	126671	27224	16992	170888	15.9
2015-16	123218	26087	18001	167306	15.6
2019-20	126991	27139	18753	172883	15.7
Production ('000 Tonnes)					
Year	Food grains	Oilseeds	Others	Total	% share of oilseeds
2000-01	196814	18440	316036	531290	3.5
2005-06	208602	27978	310510	547090	5.1
2010-11	244492	32479	386002	662972	4.9
2015-16	251542	25251	388977	665769	3.8
2019-20	297500	33219	416442	747161	4.4

Note: Others include fiber crop such as jute and mesta, cotton and commercial crop such as, sugarcane.

Source: Directorate of Economics and Statistics.

However, the area, production and yield of oilseeds in India has witnessed a substantial shift since 1966-67. Thesequential trends in area, production and yield of major oilseeds crops are depicted in Figure 4.3 and analysed. The area under oilseeds cultivation saw an upward trend since the period of 1966-67. The area increased tremendously after implementation of TMO in 1986 reaching peak in 1993-94, after which a sharp decline in the area was witnessed in 2002-03 and rose thereafter. The production and yield of oilseeds also witnessed an upward trend after TMO, but sharp increase was observed only after 2002-03. As of 2019-20, the area under oilseed is 27139.3 ('000 Hect.) with a production of 33219.2 ('000 tonnes) and yield of 1224 Kgs/Hect.

Figure 4.3: Area, production and Yield of India during 1966-67 to 2019-20



Source: Directorate of Economics and Statistics

The production of the oilseeds jumped from 65.75LT in 1966-67 to 332.19LT in 2019-20 with the compound annual growth rate (CAGR) of area, production and yield was 1.17%, 3.13% and 1.93%, respectively. The instability in area, production and yield of the oilseeds has been computed using coefficient of variation. During this period, the maximum variability has been observed in the case of production (46.1%), followed by yield (31%) and area (19.6%) of oilseeds. India's area, production and yield under oilseeds has been on the rising trend.

Majorly grown oilseeds in the nation includes seven edible oils (groundnut, soybean, sunflower R&M, sesame, safflower and nigerseed and two non-edible oilseeds such as castor and linseed. The percentage share of the nine oilseeds in total area and production of oilseeds during 2010-11 and 2019-20 are enlisted in Table 4.13. During 2019-20, soybean has the maximum share of 44.9% and 33.8% in area and production out of all the oilseeds grown in India, respectively. Even though R&M oilseed have more area (25.3%) under cultivation than groundnut (17.8%), the share in production of groundnut is 30% as compared to R&M with 27.5% of the total production in India. The percentage share of area under nigerseed, sunflower, linseed and safflower has reduced from 1.4 %, 3.4%, 1.3% and 0.9% in 2010-11 to 0.5%, 0.8%,

0.7% and 0.2% during 2019-20, respectively. On the other hand, the area under castor seed increased from 3.2% to 3.9% in 2019-20 as compared to sesamum which saw a decline in percentage share of area under cultivation from 7.7% in 2010-11 to 6% in 2019-20.

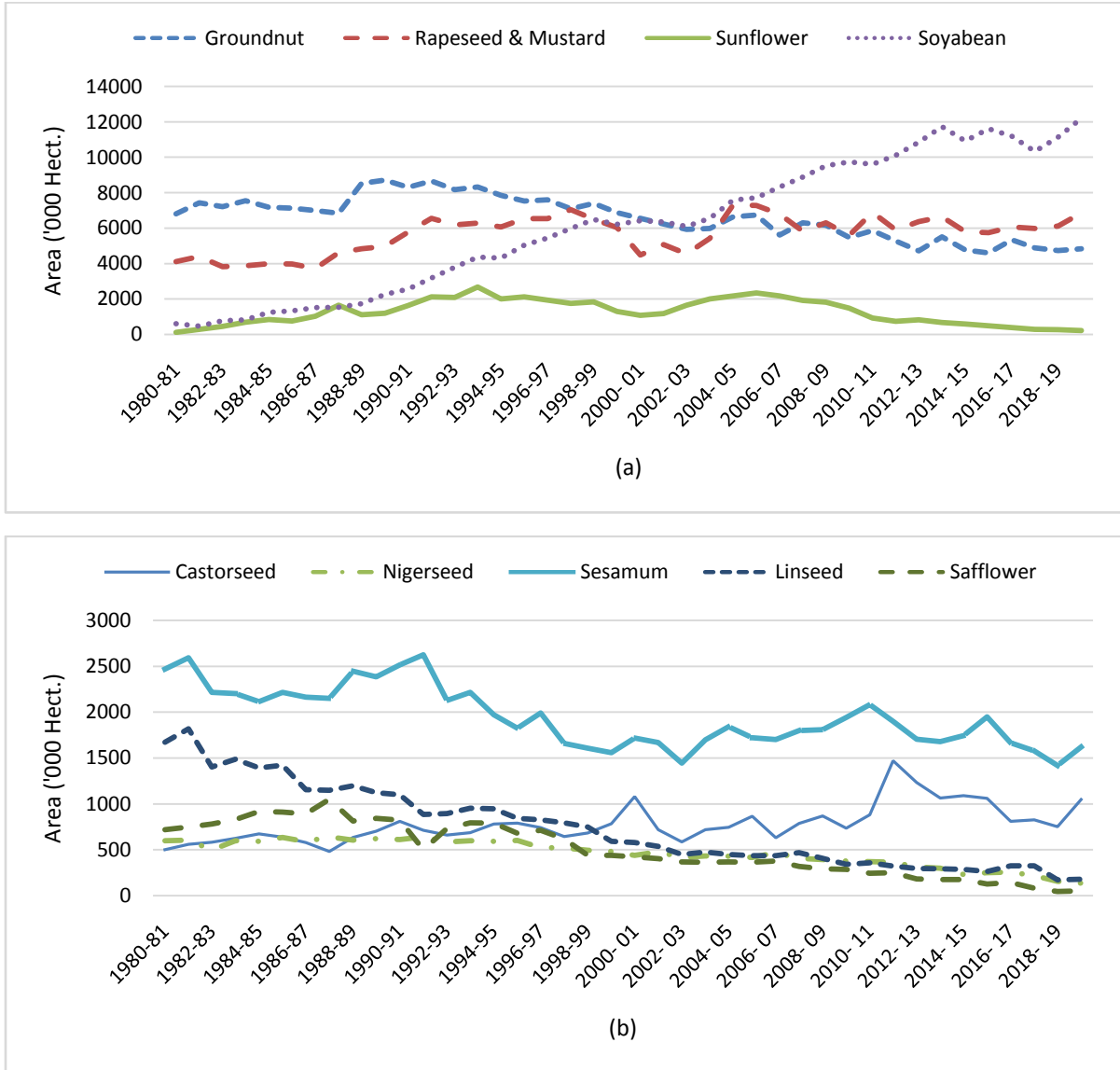
Table 4.13: Percentage share of major oilseeds in area, production and yield during 2010-11 and 2019-20 in India

Crops	2010-11		2019-20	
	Area (%)	Production (%)	Area (%)	Production (%)
Groundnut	21.5	25.4	17.8	30.0
Castor seed	3.2	4.2	3.9	5.5
Niger seed (Ramtil)	1.4	0.3	0.5	0.1
Sesamum	7.7	2.7	6.0	2.0
Linseed	1.3	0.5	0.7	0.4
R&M	25.3	25.2	25.3	27.5
Sunflower	3.4	2.0	0.8	0.6
Soybean	35.3	39.2	44.9	33.8
Safflower	0.9	0.5	0.2	0.1
Total	100.0	100.0	100.0	100.0

The area under various oilseeds in India is depicted in Figure 4.4. It is evident that the soybean, R&M and groundnut are majorly grown oilseeds in India. Soybean's area has seen an upward trend after 2002-03. On the other hand, area under groundnut production has been declining. The area under R&M has increased from 4112 ('000 Hect.) in 1980-81 to 7316 ('000 Hect.) in 2004-05 after which it declined to 6856 ('000 Hect.) in 2019-20. The area under sunflower, on the other hand, has declined to 228 ('000 Hect.) in 2019-20 from the peak of 2667.8 ('000 Hect.) in 1993-94 (Figure 4.4.a). The area under nigerseed has increased to 1046.29 ('000 Hect.) from 497 ('000 Hect.) in 1980-81. However, the area under sesamum, linseed and safflower has declined since 1980-81 (Figure 4.4.b).

The trends in production of various oilseeds are presented in Figure 4.5. India has been major producer of soybean oilseeds since 1980-81 with a production of 112.25 Lakh tonnes (LT) during 2019-20 followed by groundnut with 99.52 LT and R&M with 91.23 LT of production. The production of sunflower oilseeds increased from 0.66 LT in 1980-81 to 14.63 LT in 2007-08 after which the production declined continuously reaching to 2.12 LT in 2019-20 (Figure 4.5.a).

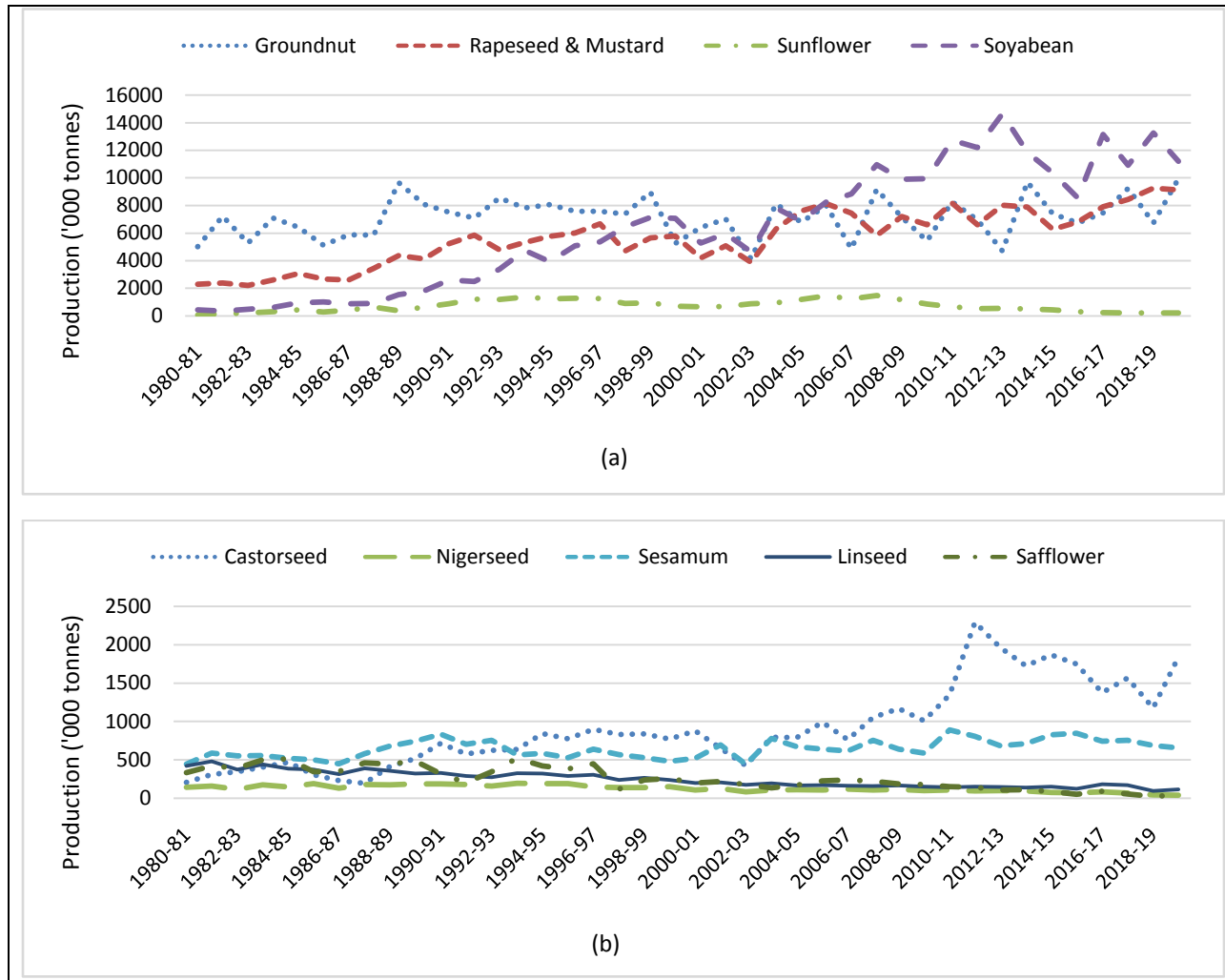
Figure 4.4: Trends in Area under various oilseeds during 1980-2020.



Source: Directorate of Economics and Statistics

Other oilseeds such as nigerseed, linseed and safflower also exhibit the declining trend in production. As of 2019-20, the production of linseed was 1.2 LT, safflower 0.43 LT and nigerseed was 0.4 LT. The graph of castorseed and sesamum production manifests the increase in production of oilseeds from 2.05 LT and 4.45 LT in 1980-81 to 18.42LT and 6.57 LT in 2019-20, respectively (Figure 4.5.b).

Figure 4.5: Production trends of various oilseeds in India during 2000-20



Source: Directorate of Economics and Statistics

4.2.2 Period wise growth rate and variation in oilseeds

Period wise growth rates in terms of compound annual growth rate (CAGR) per annum are computed for understanding the decadal growth trend in area, production and yield of nine oilseeds in India for the period of 1980-81 to 2019-20 (Table 4.14). During this period, the area, production and yield of nine oil crops have jumped from 17603 ('000 hectares), 93.73 LT and 532 kg/hectare during 1980-81 to 27139 ('000 hectares), 332.19 LT and 1224 kg/hectare during 2019-20, respectively. The area, production and yield during this period grew with the rate of 0.91%, 2.86% and 1.94%, respectively. Also, the area under soybean grew with the rate of 7.71% while the expansion rate of safflower was -6.05% during the same period.

Table 4.14: Period wise CAGR of area, production and yield of nine oilseeds at India level during the period of 1980-2020

Area					
Crops	1980-81 to 1989-90	1990-91 to 1999-00	2000-01 to 2009-10	2010-11 to 2019-20	1980-81 to 2019-20
Groundnut	1.65	-2.31	-0.96	-1.47	-1.34
Castorseed	1.67	-0.31	-0.53	-3.58	1.4
Nigerseed	0.98	-2.95	-1.6	-9.83	-2.91
Sesamum	-0.53	-5.52	1.64	-2.74	-1.03
R&M	1.94	0.71	3.34	-0.23	1.11
Linseed	-4.87	-4.66	-4.01	-5.82	-5.26
Safflower	2.27	-4.67	-3.77	-17.02	-6.05
Sunflower	25.66	-2.97	4.31	-15.14	-0.84
Soybean	17.22	10.22	5.73	1.53	7.71
Total	2.44	0.15	2.45	-0.62	0.91
Production					
Crops	1980-81 to 1989-90	1990-91 to 1999-00	2000-01 to 2009-10	2010-11 to 2019-20	1980-81 to 2019-20
Groundnut	3.76	-4.98	0.78	2.41	0.41
Castorseed	3.33	3.51	6.2	-2.25	4.99
Nigerseed	2.71	-3.11	-0.08	-9.39	-2.6
Sesamum	3.21	-4.81	1.5	-1.94	0.87
R&M	7.28	0.77	5.7	2.26	3.15
Linseed	-3.1	-2.69	-2.81	-2.04	-3.37
Safflower	1.87	-3.9	0.65	-15.62	-5.34
Sunflower	21.3	-3.18	6.09	-13.08	0.55
Soybean	17.95	13.05	8.93	-1.15	9.01
Total	5.46	2.17	5.13	0.28	2.86
Yield					
Crops	1980-81 to 1989-90	1990-91 to 1999-00	2000-01 to 2009-10	2010-11 to 2019-20	1980-81 to 2019-20
Groundnut	2.08	0.83	1.75	3.94	1.78
Castorseed	1.63	3.83	6.77	1.38	3.44
Nigerseed	1.73	-0.17	1.55	0.48	0.31
Sesamum	3.75	0.75	-0.14	0.82	1.93
Rapeseed&Mustard	5.24	0.06	2.29	2.49	2.02
Linseed	1.86	2.07	1.26	4.01	2
Safflower	-0.39	0.81	4.59	1.69	0.75
Sunflower	-3.47	-0.22	1.71	2.43	1.4
Soybean	0.62	2.57	3.02	-2.64	1.21
Total	2.95	2.01	2.62	0.9	1.94

The production growth rate ranged from -5.34% for safflower to 9.01% case of soybean. Castorseed and R&M also exhibits decent growth rates. At the time of yellow revolution, the overall area, production and yield of oilseeds experienced a significant growth. The higher growth rate in the period of 1980-81 to 1989-90 may be attributed to the initiatives of Government of India in the form of implementation of TMO in 1986 with increase in irrigated land and availability of high-yielding seeds. During 1990-91 to 1999-2000, the annual growth rate of area, production and yield fell off to 0.15 %, 2.17 % and 2.01%, respectively as compared to 2.44%, 5.46% and 2.95 % in 1980-81 to 2019-20 (Table 4.14). The reverse trend in 1991-2000 may be due to opening of imports and exports of agricultural commodities. The period of 2000-01 to 2009-10 also saw an increase in the overall area, production and yield with rate of 2.45%, 5.13% and 2.62 %, respectively. The area under all oilseeds declined in 2010-11 to 2019-20, except for soybean which saw a rise of 1.53%, whereas the growth of production was 0.28%. Groundnut has shown the highest increase in yield by 3.94% per annum during 2010-11 to 2019-20 whereas soybean was the only oilseed with negative yield growth (-2.64%) during the same period (Table 4.14).

As is evident, soyabean production in the country recorded a positive growth rate of 9.01% per annum during 1980-81 to 2019-20, with maximum production in 1980-81 to 1989-90 having annual growth rate of 17.95%. The growth in this time period was mainly due to significant increase in area under soybean with the rate of 17.22% in 1980-81 to 1989-90, after which the growth rate fell down to 1.53% during 2010-11 to 2019-20. The period also witnessed the negative annual growth rate in production of 1.15% in 2010-11 to 2019-20. The maximum increase in yield was witnessed in 2000-01 to 2009-10 with the growth rate of 3.02% after which it declined by -2.64% in 2010-11 to 2019-20.

However, the overall growth rate of area, production and yield per annum under groundnut has been -1.34%, 0.41% and 1.78%, respectively in 1980-81 to 2019-20. The area under groundnut grew to 1.65% during 1980-81 to 1989-90 but has been declining since then. During the period of 2010-11 to 2019-20, the area under groundnut decreased by the rate of -1.47%, growth rate of production was 2.41% and that of yield was 3.94%.

Since 1980-81 to 2019-20, overall area under R&M oilseed grew with the rate of 1.11%, production with 3.15% and yield by 2.02%. A decline in area during 2010-11 to 2019-20 was

observed with the rate of -0.23% but the production and yield saw an upward trend with growth rate of 2.26% and 2.49%, respectively.

The period wise growth rate suggests that after the initial increase in area and production of sunflower during 1980-81 to 1989-90, a declining trend has been observed with the overall growth rate in area being -0.84% and the production grew with the rate of 0.55% during 1980-81 to 2019-20 (Table 4.14). A major decline in growth rate is observed in the last decade with growth rate of area being -15.14% in 2010-11 to 2019-20 and that of production being -13.08%. On the other hand, minimum growth rate of yield was observed in 1980-81 to 1989-90 with a CAGR of -3.47% which increased to 2.43% in 2010-11 to 2019-20.

The instability in area, production and yield during the period of 1980-81 to 2019-20 has been estimated in terms of coefficient of variation (CV) and presented in Table 4.15. On the overall basis, the variability in area during 1980-81 to 2019-20 was (13.18%), production was 32.43% and that in yield was 23.65%. The maximum variability in area was observed during 2000-01 to 2009-10 with the CV of 9.43%, whereas the maximum variation in production and yield was estimated to be during the period of 1980-81 to 1989-90 with the CV of 22.10 and 13.74, respectively.

Table 4.15: Coefficient of variation in oilseeds area, production and yield in India during 1980-81 to 2019-20

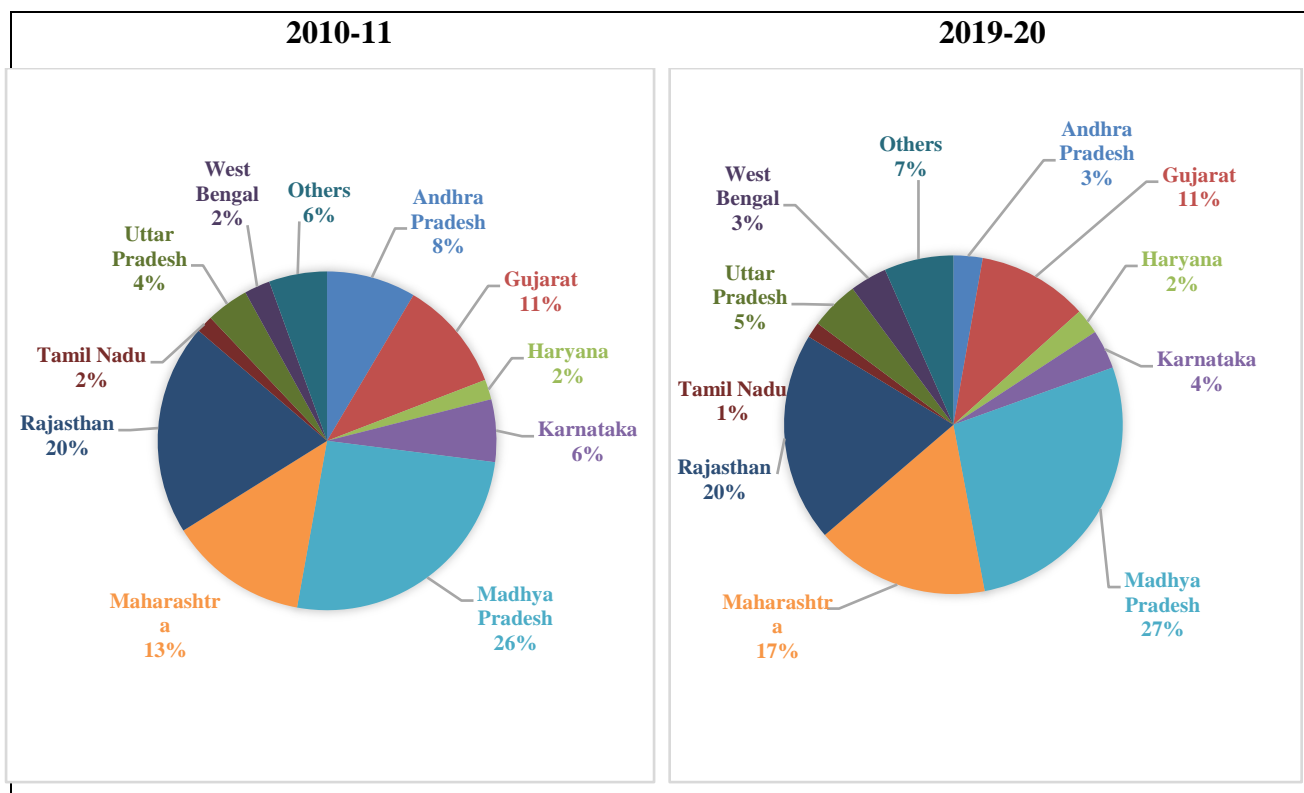
	Area	Production	Yield
1980-81 to 1989-90	8.74	22.10	13.74
1990-91 to 1999-00	3.47	9.01	7.61
2000-01 to 2009-10	9.43	19.34	13.24
2010-11 to 2019-20	4.15	8.14	7.99
1980-81 to 2019-20	13.18	32.43	23.65

4.2.3 Regional Variations in oilseeds in India:

The cropping patterns in many states have undergone a major shift in crops as well as oilseeds production. Figure 4.6 is constructed to visualise the comparison of percentage share of area under production of oilseeds during the period of 2010-10 and 2019-20. The relative importance of oilseeds grown has increased in many states. As is evident from the Figure 4.6, Madhya Pradesh, Maharashtra and Rajasthan constitutes the major share (59%) of area under oilseeds.

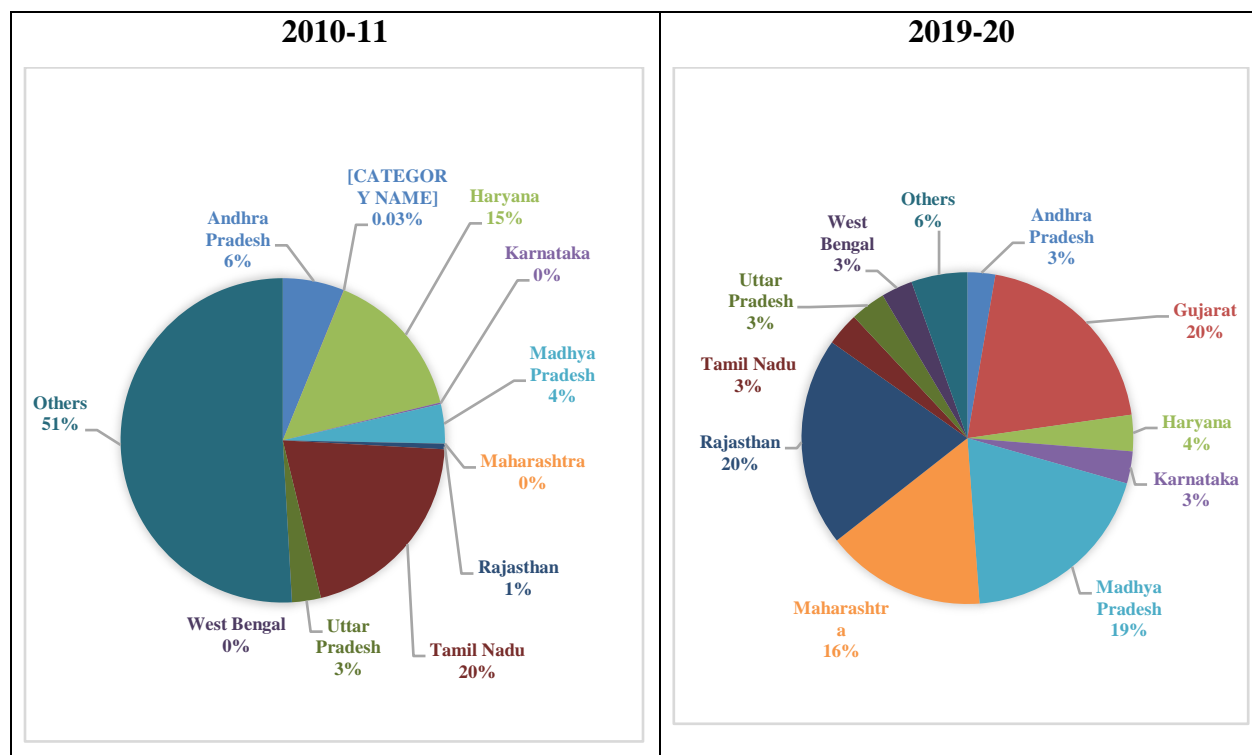
The area has declined in Andhra Pradesh and Tamil Nadu from 8 percent and 2 percent in 2009-10 to 3 percent and 1 percent in 2019-20, respectively.

Figure 4.6: Share of major states in oilseed area during 2010-11 and 2019-20



Even though the percentage share of area has consistently remained similar in the two time periods, a significant shift has been observed in percentage share of states in production of oilseeds in India (Figure 4.7). It is observed that the percentage share of Rajasthan, Gujarat Karnataka, Madhya Pradesh, Maharashtra and West Bengal has increased since 2009-10, and the share of Haryana and Tamil Nadu has declined. Rajasthan which only contributed 1% in the total production of oilseeds in India during 2010-11, occupied the first place in total production of oilseeds in country during 2019-20 with a total share of 20%. During the same period, the percentage share in production of oilseeds in Gujarat has increased from 0.03% to 20% and that of Madhya Pradesh from 4% to 19%. Tamil Nadu which contributed in 20% of the total oilseed produce now has 3% share in the total produce of oilseed. The share of Haryana declined from 15% to 4% and that of other remaining states from 51% to 6%.

Figure 4.7: Share of major states in oilseed production during 2010-11 and 2019-20



In many states, the relative importance of oilseed crops has also witnessed a shift in during the period 2010-11 and 2019-20. Table 4.16 is constructed using the state level data to analyse the preference in cropping pattern. It has been observed that, soybean which ranked first in terms of area during 2010-11 in Madhya Pradesh, occupied the second place in 2019-20. During the same period, R&M oilseed moved from the third rank to second place and sesamum from fifth to fourth place in terms of area in West Bengal. In the case of Gujarat, groundnut which had occupied the second position with respect to area now ranks first in 2019-20.

During this period, R&M in Uttar Pradesh and castor seed in Gujarat occupied the place among top five crops of the states in terms of area. In Maharashtra, soybean replaced cotton in 2019-20 to become second most grown crop as compared to its third rank in 2010-11. R&M in Haryana and groundnut in Andhra Pradesh have maintained their ranks in terms of area. However, groundnut in Tamil Nadu and R&M in Rajasthan lost their position in respective states to become third most grown crop.

Table 4.16: Shift in area under crops in different states between 2010-11 and 2019-20

States	Year	I	II	III	IV	V
Madhya Pradesh	2010-11	Soybean	Wheat	Gram	Rice	Maize
	2019-20	Wheat	Soybean	Rice	Gram	Urad
Uttar Pradesh	2010-11	Wheat	Rice	Sugarcane	Bajra	Maize
	2019-20	Wheat	Rice	Sugarcane	Bajra	R&M
West Bengal	2010-11	Rice	Jute	R&M	Wheat	Sesamum
	2019-20	Rice	R&M	Jute	Sesamum	Wheat
Gujarat	2010-11	Cotton	Groundnut	Wheat	Bajra	Rice
	2019-20	Groundnut	Cotton	Wheat	Rice	Castor
Haryana	2010-11	Wheat	Rice	Bajra	R&M	Cotton
	2019-20	Wheat	Rice	Cotton	R&M	Bajra
Maharashtra	2010-11	Jowar	Cotton	Soybean	Rice	Gram
	2019-20	Cotton	Soybean	Gram	Jowar	Rice
Tamil Nadu	2010-11	Rice	Groundnut	Sugarcane	Jowar	Maize
	2019-20	Rice	Jowar	Groundnut	Maize	Cotton
Rajasthan	2010-11	Bajra	R&M	Wheat	Gram	Maize
	2019-20	Bajra	Wheat	R&M	Gram	Moong
Andhra Pradesh	2010-11	Rice	Groundnut	Gram	Cotton	Turmeric
	2019-20	Rice	Groundnut	Cotton	Gram	Jowar

4.2.3.1 Soyabean

In India, soybean has an important place as it is majorly grown oil crop in recent years. It is a kharif crop and a source of protein. In addition, it also serves as raw material for manufacture of vanaspati. Out of the nine oilseeds, soybean alone has a share of 35.1% in 2020-21 as compared to 33.8% of the total produce in 2019-20. Madhya Pradesh, Maharashtra and Rajasthan are the major producing state of soybean in India. Madhya Pradesh has been the leading producer of soybean till 2019-20. However, as per the recent estimates, Maharashtra became the leading producer with 49.67% share in total produce of soybean in 2020-21 as compared to 42.98% in 2019-20 followed by Madhya Pradesh whose share declined from 43.53% in 2019-20 to 33.82% in 2020-21. Area, production and yield of soybean in selected states and percentage (%) share of area and production with respect to India are calculated and presented in Table 4.17 for the period of 2000-01 to 2019-20. At the state level, it was observed that though Madhya Pradesh has the maximum area under soybean, the percentage share of area to the total soybean area has been decreasing from 69.7% in 2000-01 to 50.8% in 2019-20.

On the other hand, the percentage share in area of Maharashtra to the total area under soyabean has increased to 33.8% and Rajasthan to 9.2% in 2019-20. Even though the overall production (34.352 LT to 48.871 LT) has increased in Madhya Pradesh, the share of produce to total soybean produce in India has decreased from 65.1% to 43.5% during 2001-01 to 2019-20, respectively. It is evident that even though there was an overall increase in the area under soybean cultivation during 2015-16, but the production has declined significantly leading to minimum yield of 738.5 kg/Hect.

Table 4.17: Share of area (%), production (%) and yield of soybean in selected Indian states during 2000-20.

Area (in '000 hectares) (%)					
States	Madhya Pradesh	Maharashtra	Rajasthan	Others	India
2000-01	4475.5 (69.7)	1141.5 (17.8)	659.3 (10.3)	6416.6 (2.2)	6416.6 (100)
2005-06	4255.3 (55.2)	2347 (30.5)	744.3 (9.7)	7707.5 (4.7)	7707.5 (100)
2010-11	5559.9 (57.9)	2729 (28.4)	765.5 (8)	546.6 (5.7)	9601 (100)
2015-16	5906 (50.9)	3702 (31.9)	1204.8 (10.4)	791.8 (6.8)	11604.5 (100)
2019-20	6194 (50.8)	4124 (33.8)	1118.6 (9.2)	756.1 (6.2)	12192.7 (100)
Production (in '000 tonnes) (%)					
2000-01	3435.2 (65.1)	1266.2 (24)	455.9 (8.6)	122.7 (2.3)	5280 (100)
2005-06	4500.7 (54.4)	2527 (30.5)	856.3 (10.3)	389.5 (4.7)	8273.5 (100)
2010-11	6669.8 (52.4)	4316 (33.9)	1118.1 (8.8)	632.5 (5)	12736.4 (100)
2015-16	4907.9 (57.3)	2061.1 (24.1)	998.8 (11.7)	602.1 (7)	8569.8 (100)
2019-20	4887.1 (43.5)	4825.1 (43)	524.6 (4.7)	989.1 (8.8)	11225.9 (100)
Yield (in Kgs./Hect.)					
2000-01	767.6	1109.2	691.5	874.6	822.9
2005-06	1057.7	1076.7	1150.5	1079.2	1073.4
2010-11	1199.6	1581.5	1460.6	1157.2	1326.6
2015-16	831	556.8	829	760.4	738.5
2019-20	789	1170	469	1308.1	920.7

The percentage change in area, production and yield in the selected time period of major states under soybean cultivation during 2000-20 are presented in Table 4.18. It can be observed that in India the area under soybean cultivation has increased by 90% during the period of 2000-01 to 2019-2020. The maximum increase is observed in Maharashtra where the area increased by 261% in same period, followed by Madhya Pradesh (38%) and Rajasthan (70%). However, the percentage change in area has remained less than 50% in all the selected states as well as in India overall in 2019-20 as compared to 2010-11. Even though area has increased in this period, the

production has declined. The percentage change in production in Rajasthan in 2019-20 as compared to 2010-11 is -53%, followed by Madhya Pradesh by (-27%) with overall change in production in India being (-12%). It is also observed that the yield of soybean declined by 32% in Rajasthan and increased by only 3% and 5% in Madhya Pradesh and Maharashtra during the period of 2000-01 to 2019-2020.

Table 4.18: Percentage change in area, production and yield of soybean in selected time periods during 2000-01 to 2019-20

Area			
States	2000-01 and 2009-10	2010-11 and 2019-20	2000-01 and 2019-20
Madhya Pradesh	20	11	38
Maharashtra	164	55	261
Rajasthan	18	46	70
Others	319	38	439
India	52	27	90
Production			
States	2000-01 and 2009-10	2010-11 and 2019-20	2000-01 and 2019-20
Madhya Pradesh	86	-27	42
Maharashtra	74	12	281
Rajasthan	101	-53	15
Others	264	56	706
India	89	-12	113
Yield			
States	2000-01 and 2009-10	2010-11 and 2019-20	2000-01 and 2019-20
Madhya Pradesh	56	-34	3
Maharashtra	-34	-26	5
Rajasthan	70	-68	-32
Others	-13	13	50
India	24	-31	12

4.2.3.2 Groundnut

India is the second largest producer of groundnut in the world after China with a share of 13.2% in global production in 2018-19. In India, groundnut is mainly grown in states such as Gujarat, Andhra Pradesh, Karnataka and Rajasthan. As of 2020-21, the area under groundnut cultivation is 6014.95 ('000 Hectares) with the production of 10244.08 ('000 Tonnes) and yield of 1703 (Kgs./Hect.). The share of the selected states in area, production and yield of groundnut

in India during 2000-01 till 2019-20 is listed in Table 4.19. In terms of area, Gujarat ranks first with about 35% of area under cultivation during 2019-20, followed by Rajasthan (15%), Andhra Pradesh (14%) and Karnataka (10%). Similarly, Gujarat is the major producer of groundnut which alone has a share of 47% in total production of groundnut in country during 2019-20, followed by Rajasthan (16%), Andhra Pradesh (9%) and Karnataka (5%). Since 2000-01, Andhra Pradesh and Karnataka have lost area under groundnut consistently as compared to Rajasthan and Gujarat whose area have increased from combined 30% to 45% in 2019-20. Similar trend is observed in production and yield of groundnut as well.

Table 4.19: Percentage share of area, production and yield of selected states under groundnut to India during 2000-01 to 2019-20

	Area ('000 hectares) (%)					
	Andhra Pradesh	Gujarat	Karnataka	Rajasthan	others	All India
2000-01	1873.9 (29)	1745.2 (27)	1063.4 (16)	195.7 (3)	1680.4 (26)	6558.6 (100)
2005-06	1876 (28)	1954 (29)	1040 (15)	317 (5)	1549 (23)	6736 (100)
2010-11	1622 (28)	1806 (31)	848 (14)	346.9 (6)	1233.2 (21)	5856.1 (100)
2015-16	775 (17)	1414 (31)	570 (12)	516.9 (11)	1320.5 (29)	4596.3 (100)
2019-20	661 (14)	1688.7(35)	504 (10)	739 (15)	1232.5 (26)	4825.2 (100)
	Production ('000 tonnes)(%)					
2000-01	2142.9 (33)	689 (11)	1081.1 (17)	180.8 (3)	2316.2(36)	6410 (100)
2005-06	1366 (17)	3389 (42)	671 (8)	491 (6)	2076.3 (26)	7993.3 (100)
2010-11	1458 (18)	3366.1 (41)	742 (9)	681.1 (8)	2017.6 (24)	8264.8 (100)
2015-16	801 (12)	2339.1 (35)	395 (6)	1048.7 (16)	2149.5 (32)	6733.3 (100)
2019-20	848.8 (9)	4645.5 (47)	502.8 (5)	1619.3 (16)	2335.6 (23)	9952(100)
	Yield (kg/hect.)					
2000-01	1143	395	1017	924	1378	977
2005-06	728	1734	645	1549	1340	1187
2010-11	899	1864	875	1963	1636	1411
2015-16	1034	1654	693	2029	1628	1465
2019-20	1284	2751	998	2191	1895	2063

The percentage change in area, production and yield in groundnut in selected states of India during 2000-01 to 2019-20 are presented in Table 4.20. It is evident that area under groundnut in Rajasthan increased by 278% in 2019-20 as compared to 2000-01. On contrary, the area at all India level decreased by 26%, Andhra Pradesh (-65%), Gujarat (-3%), Karnataka (-53%). It is interesting to note that even though the area in Gujarat has declined, the production

increased by 574% and all over India by 55%. In comparison to 2000-01, the area under groundnut cultivation during 2009-10 increased by 67% in Rajasthan and 4% in Gujarat. On contrary, the area declined at all India level by 16%, Andhra Pradesh (31%), Karnataka (-23%). The area at national level declined by 18% in 2019-20 as compared to 2010-11 but the production increased by 20%.

Table 4.20: Percentage change in area, production and yield of groundnut in selected states of India during 2000-01 to 2019-20

Area			
States	2000-01 and 2009-10	2010-11 and 2019-20	2000-01 and 2019-20
Andhra Pradesh	-31	-59	-65
Gujarat	4	-6	-3
Karnataka	-23	-41	-53
Rajasthan	67	113	278
others	-28	0	-27
All India	-16	-18	-26
Production			
States	2000-01 and 2009-10	2010-11 and 2019-20	2000-01 and 2019-20
Andhra Pradesh	-53	-42	-60
Gujarat	155	38	574
Karnataka	-53	-32	-53
Rajasthan	96	138	796
others	-22	16	1
All India	-15	20	55
Yield			
States	2000-01 and 2009-10	2010-11 and 2019-20	2000-01 and 2019-20
Andhra Pradesh	-32	43	12
Gujarat	144	48	597
Karnataka	-38	14	-2
Rajasthan	18	12	137
others	8	16	37
All India	1	46	111

4.2.3.3 Rapeseed & Mustard (R&M)

The area under cultivation of R&M oilseeds in India during period 2019-20 was 6,856 thousand hectares, out of which Rajasthan contributes 45% of area followed by Uttar Pradesh (11%), Madhya Pradesh (10%) and Haryana (9%). Total production of R&M oilseeds during period 2019-20 was 9,124 ('000 Tonnes). Rajasthan followed by Haryana and Madhya Pradesh has also been the major producer of R&M oilseeds since 2012, contributing about 70% of total

production of R&M oilseeds in India. The recent estimates suggests that the area, production and yield of R&M oilseeds in nation has increased to 6,699.76 thousand hectares, 10,210.01 thousand Tonnes and 1524 kgs. Per hectare, respectively. The percentage share of area, production and yield in different states of India during selected time period in 2000-01 to 2019-20 is recorded in Table 4.21. Rajasthan alone produce 46% of total R&M, Haryana 13% and Madhya Pradesh contributing 11% of the total produce of oilseed in 2019-20.

It can be observed that the percentage share of area under R&M is maximum in Rajasthan which increased from 31% in 2000-01 to 45% in 2019-20 before peaking to 53% in 2010-11. Similar pattern can be observed in the production share as well. Haryana has maintained its area under R&M cultivation with a declined share in 2010-11 to 7% as compared to 9% in 2019-20. Also, in Madhya Pradesh, the share of area increased from 9% in 2000-01 to 10% in 2019-20, before peaking to 11% with maximum area in 2005-06. Uttar Pradesh, on the other hand, has witnessed declining share in area from 21% in 2000-01 to 11% in 2019-20 before declining to 9% in 2010-11.

Table 4.21: Percentage share of area, production and yield of R&M in the selected states of India during period 2000-01 to 2019-20

	Area (%)				
	Haryana	Madhya Pradesh	Rajasthan	Uttar Pradesh	All India
2000-01	404 (9)	418.7 (9)	1429.8 (32)	945.5 (21)	4476.7 (100)
2005-06	709 (10)	809.4 (11)	3665.3 (50)	790.2 (11)	7276.5 (100)
2010-11	504 (7)	745 (11)	3678.6 (53)	604 (9)	6900.5 (100)
2015-16	505 (9)	617 (11)	2532.33 (44)	593 (10)	5745.5163 (100)
2019-20	641.3 (9)	675 (10)	3076.32 (45)	759.3 (11)	6856.269 (100)
	Production(%)				
	Haryana	Madhya Pradesh	Rajasthan	Uttar Pradesh	All India
2000-01	554 (13)	323.6 (8)	1315.6 (31)	945.7 (23)	4190 (100)
2005-06	792 (10)	847.5 (10)	4416.9 (54)	907.8 (11)	8131.2 (100)
2010-11	942 (12)	855.1 (10)	4369.7 (53)	717 (9)	8178.7 (100)
2015-16	805 (12)	666 (10)	3258 (48)	603 (9)	6796.7 (100)
2019-20	1149.9 (13)	1038.2 (11)	4202.4 (46)	956.7(10)	9123.6 (100)
	Yield				
	Haryana	Madhya Pradesh	Rajasthan	Uttar Pradesh	All India
2000-01	1371	773	920	1000	936
2005-06	1117	1047	1205	1149	1117
2010-11	1869	1148	1188	1187	1185
2015-16	1594	1079	1287	1017	1183
2019-20	1793	1538	1366	1260	1331

Percentage change in area, production and yield in different time periods during 2000-01 to 2019-20 are calculated in Table 4.22. The overall area under R&M oilseeds has increased by more than 53% in 2019-20 as compared to 2000-01. On the other hand, production has increased by 117.8% and yield by 42.1% in 2019 as compared to 2000-01. During the period of 2000-01 to 2009-10, the area grew by 24.8% however, the area under R&M in Uttar Pradesh declined by -35.1%, with the overall change in area of Uttar Pradesh being -19.7% in 2019-20 as compared to 2000-01. Haryana is the only state under which area has increased (25.7%) by 2019-20 since 2010-11. On the other hand, striking increase in production has been observed in Madhya Pradesh, Rajasthan and Haryana during 2000-01 and 2019-20. During the same period, the percentage change in yield in Madhya Pradesh has been 38.9%.

Table 4.22: Percentage change in area, production and yield of R&M oilseeds during different time periods in selected Indian States

Area			
States	2000-01 and 2009-10	2010-11 and 2019-20	2000-01 and 2019-20
Haryana	26.98	27.2	58.7
Madhya Pradesh	88.8	-9.4	61.2
Rajasthan	61.6	-16.3	115.2
Uttar Pradesh	-35.1	25.7	-19.7
All India	24.8	-0.6	53.6
Production			
States	2000-01 and 2009-10	2010-11 and 2019-20	2000-01 and 2019-20
Haryana	53.2	22.1	107.6
Madhya Pradesh	162.3	21.4	220.8
Rajasthan	124.1	-3.8	219.4
Uttar Pradesh	-27.9	33.4	1.2
All India	57.7	11.6	117.8
Yield			
States	2000-01 and 2009-10	2010-11 and 2019-20	2000-01 and 2019-20
Haryana	20.7	-4.1	30.8
Madhya Pradesh	38.9	34	99
Rajasthan	38.7	15	48.5
Uttar Pradesh	11.2	6.1	25.97
All India	26.3	12.3	42.1

4.2.3.4 Sunflower

Sunflower is an important oilseed crop in India. The area under sunflower as declined from 228.28 thousand hectares in 2019-20 to 225.87 thousand hectares in 2020-21. However,

production rose by 7% from 212.53 thousand tonnes in 2019-20 to 228.32 thousand tonnes in 2020-21. At the state level, Karnataka has the majority of area under sunflower cultivation and production. The other states being Andhra Pradesh, Maharashtra, Odisha and Haryana. The percentage share of area, production and yield in selected states of India during 2000-01 to 2019-20 is estimated in Table 4.23. In terms of area, more than half of the area (56.5%) under sunflower cultivation is in Karnataka during 2019-20, followed by Maharashtra (12.2%), Odisha (7.3%) and Andhra Pradesh (3.9%). Similarly in production, Karnataka ranks first with 48.6%, followed by Odisha (9.9%), Maharashtra (5.7%) and Andhra Pradesh (4%). These states account for about 80% of the total area under sunflower cultivation. A significant decline in area is observed in Andhra Pradesh whose share first increased from 18.3% in 2000-01 to 24.2% in 2010-11, after which it declined to 3.9% in 2019-20. Odisha, on the other hand, has increased its area under sunflower from 5% in 2000-01 to 17% by 2019-20.

Table 4.23: Percentage share in area, production and yield of sunflower in India during 2000-01 to 2019-20

	Area				
	Andhra Pradesh	Karnataka	Maharashtra	Odisha	All India
2000-01	197 (18.3)	477.8 (44.5)	337.3 (31.4)	5 (0.5)	1073.8 (100)
2005-06	444 (19)	1427 (61)	355 (15.2)	9.5 (0.4)	2339.6 (100)
2010-11	225 (24.2)	409 (44)	208 (22.4)	20.6 (2.2)	929 (100)
2015-16	27 (8.5)	330 (60.4)	47 (13.9)	16 (3.7)	487 (100)
2019-20	9 (3.9)	129 (56.5)	28 (12.2)	17 (7.3)	228 (100)
	Production				
	Andhra Pradesh	Karnataka	Maharashtra	Odisha	All India
2000-01	168 (25.9)	234.5 (36.1)	175.1 (26.9)	5 (0.8)	649.9 (100)
2005-06	298 (20.7)	787 (54.7)	206 (14.3)	7.8 (0.5)	1439 (100)
2010-11	156 (24)	254 (39)	125 (19.2)	21.6 (3.3)	651.1 (100)
2015-16	23 (9.2)	152 (47.4)	10 (7.6)	19 (6)	296 (100)
2019-20	8 (4)	103 (48.6)	12 (5.7)	21 (9.9)	213 (100)
	Yield				
	Andhra Pradesh	Karnataka	Maharashtra	Odisha	All India
2000-01	853	491	519	1000	605
2005-06	671	552	580	821	615
2010-11	693	621	601	1049	701
2015-16	852	459	213	1189	609
2019-20	942	802	436	1266	931

The decadal change in area, production and yield in percentage from 2000-01 to 2019-20 are presented in Table 4.24. It is observed that as compared to 2000-01, the period of 2009-10

witnessed increase in area by 37.5% with majority of increase in area in Odhisa (254%) and Maharashtra's area under sunflower declined by 35.1%. During the same period, the overall production has increased by 30.9% however the yield declined by 4.8%. As compared to 2010-11, the area all over India declined by 75.4% and production by 67.4% with major decline in area and production in Andhra Pradesh (-96% and -94.6%, respectively) in 2019-20. On the other hand, yield increased by 32.8% during the same time period. As compared to 2000-01, the area and production declined by 0.8% and 0.7%, respectively, however, yield increased by 0.5%.

Table 4.24: Percentage change in area, production and yield in sunflower oilseeds in selected states of India during 2000-01 to 2019-20

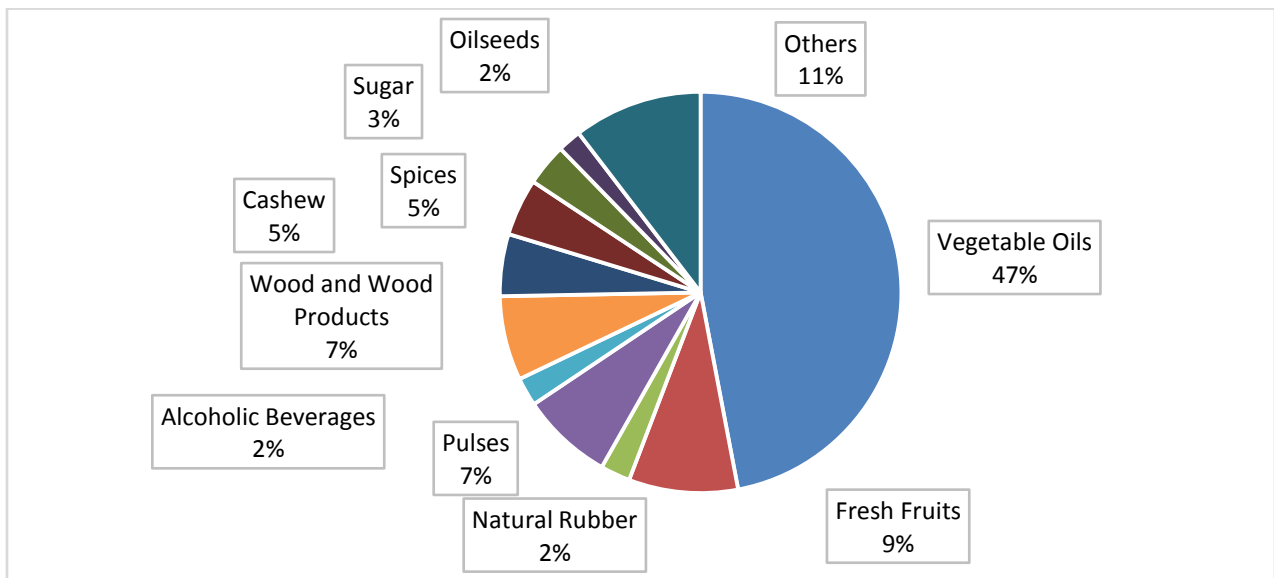
States	2000-01 and 2009-10	2010-11 and 2019-20	2000-01 and 2019-20
Area			
Andhra Pradesh	77.7	-96.0	-1.0
Karnataka	66.2	-68.5	-0.7
Maharashtra	-35.1	-86.6	-0.9
Odisha	254.0	-19.6	2.3
All India	37.5	-75.4	-0.8
Production			
Andhra Pradesh	60.7	-94.6	-0.9
Karnataka	29.6	-59.3	-0.6
Maharashtra	-34.9	-90.3	-0.9
Odisha	220.0	-3.0	3.2
All India	30.9	-67.4	-0.7
Yield			
Andhra Pradesh	-9.5	35.9	0.1
Karnataka	-22.0	29.1	0.6
Maharashtra	0.3	-27.5	-0.2
Odisha	-9.6	20.7	0.3
All India	-4.8	32.8	0.5

4.3 Trends in trade and price of oilseeds and edible oil in India

India has been the major importer of edible oil in the world. Share of major commodities in total agricultural imports by India is depicted in Figure 4.8. As per DGCIS, the share of vegetable oil in total agricultural imports by the country is 47% in the period of Apr- Dec 2020. It is followed by fresh fruits (9%), pulses (7%) and wood and wood products (7%). However, the share of oilseeds in total imports is only 2%. On the other hand, oil meals, oilseeds and castor oil form 3.1%, 3% and 2.3% of the total India's agricultural exports in the period of Apr- Dec 2020,

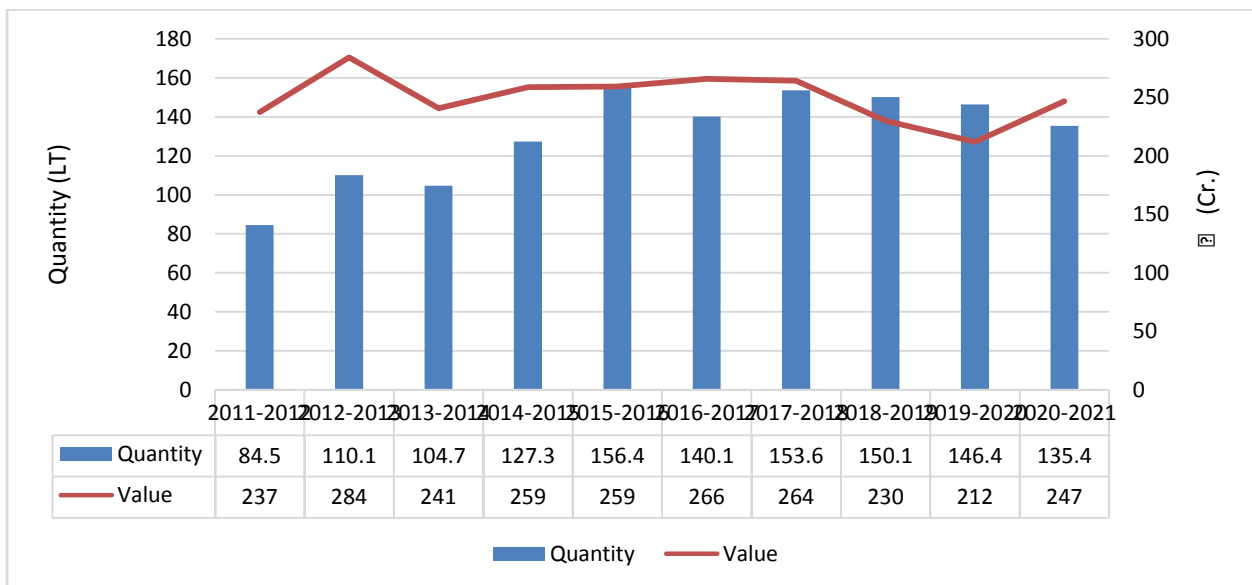
respectively. In terms of oilseeds and edible oil, India imports crude palm oil, RBD Palm oil, Soybean oil, sunflower oil, R&M oil and others and exports groundnut oilseeds, soybean meal, castor oil and others. In this section, the trade and prices of four major oilseeds and their derived oil is discussed.

Figure 4.8: Share in Total Agricultural Import in Apr-Dec 2020 (%)



Source: Directorate General of Commercial Intelligence & Statistics (DGCIS)

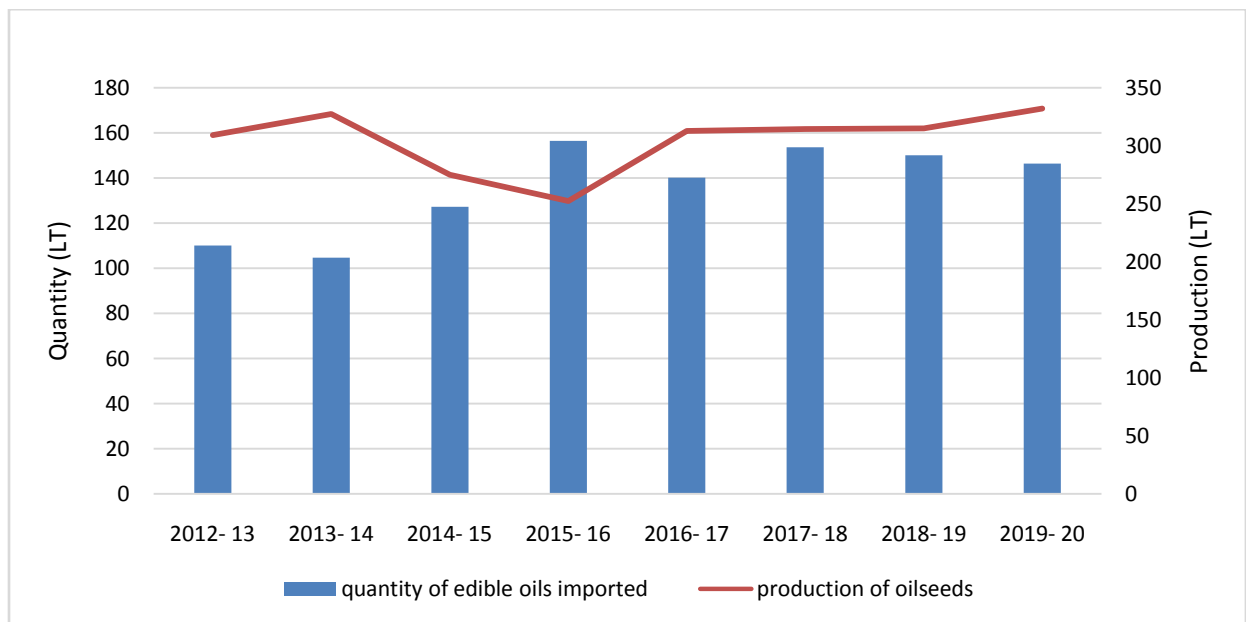
Figure 4.9: India's import of edible oil during 2011-12 to 2020-21



Source:Commission for Agricultural Costs and Prices

The total imports of edible oil by India in terms of quantity and price (deflated) is presented in the Figure 4.9. As of 2020-21, India imported 135.4 Lakh tonnes (LT) of edible oil worth ₹247 Cr., which is about 19% of total import of vegetable oil around the world. The country imported 156.4 LT of edible oil imports in 2015-16 worth ₹259 Crore. One of the reasons for high imports during this period is that the country witnessed the minimum production of oilseeds in 2015-16 with 252.5 LT of oilseeds produced as compared to 332.1 LT produced in 2020-21. (Figure 4.10).

Figure 4.10: Quantity of edible oils imported and production of oilseeds in India



Source: Commission for Agricultural Costs and Prices

The compound annual growth rate and coefficient of variation is estimated of the imports and exports of various edible oils by the country and presented in Table 4.25. The imported quantity grew at the rate of 8.68% and the value of the imports grew by 15.89%. The prices of imported edible oil saw most of the instability with variation of about 66.74% and that in quantity being 45.7%. Similarly, the overall import of soybean oil grew at the rate of 8.78% with the variation of 15.33%, while the value of imports saw an upsurge with the rate of 15.33% and the variation in price being 72.29%. It is also observed that the overall imports of R&M oil grew at the rate of 87.3%, while the value of imports grew at 75.84% during 2005 to 2021 (Table 4.25). The variation in the import quantity is 121.12% suggesting that the mean of quantity imported is less than the standard deviation. Similar variation is observed in the value of imports

of R&M oil with CV 118.21%. On the other hand, the import quantity of sunflower oil grew at the rate of 27.07% as compared to 33.78% for the value of imports. The imports are highly volatile with the overall variation being 84.02% and that in value of imports being 85.63%.

Table 4.25: Compound annual growth rate (CAGR) and coefficient of variation (CV) of import and export quantity and value of different edible oils

	Commodity	CAGR		CV	
		Quantity (%)	Value (%)	Quantity (%)	Value (%)
Import	Edible oil	8.68	15.89	45.69	66.74
	Soybean oil	8.78	15.33	56.96	72.29
	Sunflower oil	27.07	33.78	84.02	85.63
	R&M oil	87.33	75.84	121.12	118.21
Export	Groundnut	7.77	15.55	44.32	63.65
	Soybean meal	-8.23	0.36	54.8	57.7

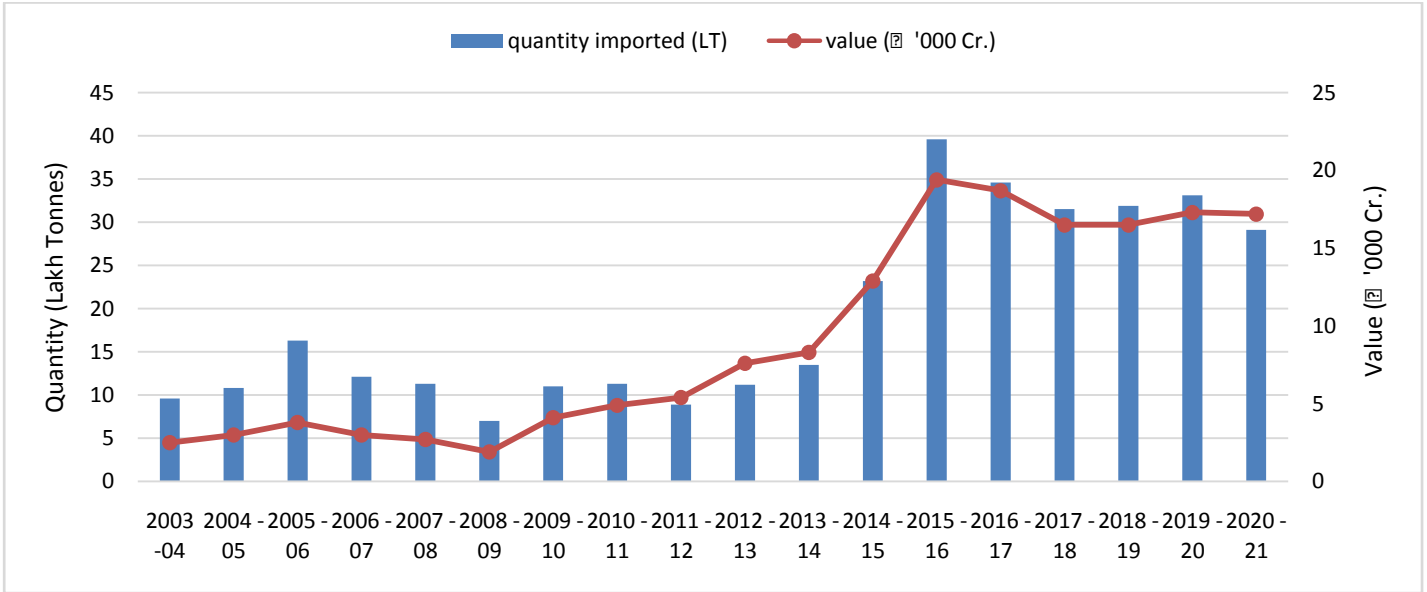
Note: CAGR: compound annual growth rate, CV: coefficient of variation.

The finding from the study also suggests that the export of groundnut seeds increased with the rate of 7.77% while the earnings on export increased at the rate of 15.55%. The overall fluctuation in the exports of groundnut is 44.32% as compared to 63.65% CV of values of exported quantity. However, the overall export of soybean meal declined at the rate of 8.23% during 2003-04 to 2020-21, while the earnings on export grew at the rate of 0.36% The overall variation in the export of soybean meal has been 54.8% as compared to 57.7% for the value of exported quantity.

4.3.1.1 Soybean

India surpassed China in 2014-15 to become the largest importer of soybean oil in the world, with the share of about 32.3% of the total imports during 2016-17 as compared to 30.3% in 2019-20. Imports of soybean oil increased from 9.6 LT in 2002-03 worth ₹ 2.5 ('000 Cr.) to 39.6 LT worth ₹ 19.4 ('000 Cr.) in 2015-16 but declined in next two years and then rose to 33.1 LT in 2019-20 (Figure 4.11). Imports of soybean oil witnessed an upward trend since 2012-13 and significantly rose by 72% in 2014-15 as compared to 2013-14.

Figure 4.11: Imports of soybean oil by India, 2003-04 to 2020-21

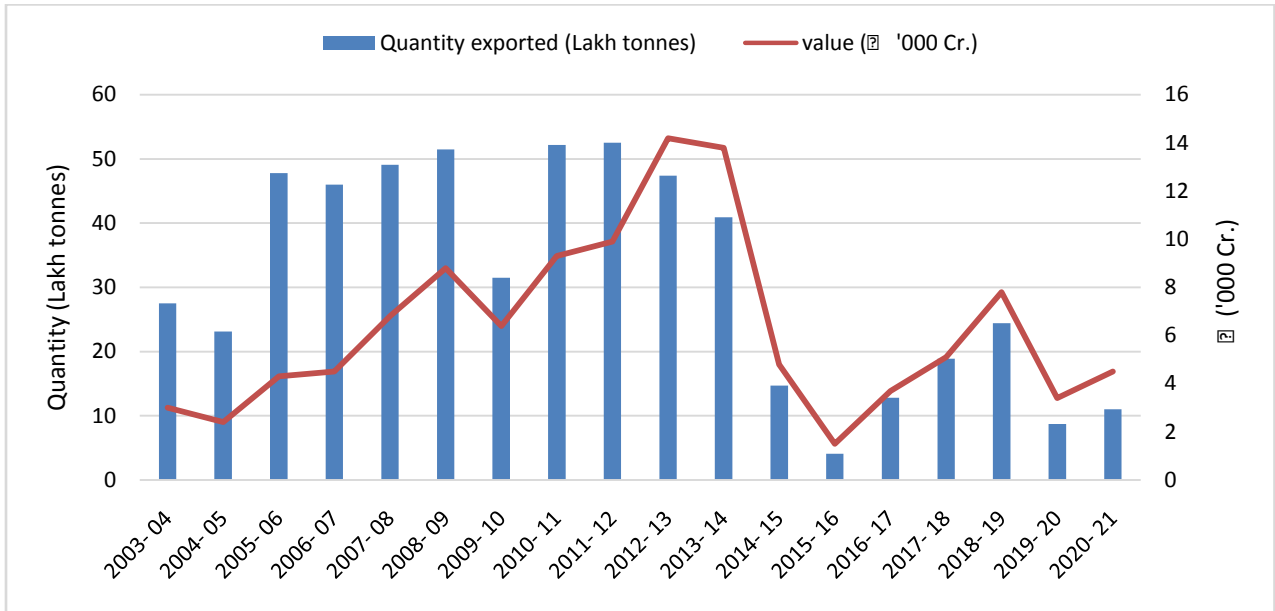


Source: Commission for Agricultural Costs and Prices

On the other hand, the country’s export of soybean meal and its value are presented in Figure 4.12. During the period of 2020-21, the country exported 11 LT of soybean meal, worth ₹ 4500 Cr. India’s export of soybean meal and the quantity exported has been increasing from 27.5 LT in 2003-04, reaching a peak of 52.5 LT in 2011-12, after which a sharp decline has been observed with minimum export of 4.1 LT in 2015-16 (Figure 4.12). Similar trends are observed in the value of exports as well.

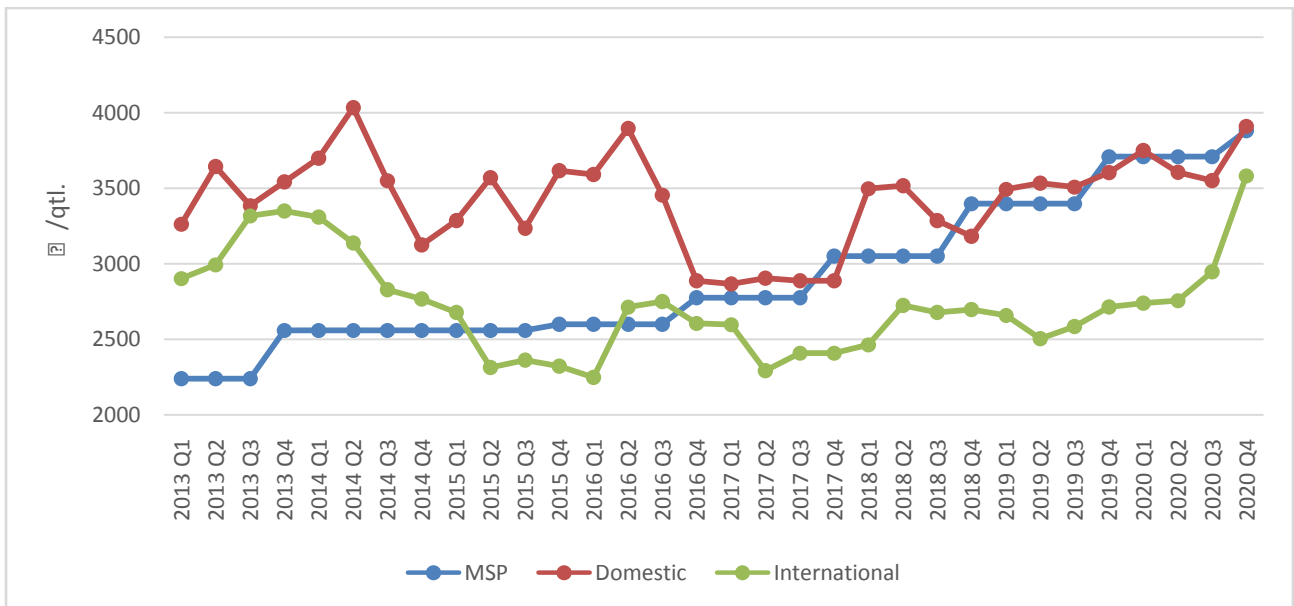
To understand the increasing trend in imports of soybean oil and exports of meal, it is important to analyse the trends in the prices of oilseeds and the derived oil. The prices being minimum support price (MSP), domestic price and international price. The MSP are announced by the Government of India (GoI) at the beginning of the sowing season for certain crops based on the recommendations of the Commission for Agricultural Costs and Prices (CACP). MSP is price fixed by GoI to protect the producer or farmers against excessive fall in price during bumper production years. While recommending MSP for crops, the Commission used to consider the cost of production, overall demand-supply, domestic and international prices, inter-crop price parity, terms of trade between agricultural and non-agricultural sectors and the likely impact of the price policy on rest of the economy.

Figure 4.12: Export of soybean meal by India during 2003 to 2021



Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

Figure 4.13: MSP, domestic and international price of soybean during 2013 to 2020



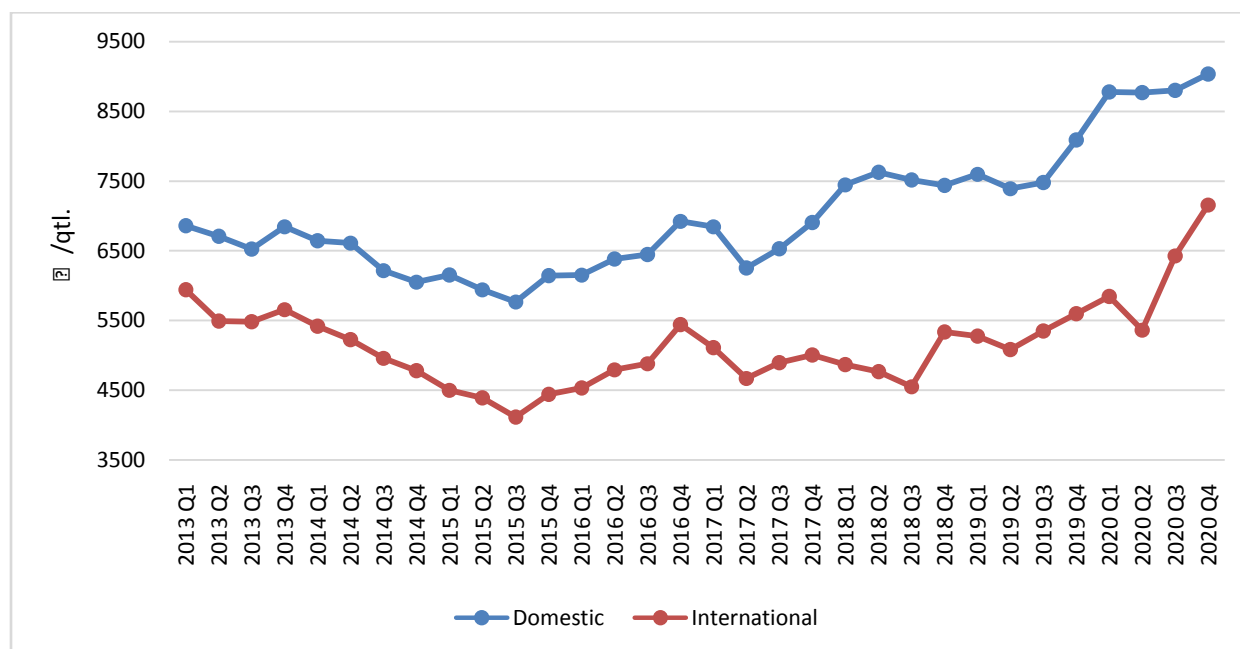
Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

The trends in quarterly prices of soybean oilseeds during the period of 2013 to 2020 are presented in Figure 4.13. It is observed that the domestic wholesale price of soybean oilseeds has always remained higher than the international prices since 2013. Annual growth rate and the

coefficient variation in each quarter are recorded in Table 4.26. MSP of soybean grew at the rate of 1.68% as compared to 0.03% of domestic soybean price. However, international prices witnessed decline at the rate of -0.22% (Table 4.26). Domestic wholesale price of soybean, on the other hand, has continuously remained above MSP except 2017 (Q4), 2018 (Q4), 2019 (Q4) and 2020 (Q2 and Q3). The MSP of soybean, which was lower than international prices, is currently higher than international prices since 2016 (Q4).

Similarly, domestic wholesale price of soybean oil has consistently remained higher than international price during 2013 to 2020 and the gap has widened since the beginning of 2018 (Figure 4.14). The domestic wholesale prices of soybean meal (Figure 4.15) also have been continuously higher than the international prices from 2013 to 2020, except for 2013 (Q3), 2017 (Q1) and 2020 (Q4), indicating soybean meal exports are not competitive in global market.

Figure 4.14: Domestic and International prices of soybean oil during 2013 to 2020

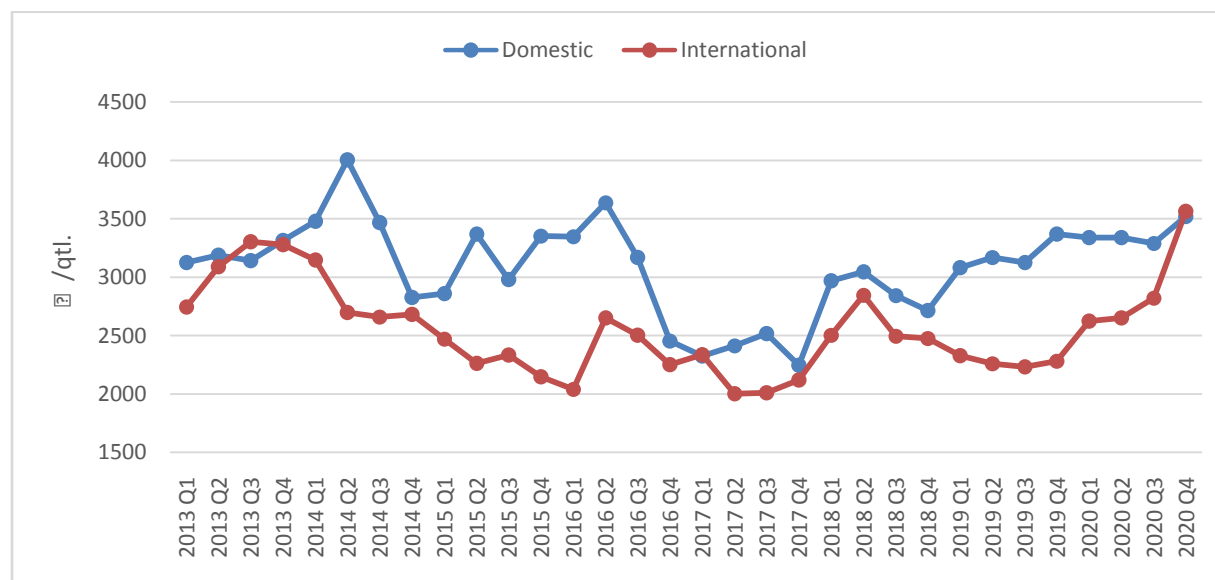


Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

It is also observed that the soybean seed prices are less volatile as compared to the soybean oil and meal prices, the coefficient of variation of domestic seed prices being 9.05% as compared to 12.8 % percent for soybean oil and 12.96% of soybean meal (Table 4.26 and 4.27). On the other hand, international prices of soybean oil are less volatile with coefficient of variation 12.04% as compared to soybean (12.14%) and 15.45% of soybean meal (Table 4.26 and 4.27). It is also

observed that quarter 4 has the maximum volatility in international and domestic wholesale price trends of soybean, soybean oil and meal except for domestic price of oil where quarter 3 reports maximum variation in prices (14.01%).

Figure 4.15: Soybean meal domestic and international prices during 2013 to 2020



Source: Compiled from various price policy reports from commission for agricultural costs and prices, Ministry of Agriculture and farmer's welfare, GOI.

Table 4.26: Coefficient of variation and CAGR of prices of various oilseeds during 2013 to 2020

Crop	Prices	CV Q1	CV Q2	CV Q3	CV Q4	CV overall	CAGR
Groundnut	MSP	11.17	11.17	11.17	11.6	10.91	1.09
	Domestic	11.5	16.35	16.1	12	13.82	0.88
	International	6.81	7.85	11.83	10.24	9.09	0.22
Sunflower	MSP	18.69	18.69	18.69	20.75	18.53	1.64
	Domestic	14.16	15.84	19.92	15.68	15.86	0.47
	International	10.92	7.99	8.48	19.69	12.95	0.14
R&M	MSP	16.91	15.51	15.51	15.51	15.35	1.60
	Domestic	5.48	10.85	14.01	16.34	12.67	0.65
	International	10.58	7.78	8.49	10.14	8.99	0.15
Soybean	MSP	17.16	17.16	17.16	17.44	16.68	1.68
	Domestic	8.36	9.25	6.65	11.26	9.05	0.03
	International	11.59	11.21	11.27	15.66	12.14	-0.22

Note: CV is coefficient of variation and CAGR : compound annual growth rate.

Table 4.27: Coefficient of variation and CAGR of prices of various edible oils and meal during 2013 to 2020

Crop	Prices	CV Q1	CV Q2	CV Q3	CV Q4	CV overall	CAGR
Groundnut	Domestic	15.74	19.41	19.24	18.22	17.43	0.73
	International	10.98	14.03	16.33	18.08	15.48	0.82
Sunflower	Domestic	12.98	14.07	15.37	20.86	15.66	1.07
	International	10.92	10.16	9.75	9.27	9.55	-0.30
R&M	Domestic	5.85	10.53	10.86	11.21	10.17	0.7
	International	10.67	7.7	10.18	12.67	10.53	0.39
Soybean	Domestic	12.33	13.25	14.01	13.85	12.8	1.04
	International	10.49	7.61	13.62	15.05	12.04	0.37
Soybean Meal	Domestic	11.88	14.1	9.46	16.09	12.96	-0.017
	International	13.03	13.92	15.56	20.92	15.45	-0.36

Note: CV is coefficient of variation and CAGR : compound annual growth rate.

The correlation between the prices in Table 4.28 shows that domestic prices significantly increases with increase in international prices with the significant correlation of 0.46 between them. However, correlation between MSP and international prices (0.02) as well as between MSP and domestic prices (0.18) of soybean oilseeds is observed to be weak but positive.

There is a negative but weak correlation (-0.2) between soybean oil imports and production of soybean in the country. This suggests that imports increase when the production of soybeans has declined but this relation is not very significant, meaning that production alone does not explain the increasing imports of oil in nation. On the other hand, lower international prices of soybean and its byproducts such as oil and meal show very high correlation with increasing imports in the country with a correlation of about 0.9. Lower international prices of soybean as compared to domestic wholesale prices have thus led to an increase in high quantity of imports in the nation. Thus, it is valid to say that decline in domestic production and lower international prices of soybean oil during this period has led to increase in imports of oil in nation.

On the other hand, exports of soybean meal are positively correlated (0.5) with the production in country, suggesting that higher production leads to increase in exports of soybean meal by India. However, exports are highly correlated with the international price of oilseed (0.7) and soybean meal (0.7). This explains that higher international prices encourage exports of large quantity of soybean meal by India.

Table 4.28: Correlation between MSP, domestic and international prices of oilseeds between 2013to 2020

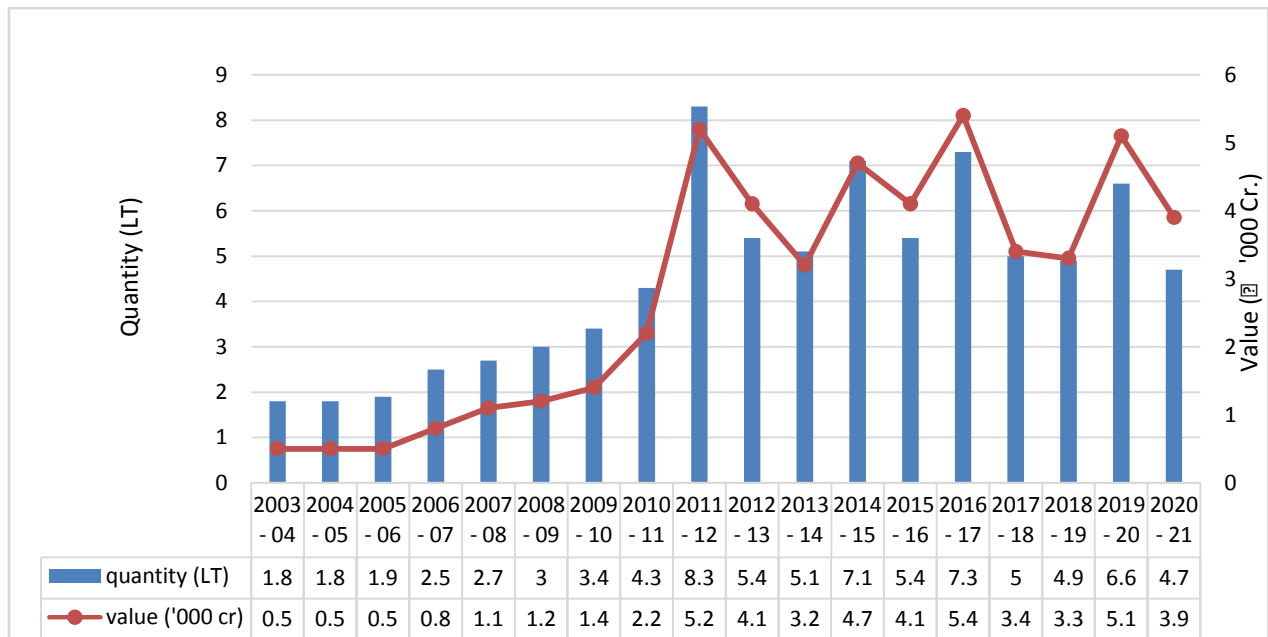
Groundnut	MSP	Domestic Price	International Price
MSP	1		
Domestic	0.62** (.000)	1	
international Price	0.35* (0.026)	0.09 (0.308)	1
Sunflower	MSP	Domestic Price	International Price
MSP	1		
Domestic	0.58** (.000)	1	
international Price	0.32* (0.038)	0.09 (0.321)	1
R&M	MSP	Domestic Price	International Price
MSP	1		
Domestic	0.39* (0.013)	1	
international Price	0.23 (0.105)	0.11 (0.278)	1
Soybean	MSP	Domestic Price	International Price
MSP	1		
Domestic price	0.18 (0.161)	1	
international Price	0.02 (0.456)	0.46** (0.004)	1

Note: **. Correlation is significant at the 0.01 level; *. Correlation is significant at the 0.05 level.

4.3.1.2 Groundnut

The trends in groundnut exports by India during 2003-04 to 2020-21 are depicted in Figure 4.16. India's exports of groundnut have increased from 1.8 LT in 2003-04 earning ₹ 500 Cr to 8.3 LT, earning ₹ 5200 Cr. in 2011-12. Since then, the quantity exported and value of exports have been volatile. As of 2020-21, India exported 4.7 LT of groundnut earning ₹ 3900 Cr.

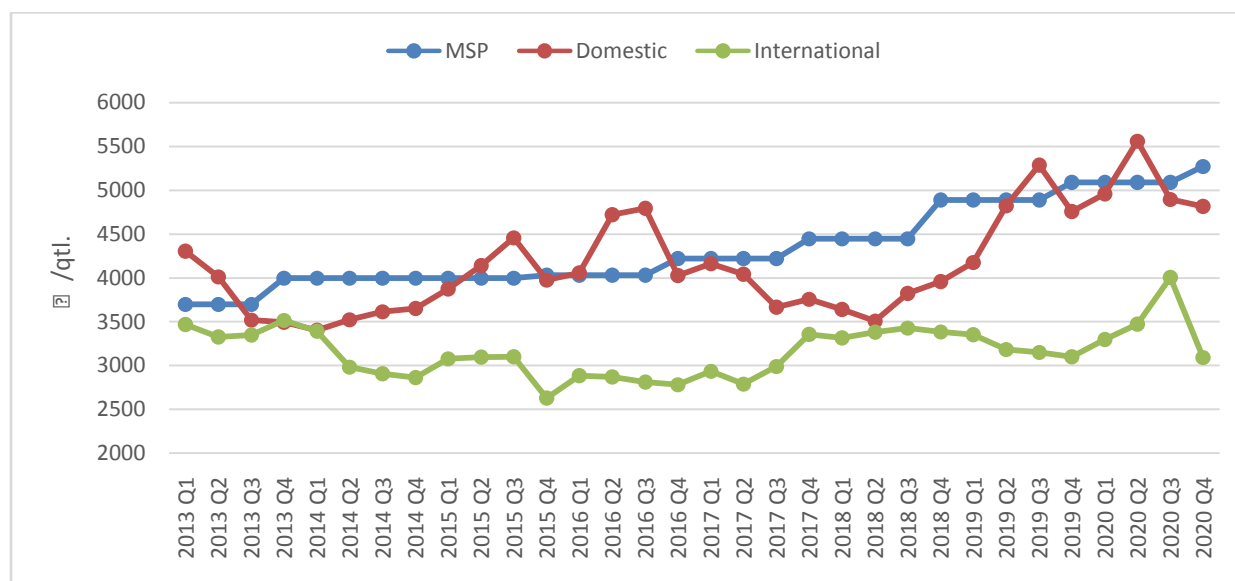
Figure 4.16: Export of groundnut by India during 2003 to 2021



Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

The price trends of MSP, domestic wholesale price and international prices of groundnut oilseeds during the period of 2013-2020 are depicted in Figure 4.17. The domestic price of the groundnut has been higher than the international price during 2013 to 2020, except for 2013 (Q4) where international price was higher than the domestic price. In 2018 (Q2), the gap between domestic and international price closed to 3% after which the gap widened as domestic price rose sharply along with decline in international price of the oilseed. The MSP of groundnut has been higher than the international price for the entire period, while the MSP was below domestic price in the period 2013 (Q1 and Q2), 2015 (Q2 and Q3), 2016 (Q1, Q2 & Q3), 2019 (Q3) and 2020 (Q2). The price trends suggests that MSP grew at the rate of 1.09 %, domestic prices by 0.88% and international prices by 0.22% (Table 4.26). Domestic price witnessed highest volatility with the coefficient of variation being 13.82% followed by MSP with variation of 10.92%. International prices, on the other hand, are least volatile with 9.09% of variation in price. The increasing trend of the MSP of groundnut is correlated with increase in domestic price as the correlation between them is 0.62 (Table 4.28).

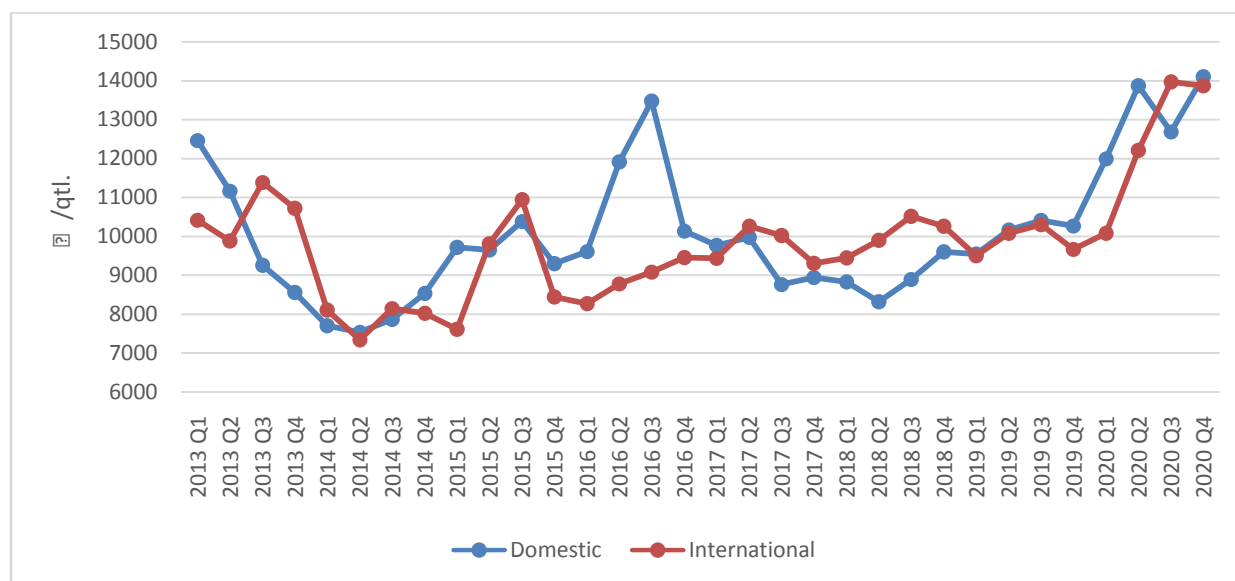
Figure 4.17: MSP, domestic and international price of groundnut seeds during 2013-20



Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

The movement of domestic and international price of groundnut oil, however, are observed from Figure 4.18. It can be observed that there is a significant difference between the price movement of groundnut oilseeds as compared to the groundnut oil. The domestic wholesale price of groundnut oil has moved in tandem with the international prices except for 2016 when the domestic prices sharply rose and then declined in 2016 (Q4) closing the gap between prices to 3.3% in 2017 (Q1). The domestic prices of groundnut oil grew with the rate of 0.73% and international price by 0.82% (Table 4.27). It is also evident that the overall variation in domestic prices during the period of 2013 to 2020 was 17.43% as compared to 15.48% in international prices. At quarterly level, maximum volatility is observed in Q3 of domestic prices (19.24%) and Q4 of international prices (18.08%). It is also observed that the groundnut seeds prices have been less volatile as compared to prices of groundnut oil, the coefficient of variation of domestic seed price being about 14% as compared to 17% for groundnut oil. Similarly, the coefficient of variation of international seed price of groundnut is 9% as compared to 16% of groundnut oil price.

Figure 4.18: Domestic and international prices of groundnut oil during 2013 to 2020



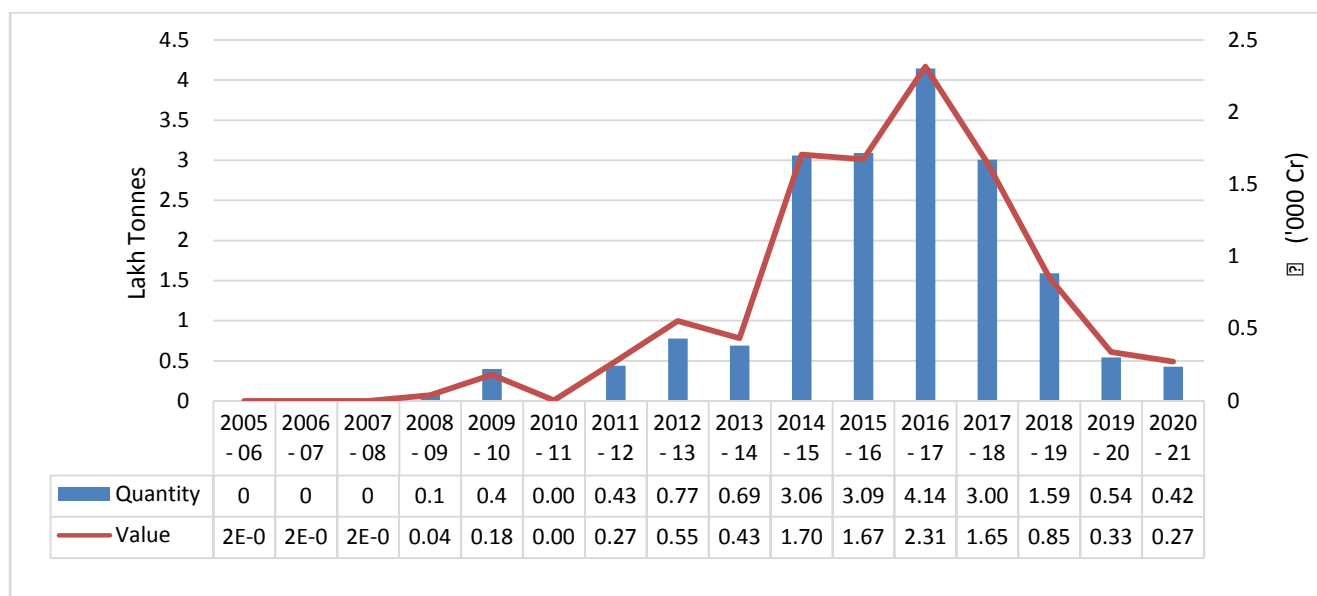
Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

It is evident that exports of groundnuts are weakly influenced by the level of production in the country and the prices of seeds and oil. The correlation between exports and production is -0.05, suggesting a weak negative correlation. The results are contrary to the fact that exports are mainly based on the level of produce and thus should provide a positive relation. These results thus suggest that production is not an important factor in understanding the trends in exports. Similar conclusions can be made about the correlation between exports and the prices of groundnut.

4.3.1.3. Rapeseed and Mustard

India has remained the third largest importer of R&M oil after China and EU. India's import of Rapeseed and Mustard (R&M) oil during the period of 2005-06 to 2020-21 are depicted in Figure 4.19. It is evident that an increasing trend in the import of R&M oil is observed after 2010-11, increasing almost ten-times from 0.437 LT in 2011-12 to 4.146 LT in 2016-17, after which a declining trend in the imports is observed till 2020-21. It is to be noted that about 10% of the global import of R&M oil is done by India in 2016-17.

Figure 4.19: India's import of R&M oil during 2005 to 2021

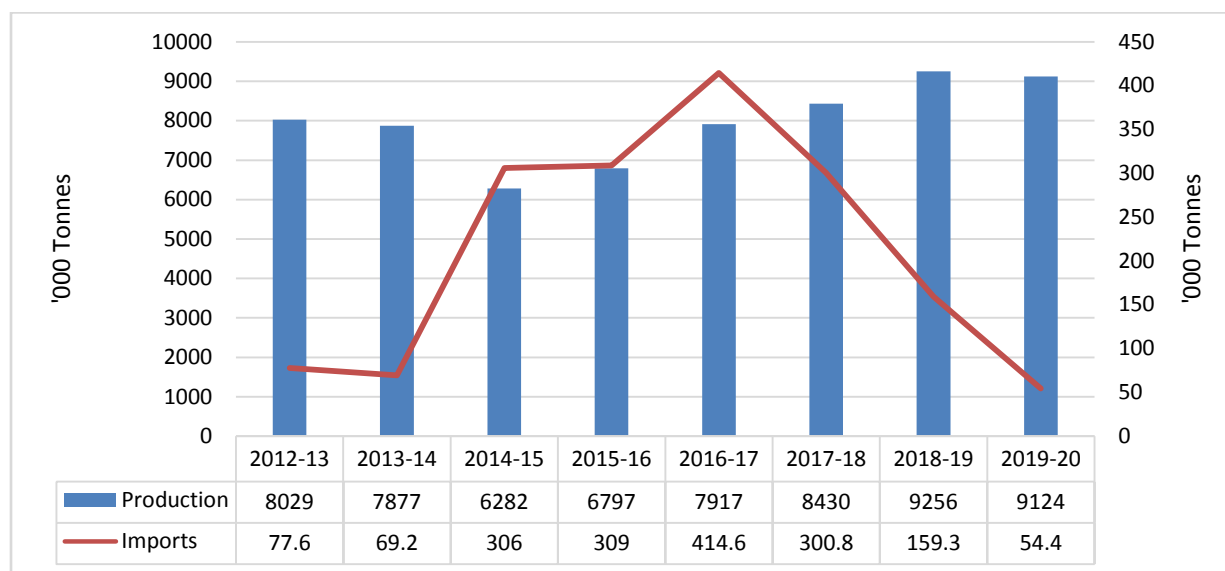


Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

The imports peaked in 2016-17 to 4.146 LT costing ₹ 2315 Cr. before declining to 0.427 LT in 2019-20, costing ₹ 272 Cr. The graph of production of R&M oilseeds within country to imports of R&M oil by the nation are presented in Figure 4.20 suggesting that imports increased when the production of the R&M oilseed was low within the nation.

The quarterly trends of MSP, domestic and international price of R&M oilseeds during the period of 2013 to 2020 are illustrated in Figure 4.21. As is evident from the graph, the domestic wholesale prices have been consistently higher than the international prices during year 2014 (Q3) to 2021. International prices, on the other hand, are least volatile with 8.99% of variation in price. While the wholesale prices were higher than MSP since 2013 but they fell below MSP in 2017 (Q2) until 2020 (Q2), after which it rose sharply. The MSP increased only 3% during the period 2013 (Q2) and 2016 (Q1). After 2016 (Q1) the MSP increased during the first quarter of every year. The growth rate of MSP, domestic and international prices from Table 4.27 suggests that during the period of 2013 to 2020, MSP grew at the rate of 1.6%, domestic prices by 0.65% and international prices by 0.15%. MSP witnessed highest volatility with coefficient of variation being 15.35% followed by domestic price with variation of 12.67%. The correlation between MSP and domestic price (0.39) suggests increase in MSP can be explained by increase in domestic price (table 4.29).

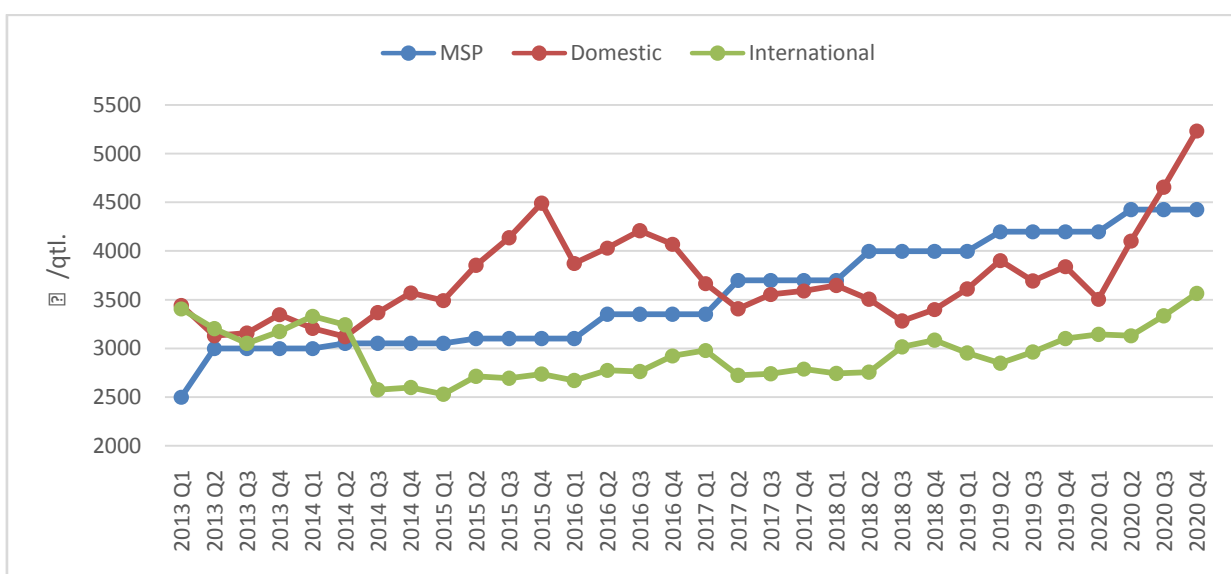
Figure 4.20: All India R&M oilseeds production and import of oils during 2012 to 2020



Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

The comparative trends in domestic and international prices of R&M oil during period of 2013 to 2020 are illustrated in Figure 4.23. It is observed that the domestic prices of R&M oil have been consistently higher than international prices since 2013 to 2020. The domestic prices of R&M oil grew with CAGR of 0.7% and international price by 0.39% (Table 4.27).

Figure 4.21: MSP, Domestic and International prices of R&M oilseeds during 2013 to 2020

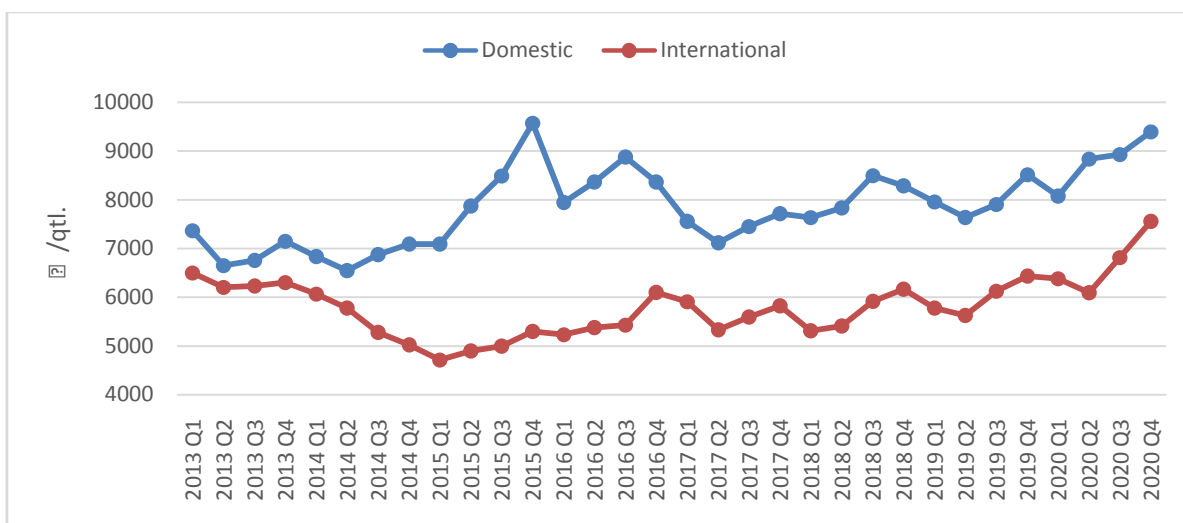


Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

Both domestic and international prices showed fluctuating trends during the period. Thus, the overall variation in domestic prices during the period of 2013 to 2020 was 10.17% as compared to 10.53% in international prices.

At quarterly level, maximum volatility is observed in Q4 of domestic prices (11.21%) and international prices (12.67%). Since 2019(Q2), the domestic prices have been gradually rising with a dip in 2020 (Q4) and by 2020(Q4), it has increased by 23.1%. Similarly, international prices of R&M oil have also been on an uptick since 2019 (Q2) with a dip in 2020 (Q2) and have risen by 34.3% in 2020(Q4) (Figure 4.22).

Figure 4.22: Domestic and international prices of R&M oil during 2013 to 2020



Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

It is evident that imports of R&M oil are negatively associated with production of R&M seeds (-0.52), suggesting that as higher imports are due to decreased production of R&M seeds in India. Similarly, imports are negatively correlated with international prices of seeds and oil (-0.74). However, imports have a weak positive correlation with domestic price of seeds (0.48) and oil (0.24). This implies that higher domestic prices with lower international prices invigorates imports of R&M oil in India.

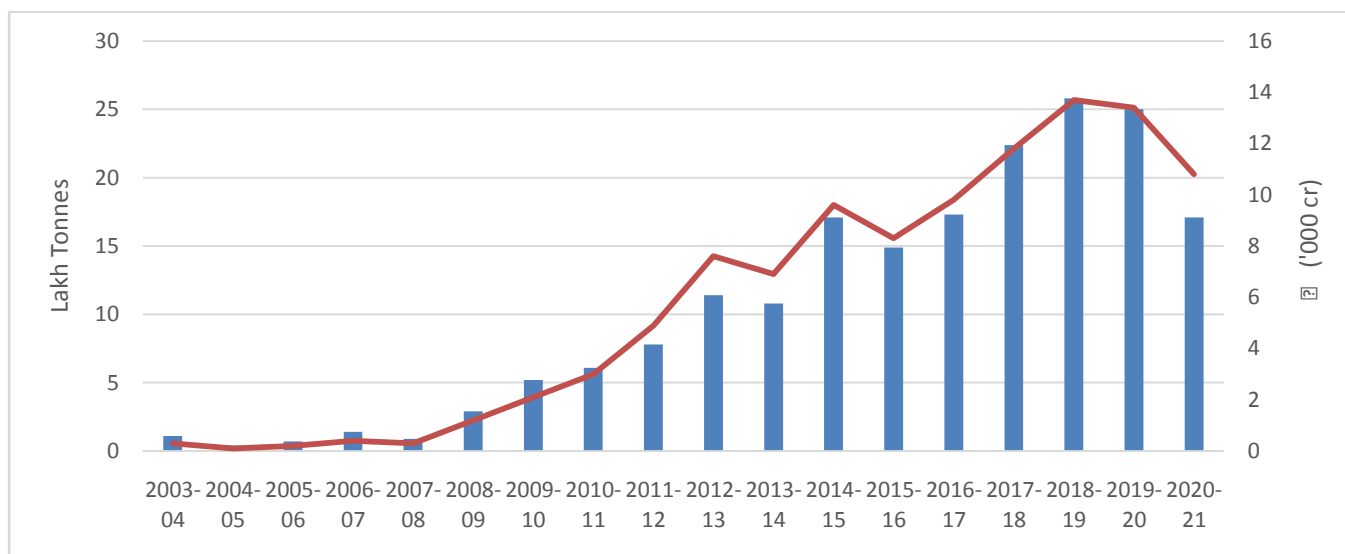
4.3.1.4 Sunflower

According to DGCIS, India exports small quantities of sunflower seed, whereas imports are nil. The imports of sunflower oil by India during the period of 2003-04 to 2020-21 are illustrated in Figure 4.23. It is evident that, India has witnessed an increasing trend in the import

of sunflower oil. As of 2003-04, India imported 1.1 Lakh tonnes (LT) of sunflower oil costing ₹ 300 Cr, which substantially increased to 25.8 LT costing ₹ 13.7 ('000 Cr.) in 2018-19. As of 2020-21, India's import of sunflower oil decreased to 17.1 LT costing about ₹ 10.8 ('000 Cr). This increasing trend in sunflower oil can be attributed to low production of sunflower in India and higher demand of oil by households.

The comparative trends in MSP, domestic and international prices of sunflower oilseeds during 2013 to 2020 are illustrated in Figure 4.24. India's domestic price of sunflower seed has remained higher than the international price since 2013 (Q2) except for 2018 (Q2) after which it rose till 2019(Q3), widening the gap between international and domestic prices. From 2019(Q3) the international prices of oilseed increased sharply and converged with domestic prices in 2020 and in 2020(Q4), the international prices were 19 percent higher than the domestic price. MSP on the other hand has always remained higher than both domestic and international prices.

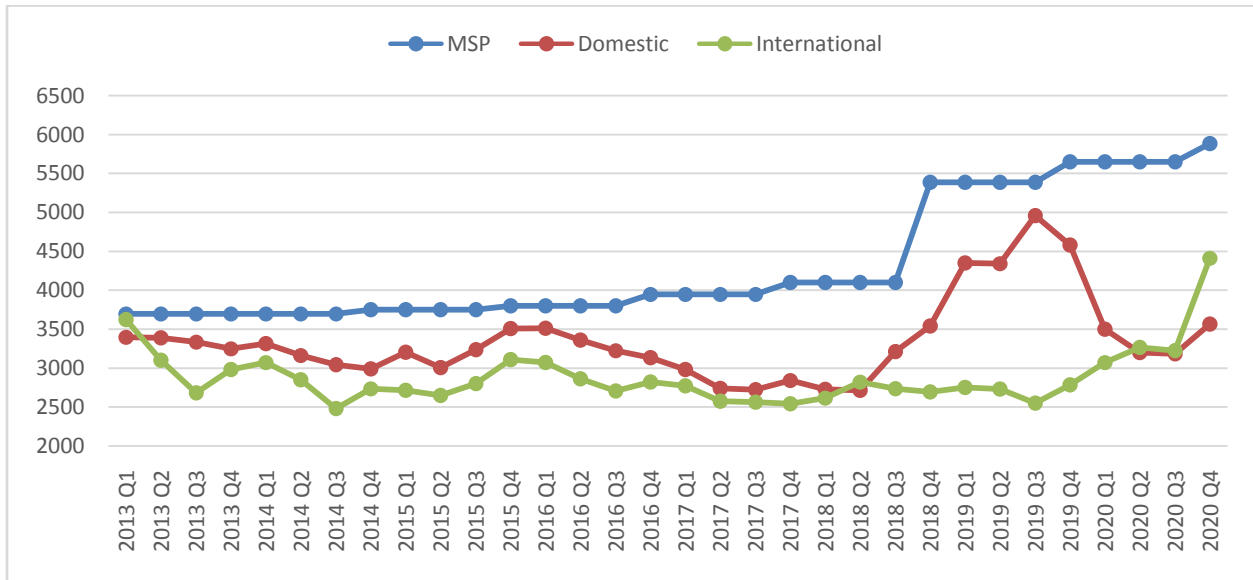
Figure 4.23: India's import of sunflower oil during 2003 to 2021



Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

The MSP of sunflower seeds in India grew with CAGR of 1.64% in 2013 to 2020, the growth rate of domestic price being 0.47% and that of international price 0.14% (Table 4.27). Increase in MSP is correlated with increase in domestic price with the correlation coefficient being 0.58 and that with international price (0.32) (Table 4.28).

Figure 4.24: MSP, Domestic and International price of sunflower seed

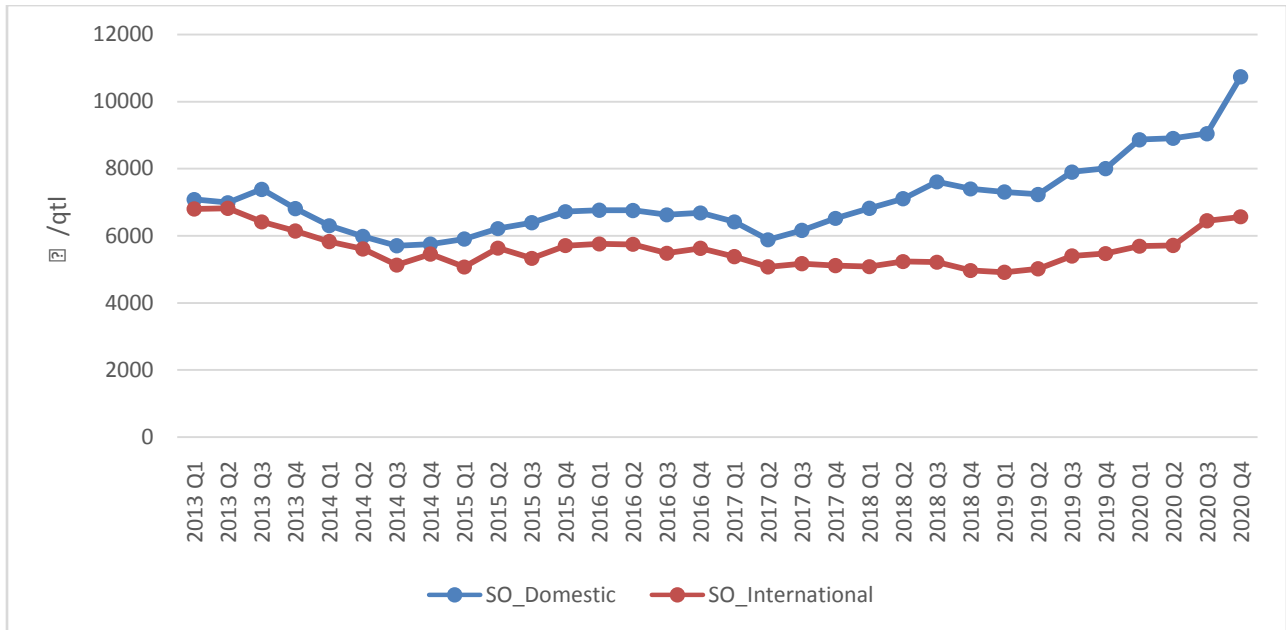


Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

Fluctuating trends in the prices of oilseeds is observed which is measured through coefficient of variation. It is evident that major volatility was observed in MSP with CV 18.53%, while that in domestic and international prices being 15.86% and 12.95%. It is also observed that major volatility is present in Q4 of MSP and international prices as compared to Q3 of domestic prices (table 4.26).

Similar trends in international and domestic price of sunflower oil are observed in figure 4.25. Domestic prices of sunflower oil have been higher than the international price from 2013(Q2) onwards and followed the trend similar to that of international prices. It is evident from Table 4.27 that the domestic prices of sunflower oil grew by the rate of 1.07% and that the decline in international prices was observed in the period of 2013 to 2020 with the CAGR of -0.30%. Domestic price of oil showed the maximum fluctuation with CV 15.66% as compared to 9.55% in international prices. It can also be observed that the maximum volatility is observed in Q4 of domestic price and Q1 of international prices (Table 4.27).

Figure 4.25: Domestic and International price of sunflower oil



Source: Commission for Agricultural Costs and Prices, Ministry of Agriculture and farmer's welfare, GOI.

It is evident that imports of sunflower oil are influenced by the level of production in the country. The correlation between imports and production is -0.82, suggesting a strong negative correlation. The result suggests that as production is declining, the imports of sunflower oil are increasing. Similarly, negative correlation of imports with international price of oilseed (-0.85) and oil (-0.86) implies that decreasing trend in international prices of seed and oil has led to increase in imports. On the other hand, domestic prices seem to have a weak positive correlation with imports, suggesting that higher domestic prices lead to an increase in imports.

4.4 Consumption of edible oils in India

As is evident from the previous sections, the share of oilseeds in Indian agriculture has a prominent role. The area under oilseeds is increasing, however the imports of edible oil has also been on rise. This increasing trends in imports of oil can be understood by analysing the past consumption trends of edible oil in India. For this purpose, the consumption data on the select Indian states and the country as a whole are analysed. The states included are according to the study namely,

The data is derived from the National Sample Survey Organization (NSSO) which publishes data on different edible oils consumed by the rural and urban households for different

states and for different rounds. The latest 68th round of NSSO data is pertaining for the period 2011-12. The NSSO data encompass only five oils viz., vanaspati/margarine, mustard oil, groundnut oil, coconut oil and Other Edible Oils (OEO's). However, in the 68th round, refined oil was included in the data. Moreover, information on the important oils consumed by the households in recent years like sunflower oil, soybean oil, rice bran oil, palm oil and the traditional oils like sesame are completely lacking in the NSSO data. Thus, the assessment is done based on the published records to understand the consumption patterns of households in previous years.

The monthly per capita consumption of edibles in India during last four NSSO reports for the periods of 1993-94 to 2011-12 are listed in Table 4.29. The overall per capita consumption of edible oil per month has been increasing in rural households from 0.37 kg per capita per month in 1993-94 to 0.67 kg per capita per month during the 68th round (2011-12). The per capita consumption in urban households increased from 0.56 kg per capita per month in urban population to 0.85 kg per capita per month during same period. The extent of increase is estimated to be as much as 81% in rural India and about 52% in urban India.

Table 4.29: Monthly per capita consumption of edible oils in India between 1993-2012

S. No.	Edible oils	Area	Quantity (kg)			
			50 th round (1993-94)	55 th round (1999-00)	61 st round (2004-05)	68 th round (2011-12)
1.	Groundnut oil	Rural	0.12	0.12	0.07	0.04
		Urban	0.24	0.23	0.16	0.08
2.	Mustard oil	Rural	0.17	0.24	0.22	0.30
		Urban	0.15	0.25	0.2	0.24
3.	Vanaspati/Margarine	Rural	0.03	0.04	0.03	0.02
		Urban	0.06	0.06	0.05	0.02
4.	Other Edible oil (OEOs)	Rural	0.05	0.09	0.14	0.07
		Urban	0.11	0.17	0.25	0.09
5.	Edible oil: all	Rural	0.37	0.5	0.48	0.67
		Urban	0.56	0.72	0.66	0.85

Source: Compiled from different NSSO rounds.

It is also observed that during the 50th round (1993-94), the major oil consumed by the rural households were groundnut and mustard oil. The quantity of mustard oil consumed was 0.17 kg per capita per month followed by groundnut oil (0.12 kg per capita per month). Over

different rounds, the per capita consumption of mustard oil increased and reached a peak of 0.3 kg per capita per month during the 68th round (2011-12). On the other hand, per capita consumption of groundnut oil decreased by 67% since 1993-94, reaching to 0.04 kg per capita per month during the 68th round (2011-12). During the same period, the consumption of vanaspati oil in rural and urban population has also decreased by 33% and 66%, respectively. This decline in groundnut oil and vanaspati consumption in recent years was compensated by higher consumption of mustard oils and OEOs.

Comparing the consumption pattern in last two rounds such as 61st and 68th round, it is evident that there is perceptible shift in consumption of edible oil. The overall per capita consumption in rural India increased by only 40% since the 2004-05 and that in urban India by 29%. Except for mustard oil, the consumption of all the remaining oils has declined both in rural and urban households (Table 4.29).

Table 4.30.a : Monthly per capita quantity and value of consumption for selected states in rural India- 61st and 68th round

States	Andhra Pradesh				Rajasthan			
Year	2004-05		2011-12		2004-05		2011-12	
Item Description	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)
Vanaspati/ Margarine	0.001	0.05	0.005	0.33	0.005	0.25	0.007	0.56
Mustard Oil	0.001	0.04	0	0.02	0.215	10.68	0.289	22.85
Groundnut Oil	0.239	13.08	0.184	15.98	0.035	2.03	0.041	3.91
Coconut Oil	0.001	0.05	0.002	0.16	0	0.01	0	0
Refined Oil	-	-	0.34	24.34	-	-	0.289	23.13
Other Edible Oils (OEOs)	0.312	14.78	0.273	16.37	0.164	8.97	0.026	2.7
Subtotal	0.554	28	0.804	57.21	0.42	21.93	0.652	53.16
Oilseeds (gm)	8.157	0.45	31.509	3.13	3.182	0.25	3.729	0.32
States	Gujarat				Tamil Nadu			
Year	2004-05		2011-12		2004-05		2011-12	
Item Description	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)
Vanaspati/ Margarine	0.005	0.26	0.001	0.05	0	0.03	0.005	0.4
Mustard Oil	0.026	1.28	0.047	3.68	0	0.01	0	0
Groundnut Oil	0.432	24.25	0.187	20.57	0.23	12.64	0.098	8.56
Coconut Oil	0.005	0.25	0.003	0.31	0.003	0.19	0.008	0.7
Refined Oil	-	-	0.303	24.41	-	-	0.314	22.74
Other Edible Oils (OEOs)	0.35	17.52	0.505	39.89	0.207	11.28	0.199	8.91
Subtotal	0.817	43.57	1.045	88.9	0.441	24.14	0.623	41.31
Oilseeds (gm)	16.599	0.61	27.137	1.99	23.431	0.93	37.863	3.05

Source: Compiled from different NSSO rounds.

Table 4.30.b: Monthly per capita quantity and value of consumption for selected states in rural India- 61st and 68th round

Item Description	Haryana				Uttar Pradesh			
	2004-05		2011-12		2004-05		2011-12	
	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)
Vanaspati/ Margarine	0.169	8.37	0.056	3.96	0.062	3.04	0.03	2.07
Mustard Oil	0.173	8.54	0.408	30.69	0.403	20.61	0.537	42.08
Groundnut Oil	0.002	0.09	0.002	0.12	0.002	0.12	0.004	0.31
Coconut Oil	-	-	0	0	0	0	0	0.01
Refined Oil	-	-	0.105	8.43	-	-	0.039	3.03
Other Edible Oils (OEOs)	0.034	2.01	0.001	0.05	0.005	0.23	0.001	0.07
Subtotal	0.378	19.01	0.572	43.25	0.472	24.01	0.611	47.56
Oilseeds (gm)	0.211	0.02	0.368	0.08	1.36	0.05	2.732	0.17
Item Description	Madhya Pradesh				West Bengal			
	2004-05		2011-12		2004-05		2011-12	
	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)
Vanaspati/ Margarine	0.017	0.83	0.019	1.35	0.005	0.26	0.004	0.35
Mustard Oil	0.126	6.3	0.172	13.38	0.471	26.67	0.612	54.24
Groundnut Oil	0.01	0.53	0.005	0.44	0.002	0.12	0.004	0.38
Coconut Oil	0.001	0.03	0.002	0.11	0	0.01	0	0
Refined Oil	-	-	0.442	32.45	-	-	0.031	2.68
Other Edible Oils (OEOs)	0.27	12.78	0.005	0.32	0.007	0.37	0.002	0.18
Subtotal	0.424	20.48	0.644	48.06	0.485	27.44	0.653	57.84
Oilseeds (gm)	6.243	0.23	11.363	0.89	21.166	0.77	25.428	1.64
Item Description	Maharashtra				All-India			
	2004-05		2011-12		2004-05		2011-12	
	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)
Vanaspati/ Margarine	0.016	0.85	0.009	0.78	0.034	1.68	0.02	1.47
Mustard Oil	0.003	0.15	0.001	0.13	0.225	12.2	0.304	25.07
Groundnut Oil	0.163	9.29	0.039	3.61	0.072	3.98	0.04	3.68
Coconut Oil	0.002	0.1	0.001	0.13	0.01	0.71	0.015	1.36
Refined Oil	-	-	0.882	67.01	-	-	0.227	17.19
Other Edible Oils (OEOs)	0.475	23.51	0.061	4.48	0.143	7.15	0.069	4.66
Subtotal	0.659	33.9	0.995	76.14	0.484	25.72	0.674	53.44
Oilseeds (gm)	13.861	0.81	29.301	2.82	11.083	0.44	18.255	1.43

Source: Compiled from different NSSO rounds.

To analysis of the gap in the consumption pattern in the last two rounds, i.e., 61st round (2004-05) and 68th round (2011-12), the consumption in the urban and rural households of

selected states of India and All-India consumption in two periods are compared. It is to be noted that the consumption pattern of refined oil is only reported in 2011-12, hence comparable values of 2004-05 are not reported. The monthly per capita consumption in rural areas of the selected states of India is provided in Table 4.30.a and 4.30.b. It is evident that in rural India, even though the overall monthly per capita consumption has increased, the consumption of vanaspati, groundnut oil and OEOs has declined by 40%, 40% and 50% respectively. At the state level, the findings suggests that the monthly per capita consumption increased by 70% in Haryana, by 60% in Rajasthan, Gujarat and Tamil Nadu, 50% in Andhra Pradesh, Madhya Pradesh and Maharashtra, 30% in West Bengal and by only 10% in Uttar Pradesh.

The consumption of vanaspati has declined in most of the selected state and at All-India level except for Tamil Nadu, Madhya Pradesh Rajasthan and Andhra Pradesh, where per capita consumption of vanaspati increased. The consumption of mustard oil, on the other hand, increased in all the states except for Maharashtra and Andhra Pradesh. It is observed that rural households in Tamil Nadu consume negligible amount of mustard oil.

Table 4.31.a: Monthly per capita quantity and value of consumption for Urban areas of selected states in India- 61st and 68th round

Item	Andhra Pradesh				Rajasthan			
	2004-05		2011-12		2004-05		2011-12	
	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)
vanaspati	0.001	0.05	0.003	0.23	0.014	0.73	0.007	0.6
mustard	0.002	0.11	0.001	0.04	0.208	10.42	0.228	18.1
groundnut	0.244	13.21	0.174	14.68	0.169	9.65	0.07	6.95
coconut	0.003	0.2	0.002	0.23	0.001	0.05	0.001	0.15
refined oil			0.524	41.29			0.492	39.76
OEOs	0.37	18.4	0.15	9.03	0.191	10.33	0.003	0.31
subtotal	0.62	31.97	0.855	65.5	0.582	31.17	0.8	65.86
oilseeds (g)	9.207	0.56	36.074	3.6	3.686	0.28	2.758	0.33
Item	Gujarat				Tamil Nadu			
	2004-05		2011-12		2004-05		2011-12	
	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)
vanaspati	0.019	0.92	0.004	0.27	0.002	0.1	0.001	0.13
mustard	0.031	1.67	0.073	6.39	0	0.01	0	0.04
groundnut	0.639	36.12	0.299	31.93	0.143	8.03	0.043	3.78
coconut	0.005	0.24	0.007	0.67	0.003	0.2	0.012	1.55
refined oil			0.222	18.4			0.419	32.81
OEOs	0.364	18.86	0.625	49.07	0.405	23.38	0.208	11.03
subtotal	1.057	57.82	1.228	106.74	0.553	31.71	0.685	49.35
oilseeds (g)	16.951	0.69	34.099	3.04	25.923	1.13	39.248	3.41

The consumption of groundnut oil has declined at all-India level and so in Andhra Pradesh, Tamil Nadu, Gujarat and Maharashtra. Haryana on the other hand has the constant groundnut oil consumption. On contrary, the consumption of coconut oil has declined in Gujarat and Maharashtra and increased in Andhra Pradesh, Tamil Nadu and Madhya Pradesh. The consumption is negligible in the remaining states. However, the per capita consumption of Other edible oils (OESs) has declined in the two periods except in Gujarat, where per capita consumption increased from 0.35 kg in 2004-05 to 0.505 kg in 2011-12.

It is interesting to observe that per capita consumption of groundnut oil and OEOs have decreased in Andhra Pradesh, but the value of monthly per capita consumption has increased from ₹ 13.08 to ₹ 15.98 in case of groundnut oil and from ₹ 14.78 to ₹ 16.37 for OEOs during 2004-05 and 2011-12. On contrary, the per capita consumption of edible oils has increased in rural Rajasthan during same time period along with the sharp decline in the consumption of OEOs from 0.164 kg per capita per month in 2004-05 to 0.026 kg per capita per month in 2011-12.

However, the consumption of oilseeds in rural areas of all the selected states have increased sharply. This could be because these states are also major source of production of edible oils and the rural population might keep oilseeds for self-consumption.

The shift in pattern of consumption in urban areas of the selected states is depicted in Table 4.31.a and 4.31.b. As is evident, except for Andhra Pradesh, the consumption of Vanaspati has declined in all urban areas of the selected states. However, the consumption of mustard oil declined in Andhra Pradesh as compared rising trend of mustard oil in remaining selected states and the consumption remained negligible in Tamil Nadu. Groundnut oil per capita consumption saw a declining trend in urban areas except for Uttar Pradesh where the per capita consumption increased from 0.002 kg per capita per month in 2004-05 to 0.004 kg per capita per month in 2011-12.

Similarly, consumption of OEOs has also declined in two time period except in Gujarat. The monthly per capita consumption of coconut oil, however, declined in Madhya Pradesh and Andhra Pradesh but has remained similar in Rajasthan and negligible consumption is observed in Haryana and West Bengal. These declining trends can be explained due to increasing use of refined oil in 2011-12 as the urban areas have higher per capita income and invest more in packaged refined products. Another finding suggests the increasing trends in the consumption of

oilseeds in all the urban states except for Rajasthan and Haryana where oilseeds consumption has declined in urban areas.

Table 4.31.b: Monthly per capita quantity and value of consumption for Urban areas of selected states in India- 61st and 68th round

	Haryana				Uttar Pradesh			
	2004-05		2011-12		2004-05		2011-12	
item description	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)
vanaspati	0.154	7.83	0.061	4.33	0.096	4.96	0.035	2.54
mustard	0.233	11.53	0.407	31.74	0.405	21.08	0.56	44.45
groundnut	0.014	0.75	0.005	0.44	0.002	0.09	0.004	0.28
coconut			0	0	0	0.01	0.001	0.13
refined oil			0.302	26.09			0.177	14.49
OEOs	0.158	9.01	0	0.06	0.055	2.99	0	0.03
subtotal	0.56	29.12	0.775	62.66	0.559	29.12	0.777	61.93
oilseeds (gm)	0.238	0.02	0.156	0.02	0.947	0.04	3.525	0.42
	Madhya Pradesh				West Bengal			
	2004-05		2011-12		2004-05		2011-12	
item description	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)
vanaspati	0.032	1.54	0.024	1.69	0.011	0.66	0.01	0.79
mustard	0.125	6.26	0.126	9.73	0.601	34.9	0.668	59.39
groundnut	0.076	4.45	0.01	0.95	0.005	0.33	0.005	0.43
coconut	0.007	0.36	0.001	0.09	0	0.03	0	0.02
refined oil			0.678	49.95			0.171	15.89
OEOs	0.401	18.85	0.009	0.6	0.075	4.76	0.007	0.62
subtotal	0.64	31.47	0.847	63.02	0.692	40.67	0.861	77.15
oilseeds (gm)	8.733	0.37	14.691	1.23	20.056	0.89	23.202	1.72
	Maharashtra				All- India			
	2004-05		2011-12		2004-05		2011-12	
item description	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)
vanaspati	0.026	1.48	0.009	0.73	0.049	2.59	0.021	1.59
mustard	0.02	1.21	0.058	5.04	0.196	10.73	0.242	20.2
groundnut	0.359	21.07	0.188	16.54	0.157	8.94	0.081	7.53
coconut	0.004	0.21	0.005	0.5	0.011	0.79	0.016	1.57
refined oil			0.728	61.33			0.4	32.62
OEOs	0.385	20.18	0.046	3.32	0.249	13.31	0.094	6.52
subtotal	0.793	44.15	1.032	87.45	0.663	36.37	0.853	70.03
oilseeds (gm)	15.077	1.1	23.963	2.3	12.014	0.6	20.935	1.86

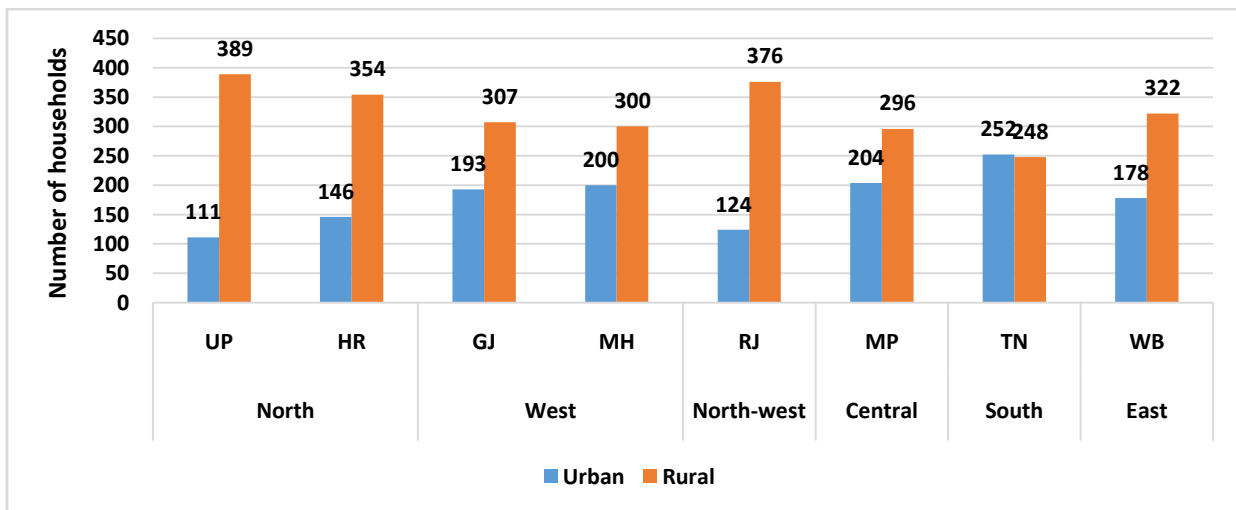
Chapter 5

Consumption Pattern of Different Edible oils in India

In this chapter the analysis on the primary data is conducted with respect to six zones of India comprising of Uttar Pradesh and Haryana in north, Gujarat and Maharashtra in the west, Rajasthan in the north-west, Madhya Pradesh in the central, Tamil Nadu in south and West Bengal in the east. The data was collected for 500 households in each state and the analysis was carried out.

The upcoming sections discuss the socio-economic characteristics of the households and their preferences of the type of oil, brand preferences, shift in per capita consumption in rural and urban areas in five years. The chapter also analyses the income of the households with the quantity of oil consumed, purchase decisions regarding oil, health impacts and awareness regarding edible oil in rural and urban areas of different zones of India comprising of different socio-economic characteristics, consumption pattern of edible oil, influence on purchase decision of edible oils, health impacts and awareness regarding the edible oil.

Figure 5.1: Number of households selected in 8 states of different zones of India



A total of 111 urban and 389 rural households in Uttar Pradesh, 146 urban and 354 rural households in Haryana, 193 urban and 307 rural households in Gujarat and 146 urban and 354 rural households were surveyed in Maharashtra. In Rajasthan there were 124 urban and 376 rural households Madhya Pradesh comprised of 204 urban and 296 rural households, Tamil Nadu of

252 urban and 248 rural households and West Bengal of 178 urban and 322 rural households (Figure. 5.1).

5.1 Socio-economic characteristics

5.1.1 Socio-economic aspects of urban and rural households

In this section the socio-economic characteristics of the households in the different zones of India are analyzed and discussed. As is evident from Figure 5.2, more than three-fourth of the respondents were males except in the south and urban east zone. In the south zone, 62.7% of the respondents in urban and 54% in rural households were males. Similarly, in urban east zone, about 73% were males and 27% were female respondents. In rural north zone (Haryana), there were 88.1% male, 11.6% female and 0.3% belonged to the other category (Figure. 5.2).

A contrasting image is observed between urban and rural households of India on different zones based on the level of education. Except for west zone and in the north (Uttar Pradesh), the urban households have graduation and above level of education (north (Haryana): 55.5%, central:61.3%, north-west: 51.6%, south: 39.7% and east: 28.1%). However, in the northern zone (Uttar Pradesh), majority (31.5%) of the households have middle level of education followed by 27% are graduates and above. In the west zone more than one-fourth have secondary level of education (Gujarat: 30.1%, Maharashtra: 26.5%). Similar trends are observed in the north, west and central zones of rural households. On the other hand, a contrasting pattern is observed in north-west, south and east zone rural households. It is observed that in the west more than one-fourth (26.6%) are illiterate with 22.3% having secondary level of education and only 11.7% have graduation and above. In the south zone, about 24.6% have middle level of education with 23.4% illiterate and 9.7% have graduation and above. In the east zone also, 28.3% have middle level of education and 24.8% have primary with only 6.2% having graduation and above level of education. The findings also suggest that illiteracy is very low in urban households with maximum in west zone (Gujarat: 8.8%) and minimum in south zone (0.4%) (Table 5.1.a and 5.1.b).

The occupation of the urban and rural households in different zones exhibit a very distinctive picture. It is observed that in urban areas, majority of the households are salaried employees (north: 54.1%(Haryana), west: 34.2% (Gujarat), 24% (Maharashtra), central: 47.1%,

south: 42.5% and east: 46.6%) or have business (north: 49.5% (Uttar Pradesh) and north-west: 33.1%) as compared to rural households where majority are either in cultivation (north: 56.8% (Uttar Pradesh), 44.1%(Haryana), west: 45% (Gujarat), 46% (Maharashtra), central: 38.2%, north-west: 68.9%, and east: 40.1%)or are casual agricultural labourers (south: 42.5%).

Figure 5.2: Gender of respondents

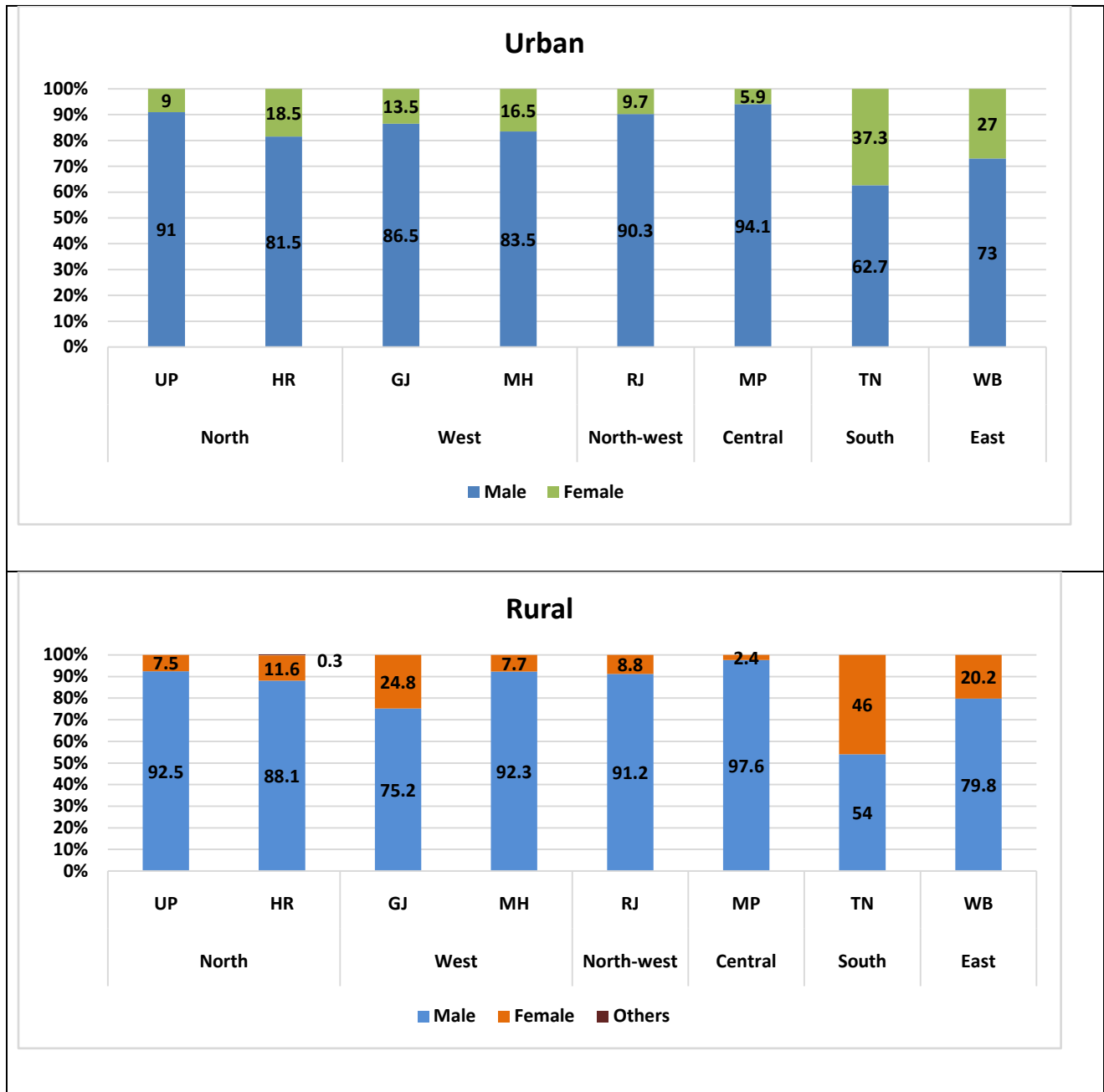


Table 5.1.a: Socio-economic factors of households

Item	Type	North				West				
		Uttar Pradesh		Haryana		Gujarat		Maharashtra		
		U	R	U	R	U	R	U	R	
Education (%)	Illiterate	1.8	13.4	4.8	8.2	8.8	20.2	2	14.7	
	Primary	8.1	24.7	6.2	11.6	2.6	9.1	6	12.7	
	Middle	31.5	27	6.2	17.5	12.4	23.1	21	19.3	
	Secondary	16.2	19	11	20.9	30.1	27.7	26.5	31	
	Higher Secondary	15.3	11.3	16.4	20.1	16.1	11.4	23	16.7	
	Graduation+	27	4.6	55.5	21.8	30.1	8.5	21.5	5.7	
Occupation (%)	Cultivation	1.8	56.8	0.7	44.1	16.1	45	2	46.7	
	Livestock	2.7	3.3	0.7	0	2.6	9.1	0	2	
	Other agr. Activity	3.6	4.1	0	0	0	0.3	1	3	
	Casual agr. Labourer	0.9	2.3	0	0.3	0.5	6.2	9.5	20.3	
	Non-agr. Casual lab	12.6	19.5	2.1	8.2	9.8	8.8	22.5	12.7	
	Salaried	19.8	6.4	54.1	23.2	34.2	10.1	24	7	
	Business	49.5	4.6	26.7	6.2	30.1	5.5	20	9.3	
	Housewife	7.2	2.1	11	6.5	5.2	14.3	9	3.3	
	Unemployed	0	0	0	3.4	1	0.3	2.5	1.7	
	Other	1.8	0.8	4.8	8.2	0.5	0.3	10	2	
	Religion (%)	Hindu	87.4	90.7	96.6	93.2	99	86.3	87.5	95.7
		Muslim	12.6	9.3	1.4	0.3	0.5	12.7	8.5	3
Christian		0	0	0	0	0.5	1	2	0	
Sikh		0	0	2.1	6.5	0	0	0.5	0	
Jain		0	0	0	0	0	0	1	0	
other		0	0	0	0	0	0	0.5	1.3	
Social category (%)	General	17.1	28	51.4	41	62.7	27.7	49	59.3	
	OBC	71.2	41.9	30.8	37.9	29.5	51.5	21	20.3	
	SC	11.7	30.1	17.8	21.2	7.8	14.7	13.5	10	
	ST	0	0	0	0	0	6.2	16.5	9.3	
Marital status (%)	Married	99.1	99.7	81.5	85	93.8	95.1	87.5	89	
	Unmarried	0.9	0	15.8	13.3	6.2	2.6	6.5	3	
	Divorced	0	0	0	0	0	0.3	0	0.7	
	widowed	0	0.3	2.7	1.7	0	2	6	7.3	
Decision household expenditure (%)	Respondent	100	99.2	59.6	67.5	65.8	70	71	81	
	Wife	0	0.5	0.7	0.3	6.7	4.6	17	10.3	
	husband	0	0	13	4.8	1.6	8.1	4	2.3	
	children	0	0	0.7	2.3	0	0.7	0	1	
	Elder	0	0.3	21.2	12.7	9.3	9.1	6.5	5	
	other	0	0	4.8	12.4	16.6	7.5	1.5	0.3	
Household income (₹ /month) (%)	below 15000	46	72.8	8.9	32.5	18.1	40.1	39.5	46.3	
	15001-30000	41.4	19.3	30.8	30.8	44.6	34.5	31	42.3	
	30001-50000	11.7	4.6	24.7	16.4	18.1	16.6	14	6.7	
	50001-80000	0.9	3.3	16.4	12.7	10.4	5.5	9.5	3	
	Above 80000	0	0	19.2	7.6	8.8	3.3	6	1.7	

It is also observed that the majority of the surveyed households are Hindu in both urban and rural households of different zones in India. After Hindus, majority of the households are Muslims in Uttar Pradesh state (north zone), west zone, rural households of the central zone and east zone. However, Sikhs are most dominant religious category in the north zone (Haryana) and north-west and Christianity in south zone, after Hindus. Social category of the households indicate that majority of the urban households belonged to OBC category (north: 71.2% (Uttar Pradesh), central: 52% and south: 86.1%) and general (north: 51.4% (Haryana), west: 62.7% (Gujarat), 49% (Maharashtra), north-west: 48.4% and east: 73%) followed by SC category. The results are similar in rural households as well except for the north-west where 45.5% and the west zone (Gujarat) where 51.5% belong to OBC category (Table 5.1.a and 5.1.b). It is observed that the majority of the respondents in the urban and rural households are married followed by unmarried respondents except for east zone and rural Maharashtra of the west zone. It is observed that 7.3% of the rural Maharashtra and in the east about 23.6% of the urban and 20.8% of the rural were widowed.

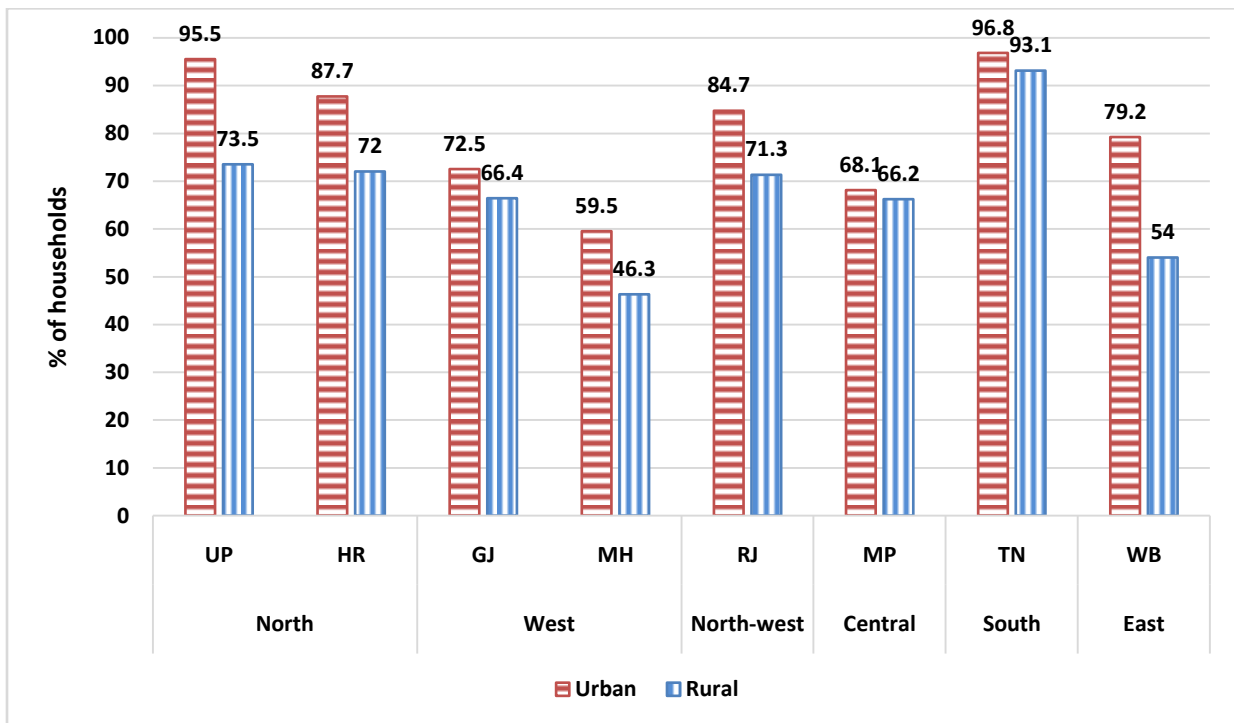
Income is a key factor in understanding the oil preference among households. It is observed that the majority of the household's income is within ₹ 30,000 per month in north and west zones of India. However, the other zones have contrasting images in rural and urban areas. The urban households' income of the central (25%) and north-west (35.5%) is between ₹ 30,000 to ₹ 50,000 per month, that of, south (29.8%) and east (28.7%) is between ₹ 15,000 to ₹ 30,000 per month. The rural households, however, in central zone about three-fourths of the households' income is below ₹ 30,000, in north-west zone about 27.4 percent's income is between ₹ 50,000 to ₹ 80,000 and in the south and east zone, more than half of the households earn below ₹ 15,000 per month. It is also observed that the household expenditure decisions are majorly taken by the respondents in urban and rural households of in all the zones of India. Husband is the decision maker in case of south (urban: 13.1% and rural: 11.7%) and east (urban: 21.9% and rural: 21.1%) zone. In the Haryana state (urban: 21.2% and rural: 12.7%) of the north zone, rural Gujarat (9.3%) of the west and rural central (8.1%) zone, the expenditure decision is taken by elders of the house. Wife on the other hand is the decision maker after respondent in rural north (Uttar Pradesh: 0.5%), west (Maharashtra urban: 17% and Maharashtra rural: 10.3%), urban central (12.3%) and north-west zone (urban: 16.1% and rural: 10.6%) of India (Table 5.1.a and 5.1.b).

Table 5.1.b: Socio-economic factors of households

Item	Type	Central		North-west		South		East	
		Madhya Pradesh		Rajasthan		Tamil Nadu		West Bengal	
		U	R	U	R	U	R	U	R
Education (%)	Illiterate	6.9	22.6	6.5	26.6	0.4	23.4	6.2	16.5
	Primary	5.4	14.2	2.4	11.4	2.4	13.7	10.7	24.8
	Middle	5.4	14.2	4.8	12	11.5	24.6	15.2	28.3
	Secondary	9.8	13.2	27.4	22.3	22.6	16.5	22.5	16.5
	Higher Secondary	11.3	16.9	7.3	16	23.4	12.1	17.4	7.8
	Graduation+	61.3	18.9	51.6	11.7	39.7	9.7	28.1	6.2
Occupation (%)	Cultivation	5.9	38.2	19.4	68.9	6.3	21	1.7	40.1
	Livestock	14.2	11.8	0	8.8	1.2	0.4	0.6	12.4
	Other agr. Activity	2	5.7	0	6.1	7.1	8.1	0	1.6
	Casual agr. Labourer	4.4	9.5	0	8.5	2.8	24.2	0	6.5
	Non-agr. Casual lab	2.5	8.4	2.4	0.8	7.5	15.3	3.9	15.2
	Salaried	47.1	7.4	31.5	2.7	42.5	22.6	46.6	14
	Business	19.1	13.9	33.1	2.4	13.9	2.4	22.5	18.3
	Housewife	0.5	2	4	6.9	14.3	3.2	17.4	9.6
	unemployed	2	2.7	0	0.5	1.2	2.4	2.8	3.1
	Other	2.5	0.3	9.7	0.3	3.2	0.4	7.3	18.9
Religion (%)	Hindu	95.6	98.3	98.4	91.8	89.7	96.4	90.4	73
	Muslim	2	1	0	2.4	4	1.6	3.4	22.7
	Christian	0	0	0	0.5	6.3	2	0.6	0
	Sikh	0	0	0.8	5.3	0	0	0	0
	Jain	2.5	0.7	0	0	0	0	0	0
	Other	0	0	0.8	0	0	0	5.6	4.3
Social category (%)	general	25.5	15.9	48.4	16.5	10.7	4.4	73	53.7
	OBC	52	38.2	29.8	45.5	86.1	71	9.6	21.4
	SC	15.7	25	21	27.7	3.2	24.2	10.1	15.8
	ST	6.9	20.9	0.8	10.4	0	0	7.3	9
Marital status (%)	Married	90.2	88.2	99.2	95.5	92.5	91.9	75.3	78.6
	Unmarried	6.4	11.8	0.8	2.1	6.7	6.9	1.1	0.6
	Divorced	0.5	0	0	0.5	0	0	0	0
	Widowed	2.9	0	0	1.9	0.8	1.2	23.6	20.8
Decision household expenditure (%)	Respondent	77.9	88.2	43.5	76.6	78.2	79.4	61.2	64.6
	Wife	12.3	1.4	16.1	10.6	3.6	1.6	3.4	5
	husband	0	0	0	0.3	13.1	11.7	21.9	21.1
	Children	2	2.4	0.8	2.4	1.6	1.2	2.8	1.6
	Elder	7.8	8.1	21	7.4	3.6	6	10.7	7.1
Household income (□ /month) (%)	Below 15000	8.3	38.9	25	15.7	6.7	55.2	21.9	53.1
	15000-30000	22.5	40.2	10.5	16.8	29.8	30.6	28.7	28
	30000-50000	25	15.2	35.5	23.1	27.8	8.9	18.5	11.2
	50000-80000	23.5	4.4	18.5	27.4	25.8	0.8	22.5	5
	Above 80000	20.6	1.4	10.5	17	9.9	4.4	8.4	2.8

The findings also suggest that more than three-fourth of the urban households have nuclear family except for west (Gujarat: 72.5%, Maharashtra: 59.5%) and central (Madhya Pradesh: 68.1%) zone of India. However, at least one-fourth of the rural households have joint family except for south zone. The maximum number of nuclear households belonged to the south zone (urban: 96.8% and rural: 93.1%) and minimum in the west (Maharashtra) (urban: 59.5% and rural: 46.3%) (Figure 5.3).

Figure 5.3: Number of households that are nuclear



There is a contrasting picture of the covered area of the urban and rural households in various zones of India. It is observed that the mean covered area of the house is higher of the rural households in north zone, west zone (Gujarat) and the east zone as compared to the urban households. However, the mean covered area of the urban households is higher than the rural households in the west (Maharashtra), central, northwest and the South zone (Table 5.2).

The average family size of the urban and rural households is estimated to be 4 and 5, respectively. In urban households, the average family size in north and central zone is 5 with the standard deviation of 1, 2 and 2 in Uttar Pradesh, Haryana and Madhya Pradesh state. The average family size is 4 in the West, northwest and east zones of India with the standard deviation of 1.

In rural households also a similar pattern is observed except for the west (Gujarat), central and the east zone. The average family size of 5 is observed in the West (Gujarat) and in the east zone and size of 6 is observed in the central zone with the standard deviation of 2 in each zone. Interestingly, the average family size in the rural and urban South zone is 3 with standard deviation of 1 (Table 5.2).

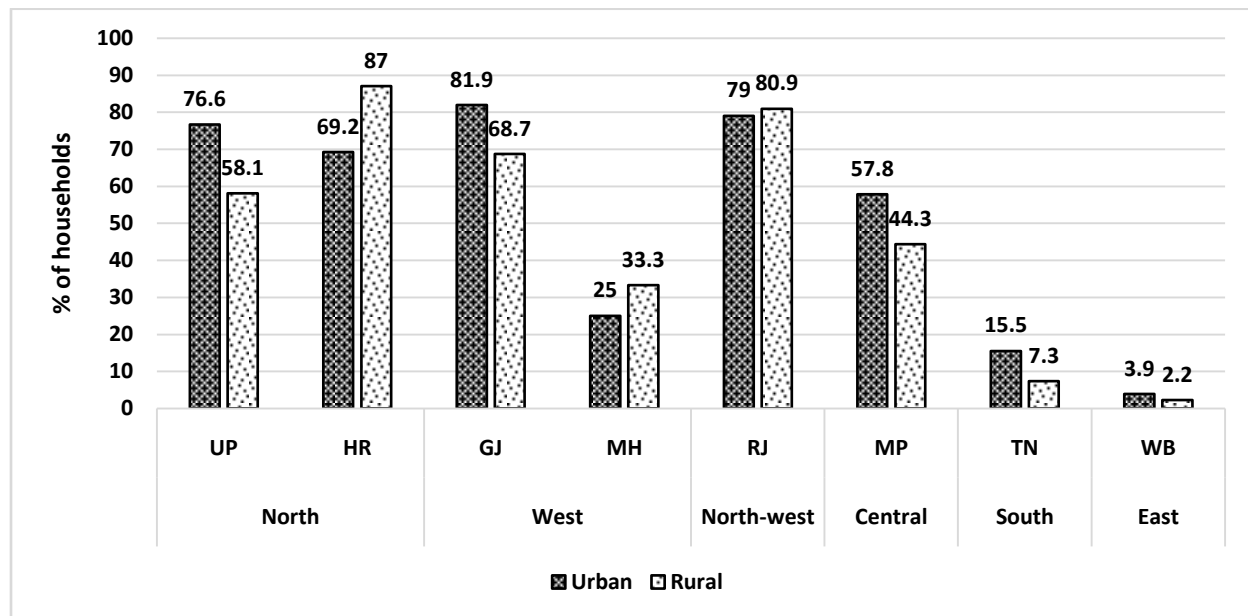
Table 5.2: Mean and standard deviation of age, family size and cover area of households

Zone	States	Households	Mean \pm Standard deviation		
			Age (in years)	Cover area of the house (sq.m.)	Family size
North	Uttar Pradesh	Urban	42.1 \pm 10.3	102.9 \pm 40.8	5 \pm 1.2
		Rural	46.9 \pm 11	105.2 \pm 50.2	5 \pm 1.7
	Haryana	Urban	38.8 \pm 12.9	1233.1 \pm 713.7	5 \pm 1.8
		Rural	43.2 \pm 16	1525.3 \pm 1381.1	5 \pm 1.9
West	Gujarat	Urban	45.4 \pm 12.8	1086.5 \pm 1220.6	4 \pm 1
		Rural	45.5 \pm 12.5	1901.3 \pm 1608	5 \pm 2
	Maharashtra	Urban	46.4 \pm 13	808.9 \pm 780.7	4 \pm 1.4
		Rural	52.1 \pm 13.9	756.7 \pm 568.6	4 \pm 1.6
Central	Madhya Pradesh	Urban	43 \pm 11	525.7 \pm 254	4 \pm 1.19
		Rural	42 \pm 12	504 \pm 242.1	4 \pm 1.12
North-west	Rajasthan	Urban	51.6 \pm 10.3	2474.4 \pm 1143.2	5 \pm 2
		Rural	48.3 \pm 12.1	1962.9 \pm 1246.9	6 \pm 2
South	Tamil Nadu	Urban	47 \pm 11.3	1095.4 \pm 470.1	3 \pm 1
		Rural	51 \pm 13	717.5 \pm 445.1	3 \pm 1
East	West Bengal	Urban	56.2 \pm 12.2	170.8 \pm 197.6	4 \pm 1.4
		Rural	57.1 \pm 13.9	280.1 \pm 407.2	5 \pm 2

It is observed that the mean age of the urban households in different zones of India lies between 39 (Haryana: north zone) and 56 (east zone) years with the standard deviation between 10 and 13. On the other hand, the mean age of the respondents in the rural households vary between 42 (north-west zone) and 57 (east zone) years and standard deviation ranging between 11 and 16. The findings also suggests that mean age of the respondents is higher in the rural households as compared to the urban households except for North-West and central zone where the mean age of the respondents in the urban households is higher than the rural households (Table 5.2).

On the food habits it is observed that the urban households were majorly vegetarian in the north (Uttar Pradesh: 76.6%, Haryana: 69.2%), west (Gujarat:81.9%), north-west (Rajasthan: 79%) and central (Madhya Pradesh:57.8%) zone. However, only 25% of urban Maharashtra in the west, 15.5% in south and 3.9% in the east zone were vegetarian and the rest were non-vegetarians. Similarly rural households in the north (Uttar Pradesh: 58.1%, Haryana: 87%), west (Gujarat:68.7%) and north-west (Rajasthan: 80.9%). However, 44.3% in the central zone, 33.3% of the rural households in the west (Maharashtra), 7.3% in south and 2.2% in the east zone were vegetarian and the rest were non-vegetarians (Figure5.4).

Figure 5.4: Food habits of the households in different zones of India



The survey also suggests that more than 90% of the households in the west, south, east, urban north-west and urban north zones have ration cards. 78.4% of the urban and 82% of the rural households in the Uttar Pradesh state, 63.7% of the urban Haryana of the north zone and 77.4% of the urban Rajasthan of the west zone have ration cards. However, in the central zone (Madhya Pradesh), only 29.4% of the urban and 79.7% of the rural households have ration cards (Figure. 5.5). On the other hand, Figure 5.6 illustrates the percentage number of households that were below poverty line, which is defined on the basis of Tendulkar Expert Group (2009) as the households with consumption expenditure less than Rs. 816 per capita per month for rural areas and Rs. 1,000 per capita per month for urban areas. It is observed that the majority of the urban households were not below the poverty line (BPL) with the maximum number of households

BPL were in Maharashtra (39%), followed by West Bengal (27%) and Tamil Nadu (21%). In the north (Uttar Pradesh:1.8%, Haryana: 3.4%), north-west (Rajasthan: 16.9%), center (Madhya Pradesh:13.7%) and the west (Gujarat: 6.2%) were BPL. However, the picture is very different in the rural areas. About 95.2% of Tamil Nadu followed by 50.8% of the Rajasthan, 44.3% of the Maharashtra, 42.2% of the Madhya Pradesh and 40.4% of the West Bengal, 28.3% of the Gujarat, 27.5% of the Uttar Pradesh and only 9.9% of the Haryana were BPL (Figure5.6).

Figure 5.5: Number of households that have ration cards

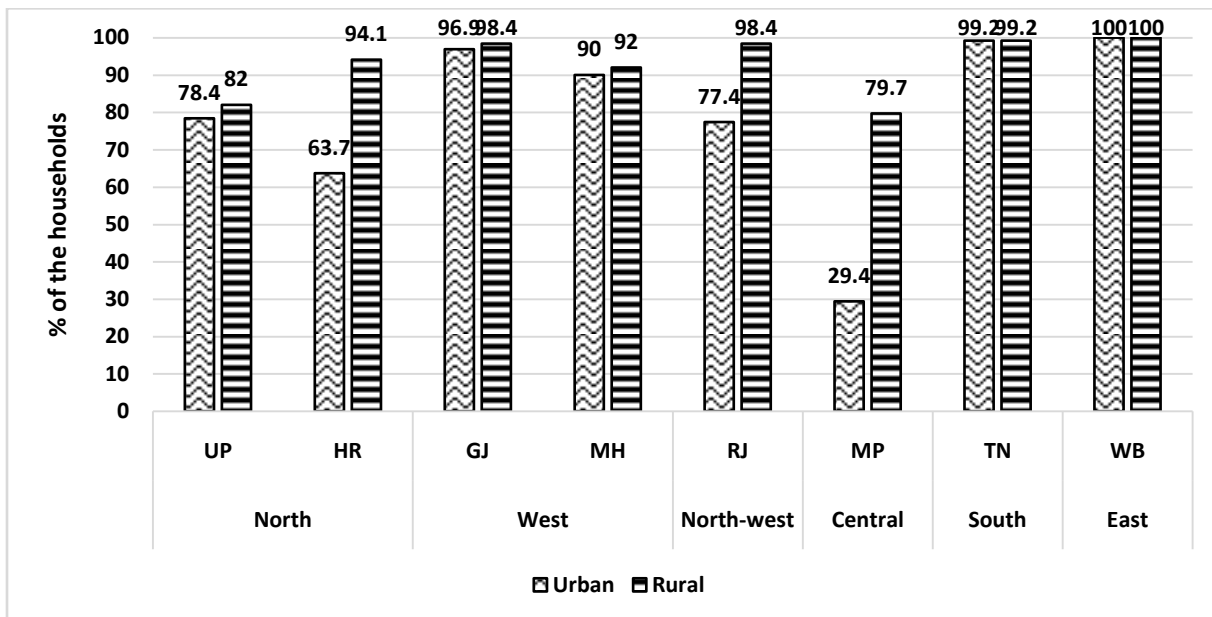
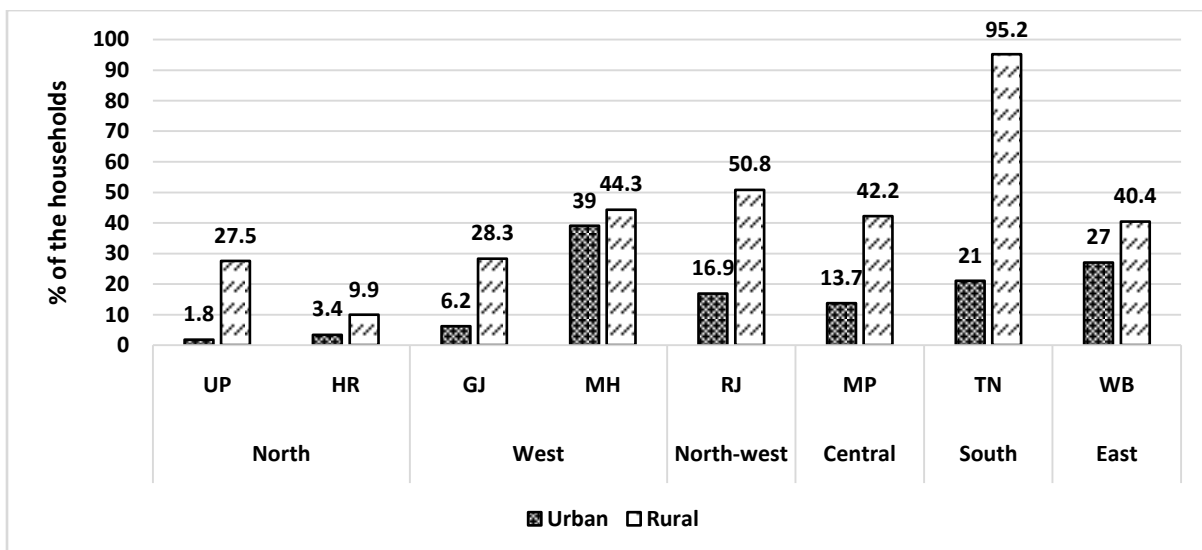


Figure 5.6: Number of households that are below poverty line (BPL)

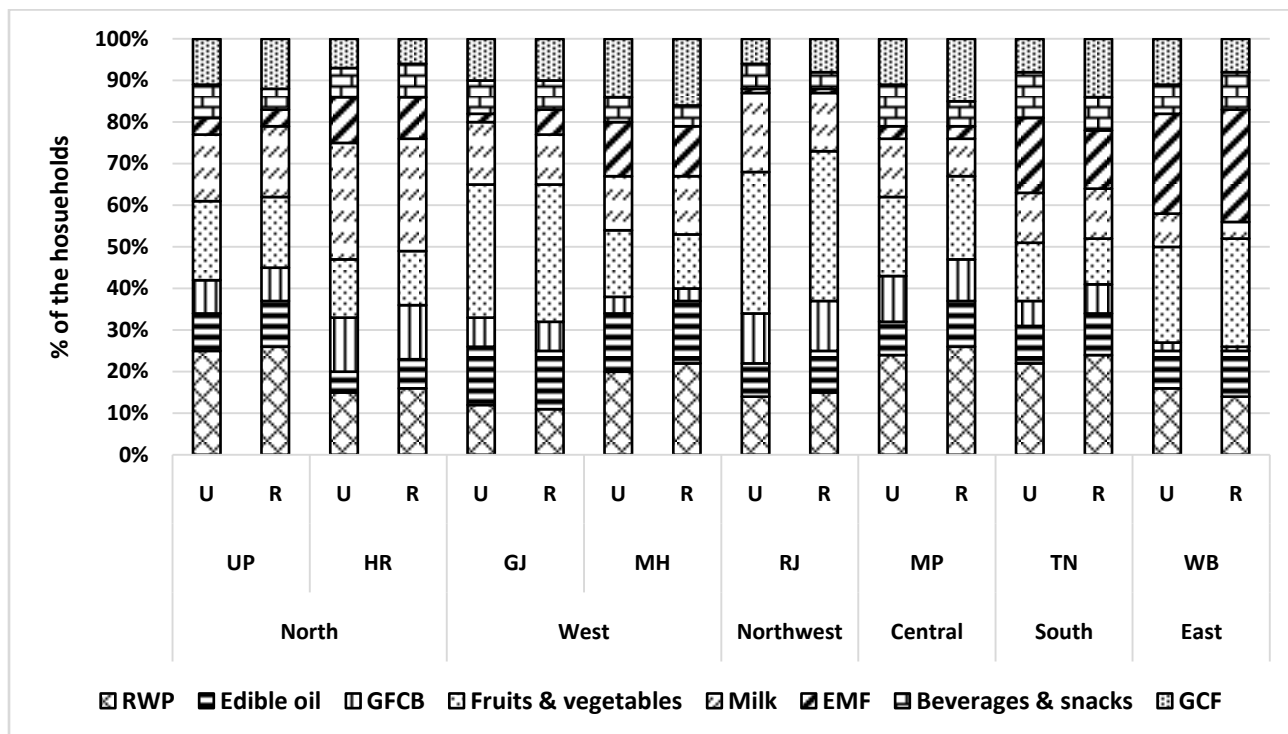


5.1.2 Expenditure by households on food and non-food items

The expenditure on food items (per month) by urban and rural households in different zones of India are presented in Figure 5.7. It is observed that the expenditure on edible oil out of total expenditure on food articles in urban and rural households ranges between 5 percent to 15 percent, with the minimum expenditure is incurred by the north zone (Haryana) and maximum by the west zone (Maharashtra and Gujarat). The minimum expenditure by Haryana state can be attributed to the findings that majority of the households in Haryana consume edible oil from their own production. In the north zone, more than one-third of the expenditure is incurred on Rice, Wheat and Pulses (RWP) and milk in both urban and rural households per month. In the west zone (Gujarat), however, 32% is spent on fruits and vegetables followed by 15% on milk by urban households and 33% on fruits and vegetables followed by 14% on edible oil by rural households.

In Maharashtra state of west zone, on the other hand, 20% is spent on RWP followed by 16% on fruits and vegetables by urban households and 22% on RWP followed by 15% on edible oil by rural households. The finding also suggests that more than half of the expenditure on food products in the north-west zone (Rajasthan) is incurred on fruits and vegetables and milk, and on RWP and fruits & vegetables in the central zone (Madhya Pradesh). Contrastingly in the east zone, more than one-fourth of the expenditure is incurred on eggs, meat and fish followed by fruits & vegetables and in Tamil Nadu state of the south zone, more than one-third of the expenditure is done on RWP and fruits & vegetables. It is also observed that the north zone (Uttar Pradesh), west zone (Gujarat), central and northwest zone spends very less on eggs, meat and fish as compared to other zones.

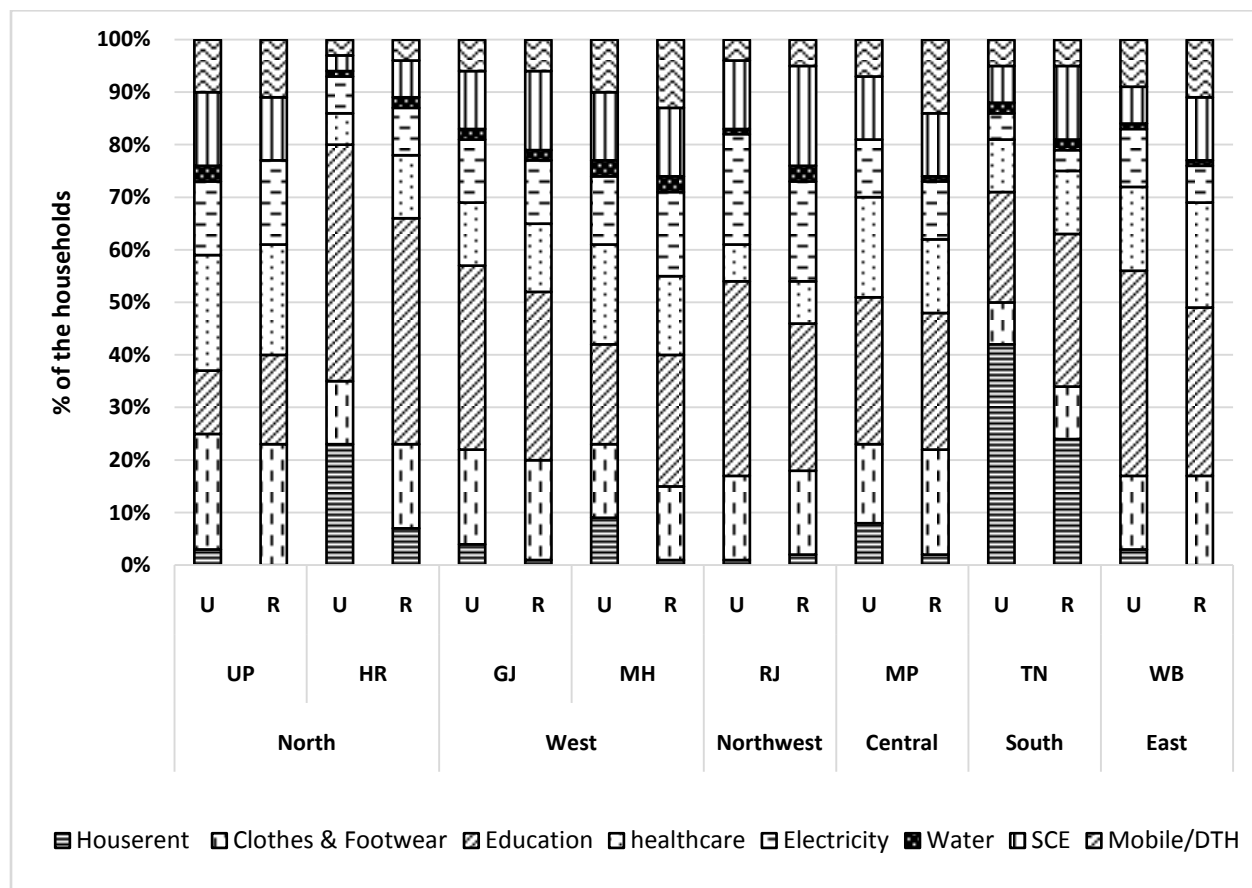
Figure 5.7: Expenditure on food items(per month)by households in different zones of India



Note: RWP: Rice, wheat, pulses; GFCB: Ghee, fats, cheese, butter, etc.; EMF: Eggs, meat, fish; GCF: Gas cylinder/fuels; U: Urban and R: Rural.

Similarly, Figure 5.8 shows the expenditure on non-food items (per year) by urban and rural households in different zones of India. The findings suggest that more than one-fifth of the expenditure related to non-food items per year is incurred on education except in the north zone (Uttar Pradesh) where expenditure on education is 12% in urban and 17% in rural households. It is also observed that expenditure incurred on house rent out of the total expenditure on non-food items is maximum in the Tamil Nadu (urban: 42% and rural: 24%) of the south zone and urban households in the north zone (Haryana: 23%). Uttar Pradesh state of the north zone spends maximum on clothes & footwear (urban: 22% and rural: 23%) and on healthcare (urban: 22% and rural: 21%). However, expenditure on clothes & footwear constitutes only 8% for the urban and 10% for the rural households in the south zone (Tamil Nadu).

Figure 5.8: Expenditure by households on non-food items (per year) in different zones of India



Note: SCE: Social ceremony, entertainment; U: Urban and R: Rural.

5.1.3 Wealth/Assets owned

The percentage of the urban and rural households that own the following assets are represented in Table 5.3. In terms of wealth and assets owned by the households, it is observed that majority of the urban and rural households have electricity and owns fan. Water pump is owned by More than half of the households except for the rural areas of Uttar Pradesh (16%) in the north, central (48%) and south (21%) zone, west zone (Gujarat: urban (27%), rural (26%) and Maharashtra: urban (43%), rural (44%)) and east zone (urban: 42% and rural: 17%). On the other hand, coolers owned by more than half of the households except for the rural areas of the north (Uttar Pradesh: 25%) and central (30%) zone, Gujarat (urban: 39% and rural: 13%) of the west, south (urban: 40% and rural: 2%) and East (urban: 7% and rural: zero)zones of India.

However, very few households own air conditioners except for the urban areas of the west (Gujarat: 39%) and urban northwest (44%) zones. Also, more than half of the households in the Haryana state of the north, Gujarat state of the West urban northwest and urban southwest owns washing machine. It is evident that majority of the households also have television however radio/ transistor is owned by very few households except for urban household in Northwest zone of India get 60% of the household zone radio/transistor.

It was also found out that refrigerator is owned by majority of the households except for rural households in Uttar Pradesh (16%) state in the north zone, central (16%), south (42%) and south (35%) zone. The findings also suggest that majority of the household own mobile phones except for the Haryana (urban: 27%, rural: 43%) of the north and rural Gujarat (30%) of west zone. However, smartphone is owned by almost all of the households with the minimum of 42% of the smartphone owners in the rural the north zone (Uttar Pradesh). On the other hand, the owners of telephone have declined except for Gujarat state in the West zone (urban: 48% and rural: 55%) and 35% of the urban households in the south zone having telephone connections.

Another finding of the study is that computer and laptops are owned by less than one-third of the urban and rural households with the exception that 58% of the urban north-west and 61% of the urban south zone households have laptops. However, more than one-fifth of the households have internet connections except for central (urban: 15% and rural: 5%), rural areas of the west (Gujarat: 10%) and northwest (14%) zone have internet connections. Bicycle and scooter/bike are owned by more than one-fifth of the households in all the zones of urban and rural households, however, tractor and jeep/car is owned by less than one-third of the households except for the rural household in northwest where 44% own tractor and 47% own jeep/car and 40% of urban households in the south zone (Tamil Nadu) owns jeep/car. Pumping set and thresher is owned by less than one-fifth of the urban and rural households in all the zones.

There is a contrasting gap between the number of owners of agricultural land between urban and rural households. It is observed that in the urban areas, the north (Uttar Pradesh), west zone (Gujarat) and northwest (Rajasthan) zone do not own agricultural land and about 21% of the north (Haryana), 16% of the west (Maharashtra), 19% of the south (Tamil Nadu), 7% of the east (West Bengal) and only 1% of the central (Madhya Pradesh) zone of India owns agricultural land. In rural areas, however, more than one-fifth of the households own agricultural land.

Table 5.3: Wealth/Assets owned by households in different zones of India

Zones	North				West				North-west		Central		South		East	
States	UP		HR		GJ		MH		RJ		MP		TN		WB	
Item	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Electricity	100	94	100	100	99	98	92	91	100	100	98	99	100	99	99	99
Water pump	55	16	86	82	27	26	43	44	88	79	50	48	83	21	42	17
Fan	100	85	100	100	98	94	93	95	100	99	94	91	99	98	79	87
Cooler	61	25	88	81	39	13	53	30	98	88	88	77	40	2	7	0
Air conditioner	3	3	39	11	39	13	10	1	44	13	21	2	45	6	24	3
Washing machine	24	7	74	56	62	61	22	3	81	40	34	10	72	9	30	6
TV	66	43	88	73	93	74	90	81	95	82	71	74	97	88	92	69
Radio/ Transistor	1	0	3	1	11	8	21	15	60	25	3	6	24	17	3	3
Refrigerator	61	16	84	76	85	65	69	59	98	67	48	16	87	42	77	35
Mobile phone	87	98	27	43	58	30	71	76	83	77	52	68	70	75	63	73
Smart phone	87	42	99	86	72	63	85	66	94	87	89	68	93	62	95	85
Telephone	0	1	1	0	48	55	8	5	13	6	7	3	35	5	4	1
Computer	0	1	19	0	18	3	12	3	28	4	6	1	29	4	0	0
Laptop	2	2	32	8	22	6	22	5	58	11	32	9	61	7		7
Internet	74	32	90	78	41	10	71	34	77	14	15	5	77	21	65	40
Bicycle	62	82	24	32	60	25	35	39	73	66	27	49	57	31	63	73
Scooter/ Bike	76	21	89	73	74	60	70	67	94	83	70	67	94	57	60	48
Tractor	0	5	3	20	12	16	1	2	3	44	13	20	2	3	1	3
Pumping set	0	15	1	12	7	11	3	17	0	18	5	9	8	7	4	13
Jeep/ car	5	1	37	19	22	11	17	5	28	47	29	9	40	6	12	3
Thresher/ harvester	1	3	1	2	3	6	0	1	0	20	1	5	1	3	1	5
Agricultural Land	0	47	21	68	0	23	16	53	0	76	1	45	19	21	7	67

5.2 Trends in consumption pattern of edible oil in urban and rural households

There are two types of edible oils that are generally used by Indian households. The first is the vegetable oil which is obtained by crushing oilseeds and the second cooking oil medium is 'animal fat known as desi ghee which is prepared from the milk of animals.

This section describes the preferences of edible oil in different zones of India with respect to urban and rural areas, shift in the consumption pattern of different edible oils in five years, brand preferences, influence on purchase decisions and health impact along with awareness among households regarding edible oils. The survey used 12 items for edible oil consumption such as, groundnut oil, mustard, soybean, sesame, sunflower, flaxseed oil/linseed oil, canola oil (rapeseed oil), coconut, olive, rice bran oil, corn/ maziie oil, cottonseed oil, ramtil(nigerseed) oil, palm oil, safflower, avocado and Vanaspati and residual items are clubbed into "others" category.

5.2.1: Consumption pattern of different type of edible oils in states/ zones of India

This section deals with zone wise consumption of edible oils by urban and rural households (in %) at present and five years back.

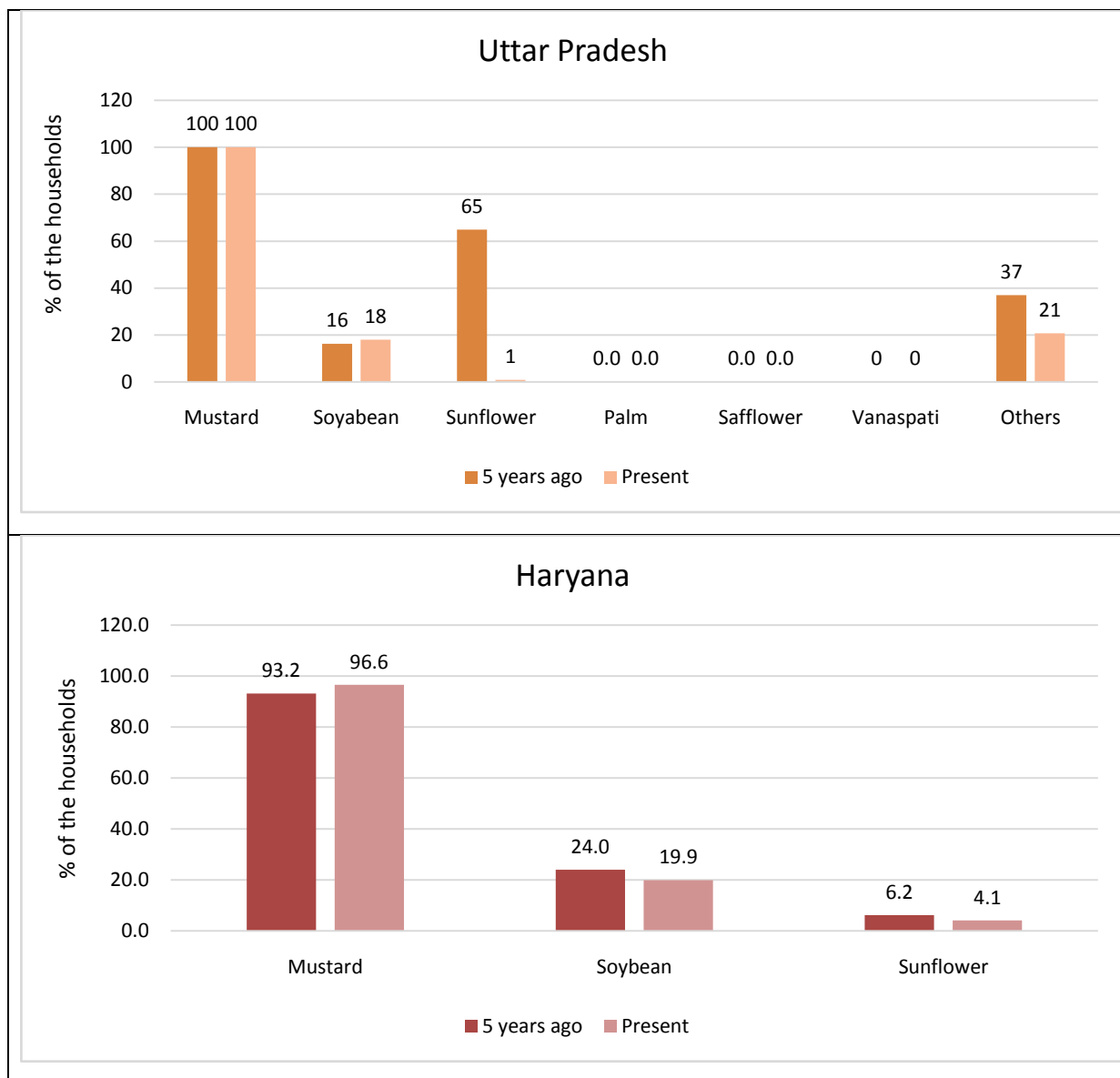
North Zone:

The percentage of people consuming oil in urban Uttar Pradesh and Haryana are illustrated in Figure 5.9.a. In Uttar Pradesh, the majority of the households consume mustard oil followed by soybean, sunflower and other edible oils. All of the surveyed households consume mustard oil, 18% consumes soybean oil, 1% reported consumption of sunflower oil and 21% reported use of other edible oils at present. However, five years back, apart from consumption of mustard oil, 65% of them consumed sunflower oil followed by soybean (16%) and other edible oils (37%).

On the other hand, in urban Haryana, mustard, soybean and sunflower oil are the dominantly consumed edible oils. The consumers of mustard oil have increased from 93.2% to 96.6% in five years' time. However, soybean oil became less popular, with the consumers decreasing from 24% to 19.9% and that of sunflower oil from 6.2% to 4.1% in five years' time. Contrastingly in rural Uttar Pradesh, major edible oils consumed are mustard oil, soybean, sunflower, palm oil, safflower, Vanaspati and other edible oils as well. Currently, mustard oil is consumed by 99% of the households, 11% consumes Vanaspati, 1% soybean

oil, 0.3% consumes palm oil and 31% reported to consume other edible oils as well (Figure 5.9.b).

Figure 5.9.a: Percentage of people consuming oil in urban areas of north zone, present vs five years ago

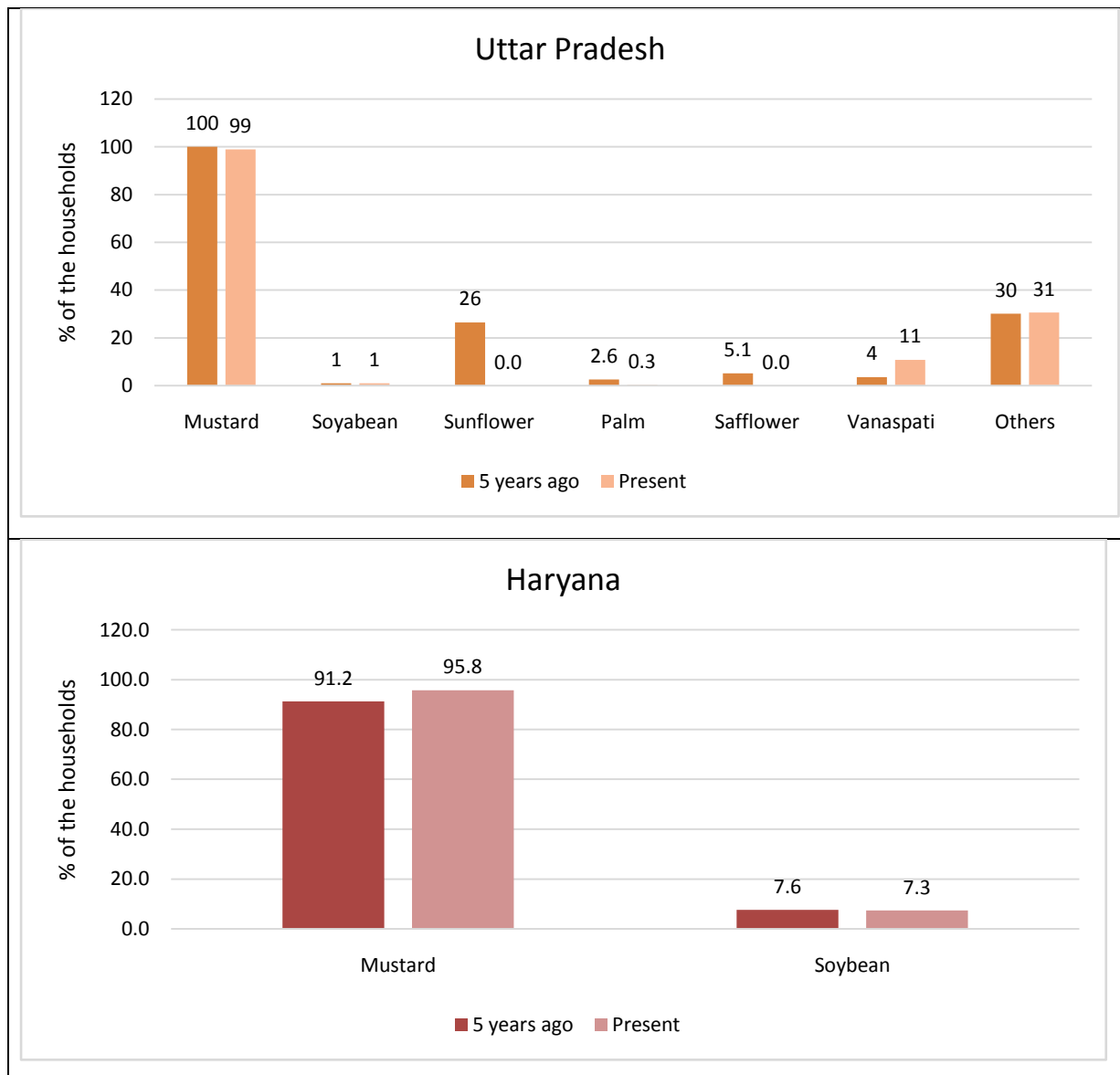


However, five years back, mustard oil was consumed by everyone with 26% of the households consumed sunflower oil, 5% safflower, 2.6% reported using palm oil, 4% Vanaspati and 1% soybean oil. This suggests that the consumption of sunflower, safflower and palm oil has declined in five years whereas the consumption of Vanaspati has increased from 4% to 11%. Also, the intake of other edible oils has increased.

In rural Haryana, on the other hand, the households consumed mustard oil and soybean oil. The consumption of mustard oil has increased from 91.2% to 95.8% in five

years' time. However, the consumer of soybean oil has decreased sharply from 7.6% to 7.3% in five years' time (Figure 5.9.b).

Figure 5.9.b: Percentage of people consuming oil in rural areas of north zone, present vs five years ago

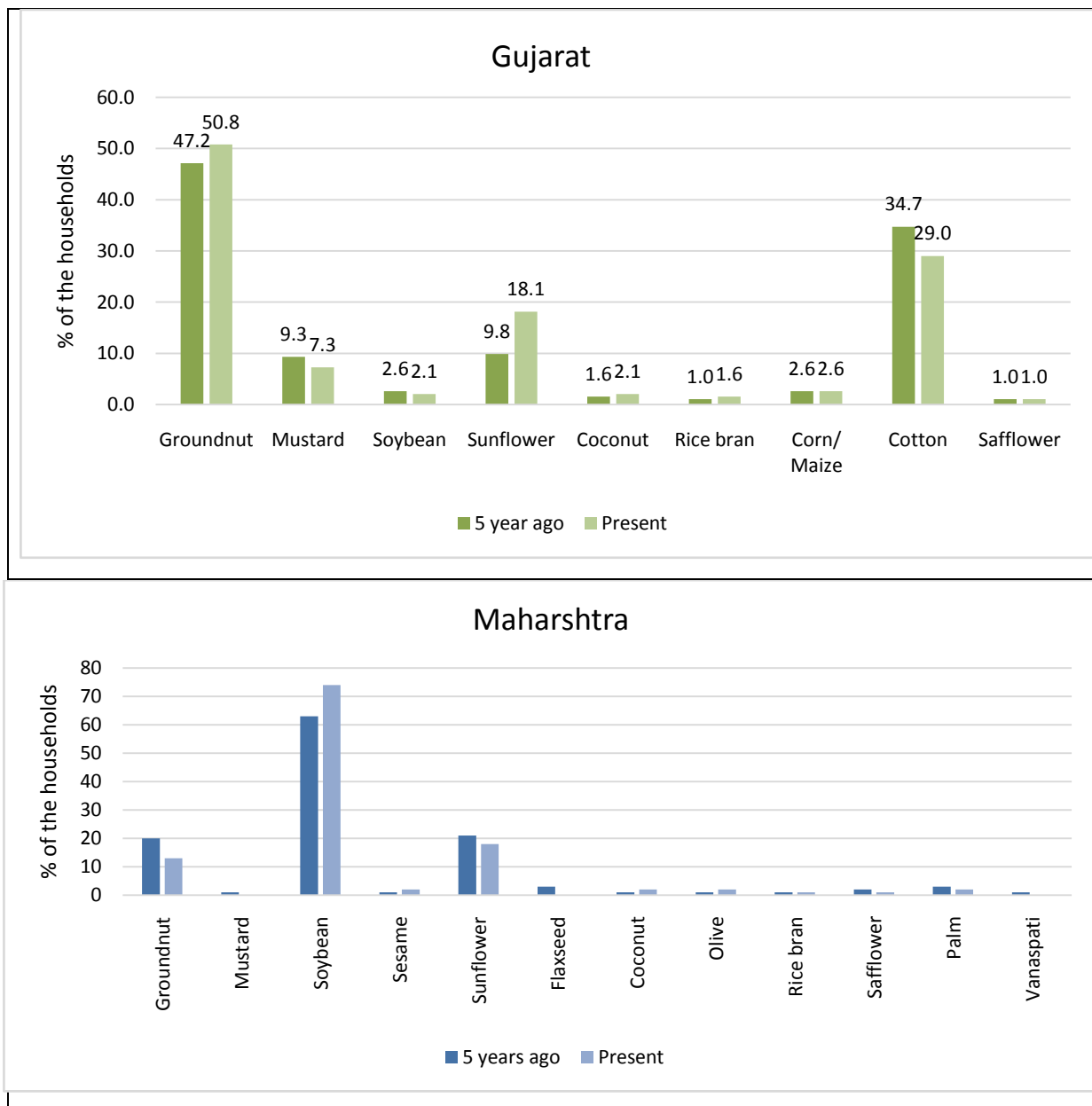


West Zone:

The percentage of households consuming oil in urban Gujrat and Maharashtra are illustrated in Figure 5.10.a. In Gujarat, the consumption of groundnut oil has increased from 47.2% to 50.8% in five years' time. Similar trends are observed in sunflower oil where 18.1% households report to consume sunflower oil as compared to only 9.8% 5 years back, coconut oil consumers increased from 1.6% to 2.1%, rice bran from 1% to 1.6%. However, cotton oil became less popular decreasing from 34.7% to 29% of household consumption. Similarly,

mustard oil consumers decreased from 9.3% to 7.3%, soybean from 2.6% to 2.1% and the consumers of corn/ maize oil and safflower oil have remained same.

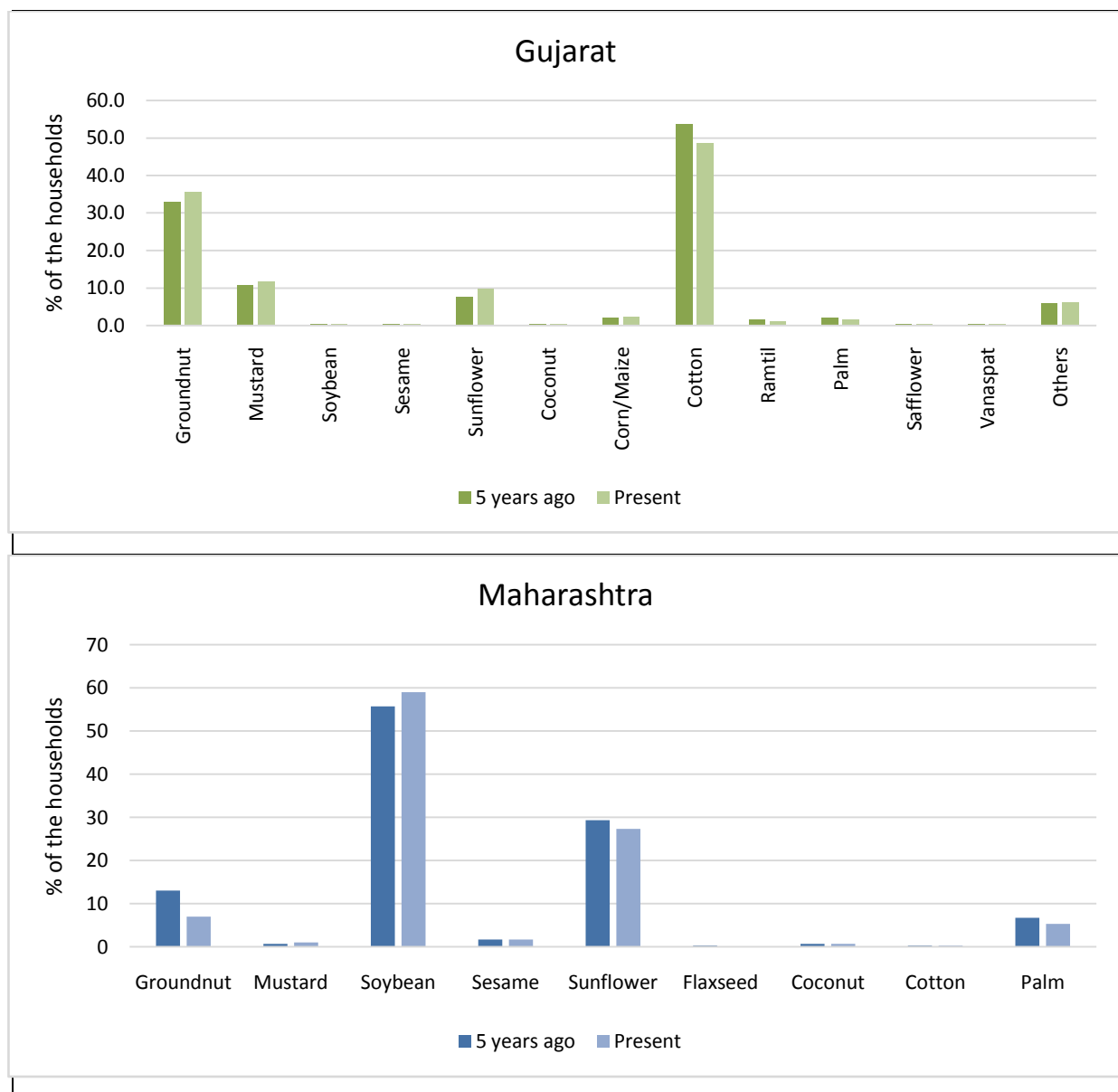
Figure 5.10.a: Percentage of households consuming oil in urban areas of west zone, present vs five years ago



In urban Maharashtra, on the other hand, majority of the households consume soybean oil followed by sunflower and groundnut oil. The consumers of soybean oil have increase from 63% to 74% in five years' time, coconut oil and olive oil from 1% to 2% and that of sesame oil from 1% consumers to 2% presently. However, the number of people consuming groundnut oil decreased from 20% to 13%, that of sunflower oil from 21% to 18%, safflower

from 2% to 1%, palm oil from 3% to 2% and that of mustard, flaxseed (Linseed) and vanaspati from 1%, 3% and 1% to zero, respectively. However, the consumption of rice bran oil (1%) has remained same (Figure 5.10.a).

Figure 5.10.b: Percentage of people consuming oil in rural areas of west zone, present vs five years ago



However, the rural Gujarat and Maharashtra areas of the west zone illustrates very different picture as depicted in Figure 5.10.b. In rural Gujarat, the consumption of groundnut oil has increase from 32.9% to 35.5% in five years' time. Similar trends are observed in mustard oil where 11.7% households report to consume mustard oil as compared to only 10.7% five years back. Consumers of sunflowers oil increased from 7.5% to 9.8%, corn/

maize oil from 2% to 2.3% and of other oil from 5.9% to 6.2% in five years' time. However, cotton oil became less popular in rural Gujrat decreasing from 53.7% to 48.5% in household consumption. Consumers of ramtil (Niger seed) oil, palm oil has also declined. The consumers of soybean, sesame, coconut, sunflower oil and Vanaspati have remained same.

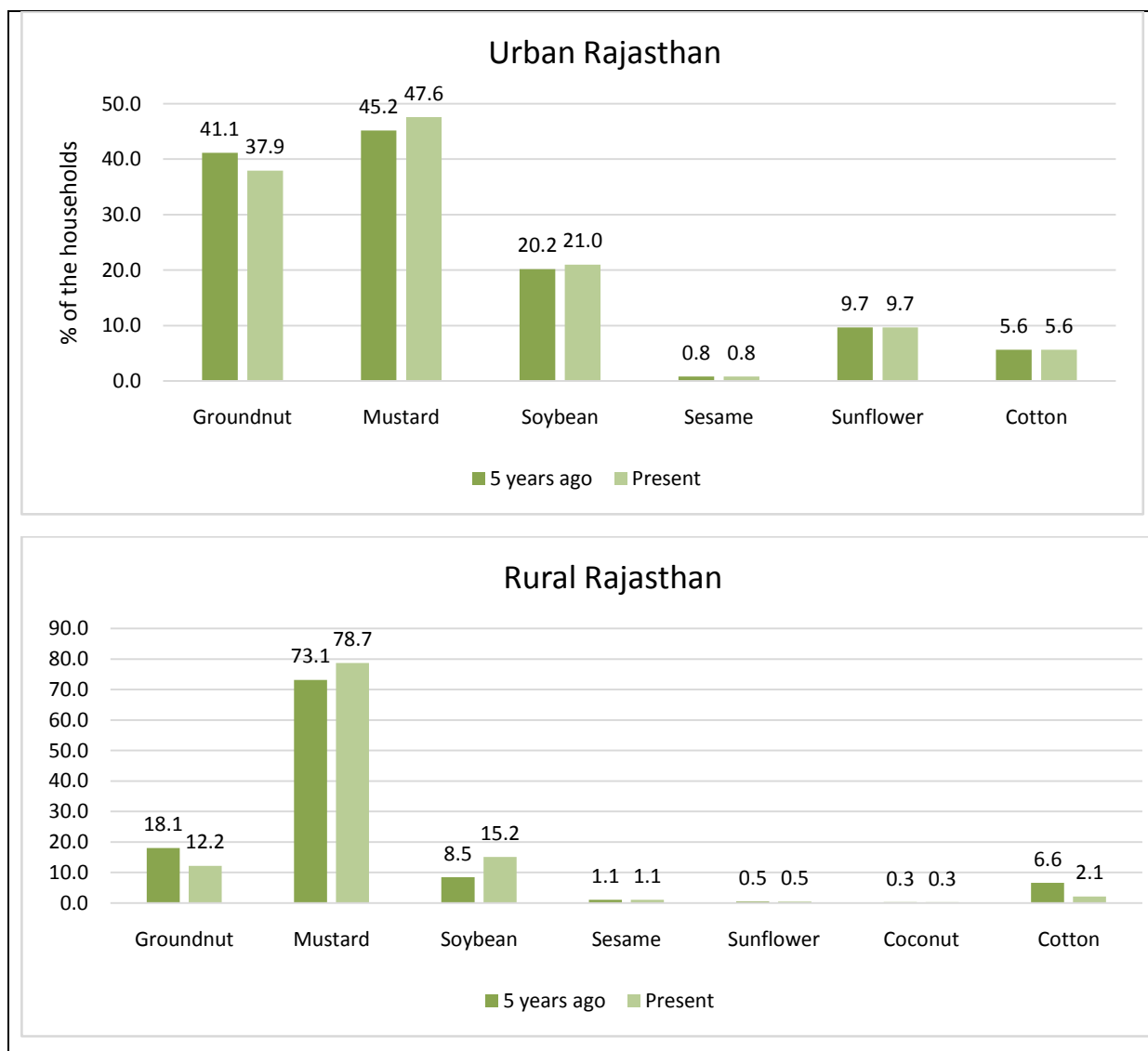
In rural Maharashtra, however, the most dominant oil is soybean oil, groundnut oil and sunflower oil, with few others consuming mustard oil, sesame oil, flaxseed (Linseed), coconut oil, cotton oil and palm oil. It is evident the number of households consuming soybean oil has increased from 55.7% to 59% and mustard oil from 0.7% to 1%. On the other hand, in five years, the consumers of groundnut oil have declined from 13% to 7%, sunflower oil from 29.3% to 27.3%, flaxseed (Linseed) from 0.3% to zero and palm oil from 6.7% from 5.3%. However, the consumption of sesame bran oil (1.7%), coconut oil (0.7%) and cotton oil (0.3%) have remained same.

North-west Zone:

The percentage of households consuming edible oil in urban and rural Rajasthan are presented in Figure 5.11. It can be observed that the households in urban areas majorly consume mustard oil, groundnut oil, soybean oil, sunflower oil, cotton oil and sesame oil. The consumption of mustard oil increased from 45.2% to 47.6% and soybean oil from 20.2% to 21% in five years' time. However, the percentage of households consuming groundnut oil decreased from 41.1% to 37.9% and consumption of sunflower oil (9.7%), sesame oil (0.8%) and cotton oil (5.6%) remained same.

On the other hand, the households in rural areas of Rajasthan consume different types of oil but the most dominant oil is mustard oil, soybean oil and groundnut oil, with few others consuming sesame oil, sunflower oil, coconut oil, and cotton oil. It is observed that the percentage of households consuming mustard oil has increased from 73.1% to 78.7% and soybean oil from 8.5% to 15.2%. However, in five years, the consumers of groundnut oil have declined from 18.1% to 12.2% and cotton oil from 6.6% to 2.1% and the consumption of sunflower oil (0.5%), sesame oil (1.1%) and coconut oil (0.3%) remained same.

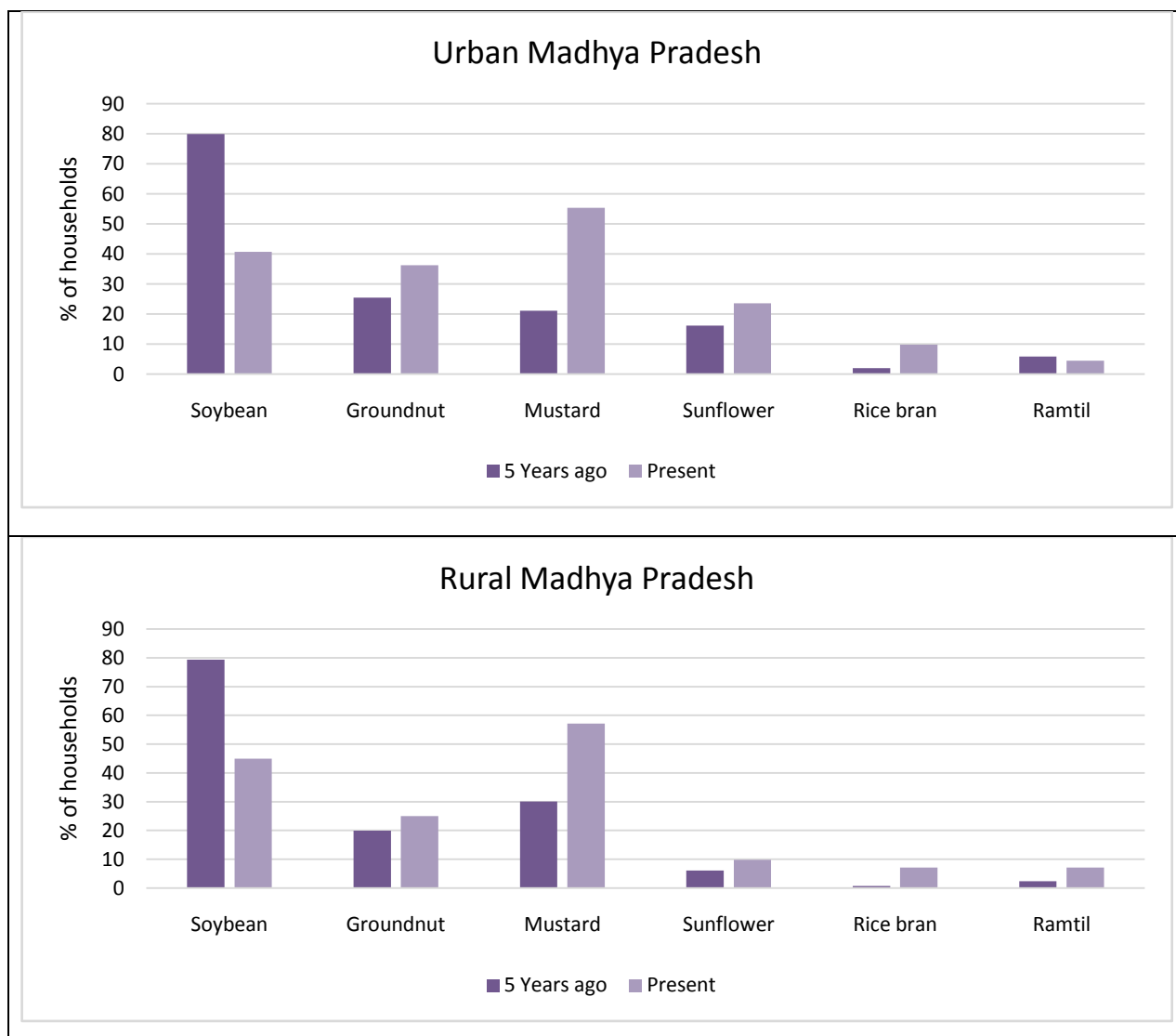
Figure 5.11: Percentage of people consuming oil in urban and rural areas of northwest zone, present vs five years ago



Central:

Oil consumption pattern by the households in urban and rural Madhya Pradesh are depicted in Figure 5.12. In the urban households, the consumers of mustard oil have increase from 21% to 55% in five years’ time. Similar trends are observed in groundnut oil where 36% households report to consume groundnut oil as compared to only 25% five years back, sunflower oil consumers increased from 16% to 24%, rice bran from 2% to 10%. However, soybean oil became less popular, with the consumer decreasing from 80% to 41% and that of ramtil (nigerseed) from 6% to 4% in five years’ time.

Figure 5.12: Percentage of people consuming oil in urban and rural areas of central zone, present vs five years ago



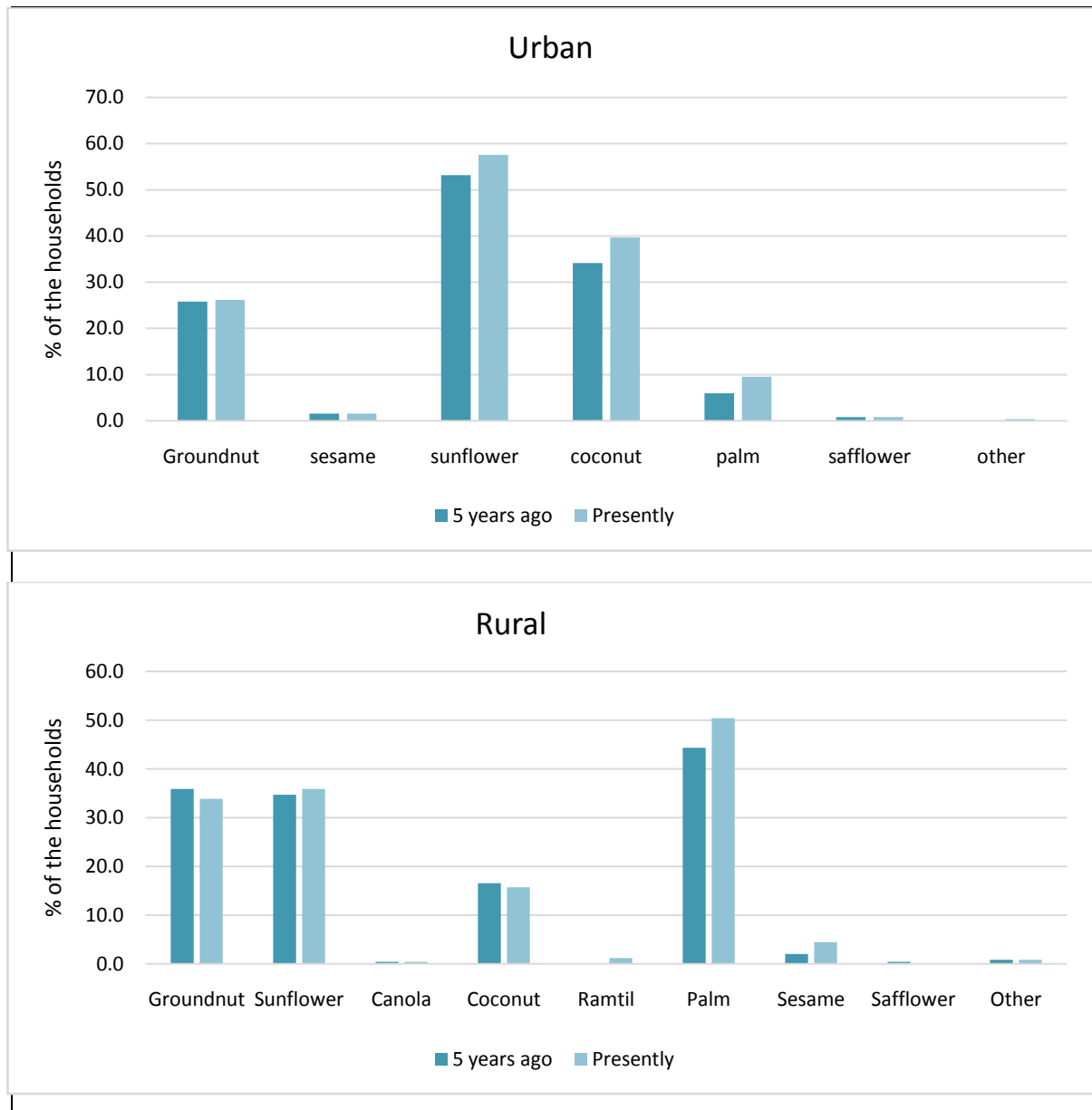
Similar trends are observed in rural Madhya Pradesh where the consumers of mustard oil have increased from 30% to 57% in five years' time. Similar trends can be observed in groundnut oil where 25% households report to consume groundnut oil as compared to only 20% five years back. Consumers of sunflowers oil increased from 6% to 10%, rice bran oil from 1% to 7% and ramtil (nigerseed) oil from 2% to 7% in five years' time. However, the consumer of soybean oil has decreased sharply from 79% to 45% in five years' time.

South Zone:

The percentage of households consuming edible oil in urban and rural Tamil Nadu are depicted in Figure 5.13. In urban areas, households majorly consumed sunflower oil, coconut

oil, groundnut oil and palm oil with few consuming safflower and other edible oils. The percentage of households consuming sunflower oil increased from 53.2% to 57.5%, coconut oil from 34.1% to 39.7%, groundnut oil from 25.6% to 26.2% and that of palm oil from 6% to 9.5% in five years' time. However, the consumers of sesame oil (1.6%), safflower oil (0.8%) and other oils (0.4%) have remained same.

Figure 5.13: Percentage of people consuming oil in urban and rural areas of south zone, present vs five years ago



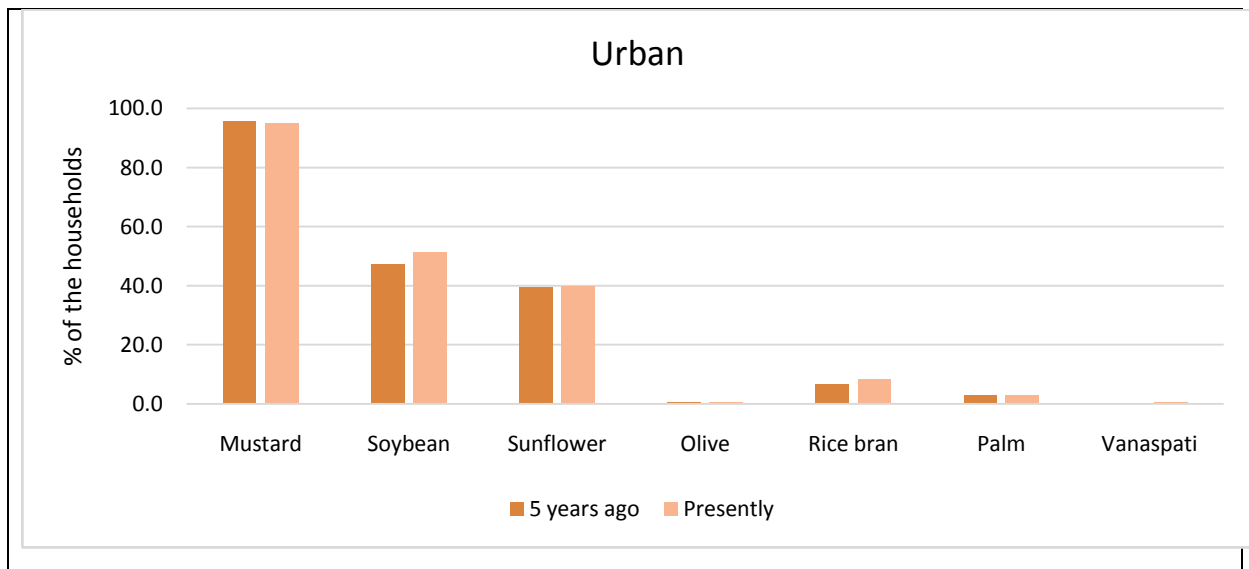
Contrastingly, the rural areas of Tamil Nadu consume different types of oil, but the most dominant oil are palm oil, groundnut oil, sunflower and coconut oil, with few others consuming canola, ramtil (nigerseed), sesame, safflower and other oils. It is evident the

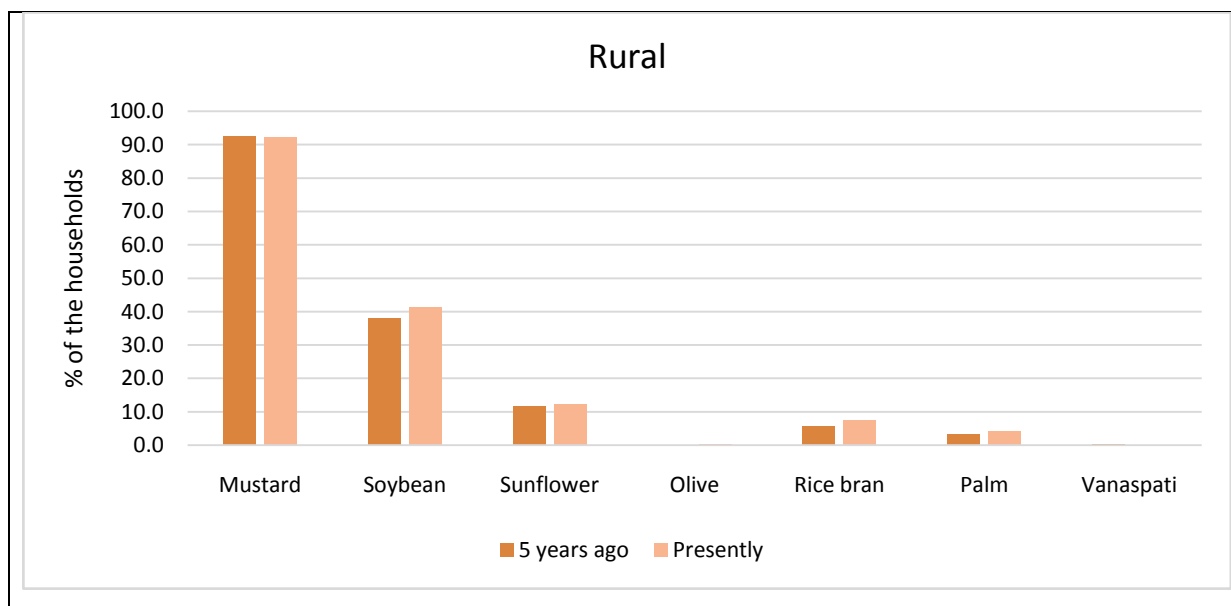
percentage of households consuming palm oil has increased from 44.4% to 50.4%, sesame oil from 2% to 4.4% and 1.2% now also consumes ramtil (nigerseed) oil. On the other hand, in five years, the consumers of groundnut oil have declined from 35.9% to 33.9%, sunflower oil from 34.7% to 35.9% consumers, coconut oil from 16.5% to 15.7% and presently safflower is not consumed by any rural households as compared to 0.4% consuming five years ago. However, the consumers of canola oil (0.4%) and other oils (0.8%) have remained same.

East Zone:

The consumption pattern of edible oil in urban and rural West Bengal are depicted in Figure 5.14. In urban areas, the consumption of soybean oil increased from 47.2% to 51.1%, sunflower oil from 39.3% to 39.9%, rice bran oil from 6.7% to 8.4% and that of vanaspati from 0 to 0.6% in five years' time.

Figure 5.14: Percentage of people consuming oil in urban and rural areas of east zone, present vs five years ago





However, the number of people consuming mustard oil decreased from 95.5% to 94.9% and consumption of olive oil (0.6%) and palm oil (2.8%) remained same.

Similarly, the households in rural areas consume different types of oil but the most dominant oil are mustard oil, soybean oil, and sunflower oil, with few others consuming olive oil, rice bran oil, palm oil, and vanaspati. It is evident the number of households consuming soybean oil has increased from 37.9% to 41.3%, sunflower oil from 11.5% to 12.4%, rice bran oil from 5.6% to 7.5%, palm oil from 3.4% to 4% and 0.3% now also consumes olive oil. On the other hand, in five years, the consumers of mustard oil have declined from 92.5% to 92.2% and of vanaspati from 0.3% to zero.

5.2.2 Preference of oil

In this section the preferences of oil by households as per their top two most preferred oil type (represented as rank 1 for first choice and rank 2 for the second choice) in different states of India covering urban and rural areas are presented in Table 5.4.a and 5.4.b.

North Zone:

The households in Uttar Pradesh urban areas reported that 100% prefer mustard oil first, after which sunflower (63%) and soybean (23%) are the popular second choices. In rural areas on the other hand, 83% of the respondents ranks mustard oil the best after which sunflower (40%) and soybean (8%) is preferred (Table 5.4.a).

In Haryana however, the respondents in the urban areas reported that 91.1% prefer mustard oil first, after which soybean (53.4%) and sunflower (34.9%) are the popular second

choice. Similarly, in rural areas, 83% of the respondents ranks mustard oil the best (95.5%) after which soybean (72.3%) and sunflower (23.4%) is preferred as second-best oil.

West Zone:

In Gujarat the urban households reported that 39.7% prefer cotton oil, 21.8% prefer groundnut oil, 14.7% mustard and 6.8% sunflower oil as their first choice. However, groundnut oil is second best choice of oil for 25.7% of the people and cotton seed oil for 18.2%. In rural areas on the other hand, 38.3% prefer groundnut oil, 24.9% cottonseed oil while sunflower is the second-best choice of oil for 22.3% of the urban households (Table 5.4.a).

The households in urban Maharashtra areas reported that 38.5% prefer soybean oil, 31.5% preferred sunflower oil first, after which 33% reported groundnut oil and 30.5% preferred sunflower oil as the second-best choice. In rural areas on the other hand, 47% of the households ranks sunflower oil, 21% soybean oil as the first best choice after which groundnut oil is preferred by 34% of the households followed by sunflower and soybean oil by 28.7% households (Table 5.4.a).

Table 5.4.a: Ranking the best oil preference by respondents (in %)

Zones	Type of oil	Urban		Rural	
		Rank 1	Rank 2	Rank 1	Rank2
North	Uttar Pradesh				
	Mustard	100	1	83	0
	Sunflower	0	63	0	40
	Soybean	0	23	0	8
	Haryana				
	Mustard	91.1	6.2	95.5	1.1
	Soybean	3.4	53.4	0.3	72.3
	Sunflower	2.1	34.9	0.3	23.4
	Rice bran	0	2.7	0.3	1.4
	Sesame	0	1.4	0.6	0
Coconut	0	0	0.8	0.3	
Others	2.7	0.7	2.3	1.4	
	Gujarat				
	Sesame	4.2	0	5.2	0
	Mustard	14.7	8.1	7.3	9.8
	Groundnut	21.8	25.7	38.3	17.6
	Sunflower	6.8	9.8	16.6	22.3
	Soybean	0.3	4.9	2.1	5.2
	Corn	1.3	5.2	3.6	5.7
	Cottonseed	39.7	18.2	24.9	21.2
Palm	2	1	0	0.5	

West	Other	0.7	0.3	0.5	0
	Maharashtra				
	Sesame	0.5	0	1	0
	Mustard	0	0	0.3	0
	Coconut	0	1	0.3	1
	Groundnut	12.5	33	19.7	34
	Sunflower	31.5	30.5	47	28.7
	Soy	38.5	19	21	28.7
	Olive	2.5	2	0	0
	Rice bran	0.5	0	0.3	0.3
	Cottonseed	0	0.5	0	0
	Palm	1	2	3	0.7
	Flaxseed	9.5	5	5	3.7
	Safflower	3.5	5.5	2	3
Other	0	1.5	0.3	0	

North-west Zone:

In urban Rajasthan areas the households reported that 73% prefer mustard oil, 12% preferred rice bran oil first, after which 49% reported groundnut, 15% prefers sunflower oil as the second-best choice. In rural areas on the other hand, 72% of the households ranks mustard oil, 17.1% soybean oil as the first best choice after which groundnut oil is preferred by 43% of the households (Table 5.4.b).

Table 5.4.b: Ranking the best oil preference by respondents (in %)

Zones	Type of oil	Urban		Rural	
		Rank 1	Rank 2	Rank 1	Rank2
North-West	Rajasthan				
	Sesame	0	1	0	1
	Mustard	73	16	72	15
	Groundnut	8	49	17	43
	Sunflower	6	15	2	5
	Soybean	2	11	1	10
	Rice bran	12	3	0	0
	Cotton seed	0	4	7	23
Central	Madhya Pradesh				
	Mustard	27	25	19	25
	Groundnut	22	37	21	23
	Sunflower	16	6	19	3
	Soybean	35	26	15	24
South	Tamil Nadu				
	Sesame	2	3.6	2.4	4
	Mustard	0	3.6	0	0
	Coconut	33.7	8.3	16.1	16.9
	Groundnut	12.7	48	17.3	21.4

	Sunflower	50.8	6.3	30.2	8.5
	Palm	0.8	4.8	33.5	19
	Ramtil	0	0	0.4	0
	Other	0	0	0	1.2
East	West Bengal				
	Mustard	66.3	26.4	73	18
	Palm	0	1.1	0.3	4
	Rice Bran	4.5	2.8	3.4	4.7
	Soybean	22.5	23.6	17.1	23
	Sunflower	6.7	34.3	5.6	8.1
	Olive	0	0.6	0.3	0
	Soybean+ Sunflower	0	1.1	0	0.6
	Mustard + Sesame	0	0	0.3	0

Central:

The ranking the best oil in Madhya Pradesh suggests that households in urban areas prefer soybean oil (35%), 27% prefer mustard oil, 22% groundnut and 16% sunflower oil as their first choice. However, groundnut oil is second best choice of oil for 37% of the people and soybean oil for 26%. In rural areas on the other hand, 21% prefer groundnut oil, 19% preferred mustard and soybean oil while mustard is the second-best choice of oil for 25% of the urban households (Table 5.4.b).

South Zone:

In Tamil Nadu the consumption of type of oil is very different. In urban households, 50.8% prefer sunflower oil first, after which groundnut oil (48%) and coconut oil (8.3%) are the popular second choice. In rural areas on the other hand, 33.5% of the households ranks palm oil, 30.2% sunflower oil, 17.3% groundnut oil as the first best choice after which groundnut oil (21.4%), palm oil (19%) and coconut oil (16.9%) are preferred (Table 5.4.b)

East Zone:

The households in urban West Bengal, on the other hand, reported that 66.3% prefer mustard oil, 22.5% preferred soybean oil first, after which 34.3% reported sunflower oil as the second-best choice. In rural areas on the other hand, 73% of the households ranks mustard oil, 17.1% soybean oil as the first best choice after which sunflower oil is preferred by 8.1% of the households (Table 5. 4.b).

Our findings are in line with Sarwade (2011) where that people in east and north prefer mustard oil while those in south and west use groundnut oil.

5.2.3 Type of oil consumed

This section will discuss the type of oil consumed in different States and zones of India. From the surveyed data in Figure 5.15, it is evident that in Uttar Pradesh more than half of the rural (62%) and urban (56%) prefer loose oil over branded. In Haryana, however, 56.8% of the urban prefer branded oil and 79.7% of the rural prefers loose oil in the state. In Gujarat, however, majority of the households prefers branded oil over loose oil. 81% of the rural and 93% of the urban households prefers branded oil, while 3% of the rural households reports to consume both type of oil. Maharashtra on the other hand, suggests that more than half of the urban households (70%) prefers branded oil, 28.5% prefers loose oil only and 1.55% prefers both branded and loose oil. Similarly, 75.3% of the rural households prefers branded oil with 22.3% prefers loose oil and 2.3% preferred both type of oil.

In Rajasthan it is evident that more than half of the urban households (56%) prefer branded oil and 45% prefers loose oil only. On the other hand, only 13% of the rural households prefer branded oil with 2% preferred both type and 65% prefers loose oil. However, in Madhya Pradesh, majority of the urban households uses both branded and loose oil (37%) followed by 33% favoured loose oil and remaining (30%) only consumes branded oil.

Figure 5.15: Classification of type of oil preferred



Whereas, in rural areas, more than half of the households (52%) preferred loose oil, 30% reported to consume both type of oil and remaining 18% preferred to use only branded oil. It is also evident that more than of half of the urban households in Tamil Nadu (64%) prefers branded oil and 63% of the rural households prefers loose oil. On the other hand, in West Bengal, more than of half of the urban households in West Bengal(52%) prefers branded oil, 39% prefers both branded and loose oil and 9% prefers loose oil only. On the other hand, 44% of the rural households prefers branded oil with 26% preferred both type and 30% prefers loose oil (Figure 5.15).

5.2.4 Ranking of branded oil

In this section the households that consume branded oil ranks the most preferred brand of edible oil as illustrated in Table 5.5.a and 5.5.b.

North Zone:

It is observed that in Uttar Pradesh, majority of the rural households preferred kachighanni (16%), saffola (12%) mustard (9%) as their first choice of brand followed by 73% preferring fortune oil as the second-best choice of oil. In urban areas, however, 31% preferred fortune 11% Gulab oil and 10% kachighanni oil as the most preferred brand followed by 54% choosing fortune oil as second-best choice, saffola (12%), nature fresh (4%) and 14% chose other oils (Table 5.5.a).

In Haryana, however, 30% of the urban households preferred fortune brand over the others followed by 3% chose Patanjali as their first choice of brand, with 29% preferred fortune, 12% saffola and 1% each for dalda, nature fresh, gemini, nutrela, aadhar, sundrop and Patanjali as their second choice of brand. On the other hand, in rural Haryana, 16% households reported that fortune is their first and second choice of brand, with 10% preferred saffola as second-best brand after fortune (Table 5.5.a).

West Zone:

In urban Gujarat, on the other hand, majority of the households preferred Tirupati (38%), gulab (13%) and 8% preferred fortune oil as their first choice of brand, while 73% preferred other oil as the second-best choice. In rural areas, however, 21% preferred Tirupati, 20% fortune, 12% preferred vimal oil and 10% gulab oil as the most preferred brand. While 13% preferred other oils as second-best choice, 74% did not have the second choice.

Table 5.5.a: Ranking the preferred oil brands by respondents

Zone	Brand	Urban		Rural	
		Rank 1	Rank 2	Rank 1	Rank 2
North	Uttar Pradesh				
	Fortune	31	54	2	73
	Saffola	7	12	12	8
	Dhara	0	2	0	2
	Patanjali	11	0	0	1
	Gulab	11	0	6	0
	Kachighanni	10	0	16	0
	Sundrop	0	0	0	1
	Nature fresh	5	4	0	0
Others	0	14	9	5	

	Haryana				
	Fortune	30	29	16	16
	Dalda	0	1	1	2
	Saffola	1	12	0	10
	Nature Fresh	0	1	0	0
	Dhara	0	0	0.3	0.3
	Gemini	0	1	1	0
	Nutrela	0	1	0.3	0
	Aadhar	0	1	0	0
	Ruchi	0	0	0	1
	Sundrop	0	1	0	0
	Patanjali	3	1	1	3
	Others	38	7	22	4
West	Gujarat				
	Dhara	0	0	4	0
	Emami	0	0	1	0
	Fortune	8	1	20	2
	Gulab	13	3	10	4
	Saffola	1	2	8	3
	Sundrop	1	0	1	0
	Sunflower	0	0	1	0
	Tirupati	38	1	21	2
	Vimal	3	3	12	3
	Others	12	73	20	13
	Maharashtra				
	Fortune	34	28.5	25.7	27.3
	Saffola	4	20	3	18.7
	Dhara	2	1	0.3	2
	Nutrela	0	0.5	0	0.7
	Aadhar	0.5	0.5	0	0.7
	Sundrop	0	3.5	0	2.7
	Patanjali	5	2	0.3	0.3
	Dalda	0.5	3	0.7	3
	Nature fresh	0	0.5	0	1
	Gemini	36	8.5	46.3	15.7
	Sweakar	0	0.5	0.3	0.7
	Ruchi	1.5	10.5	6	6
	Recon oil	0	1.5	0	0.7
	Emamai	0.5	0	0	0.7
	Tirupati	0.5	0	0	0
	Freedom	0	1	0	1
	Others (specify)	12	1.5	14.3	5

It is also observed that in Maharashtra, majority of the urban households reported their first choice as gemini (36%) followed by fortune (34%) and 4% preferred saffola oil as their first choice of brand, with 28.5% preferred fortune oil as the second-best choice

followed by saffola 20% and ruchi by 10.5% of the households. In rural areas also 46.3% preferred gemini, 25.7% preferred fortune and 3% saffola oil as the most preferred brand. While 27.3% preferred fortune oil and 18.7% chose saffola oil as second-best choice (Table 5.5.a).

North-west Zone:

The ranking the branded oil in Rajasthan suggests that majority of the urban households preferred fortune (20.2%), saffola (9.7%) and gulab (3.2%) as their first choice of brand followed by 16.9% chose saffola and 9.7% preferring dhara best choice brand as the second-best choice of oil. In rural households, however, 9.3% preferred fortune oil brand, 2.1% saffola and 1.1% preferred gulab as their first choice of brand followed by 1.1% choosing vimal as second-best choice with 0.8% preferred fortune as their second choice of brand (Table 5.5.b).

Central:

In Madhya Pradesh, however, it is found out that majority of the urban households reported their first choice as fortune (28%), mahakosh (22%) and 11% preferred keerti oil as their first choice of brand, with 29% preferred fortune oil as the second-best choice followed by mahakosh 23% and saffola by 20% of the households. In rural areas, however, 29% preferred mahakosh, 21% tulsi, 16% preferred fortune and 15% keerti oil as the most preferred brand. While 26% preferred saffola oil and 23% chose fortune oil as second-best choice (Table 5.5.b)

South Zone:

In Tamil Nadu, on the other hand, majority of the rural households preferred gold winner (3.6%), ruchi (3.6%) and other oil (37.9%) as their first choice of brand followed by 1.6% ruchi and 1.2% preferring fortune brand as the second-best choice of oil. In urban areas, however, 9.9% preferred gold winner oil brand, 7.9% fortune and 5.6% preferred saffola as their first choice of brand followed by 7.9% choosing fortune as second-best choice with saffola (4.4%), ruchi (2.8%) and 14% chose other oils (Table 5.5.b).

Table 5.5.b: Ranking the preferred oil brands by respondents

Zone	Brand	Urban		Rural	
		Rank 1	Rank 2	Rank 1	Rank 2
North-West	Rajasthan				
	Fortune	20.2	1.6	9.3	0.8
	Saffola	9.7	16.9	2.1	0.3
	Dhara	0.8	9.7	0	0.3
	Nutrela	0	0	0	0.3
	Sundrop	2.4	0	0.3	0.3
	Patanjali	1.6	0	0	0
	Nature fresh	0.8	0.8	0	0
	Vimal	2.4	2.4	0.3	1.1
	Tirupati	0	0.8	0.3	0
	Gulab	3.2	2.4	1.1	0
	Other	0	0	0.8	0
Central	Madhya Pradesh				
	Keerti	11	4	15	2
	Tulsi	8	5	21	4
	Mahakosh	22	23	29	20
	Fortune	28	29	16	23
	Saffola	6	20	6	26
	Khetan	1	3	1	7
	Patanjali	4	7	8	8
	Others	19	7	4	12
South	Tamil Nadu				
	Fortune	7.9	7.9	1.2	1.2
	Gold winner	9.9	0.8	0.8	0.4
	Govt	0	0	3.6	0
	Others	36.5	8.7	37.9	7.7
	Ruchi	4	2.8	3.6	1.6
	Saffola	5.6	4.4	0.4	0.4
	Sundrop	0	0	0.4	0
East	West Bengal				
	Emami Healthy & Tasty	8.4	6.2	3.7	0.9
	Fortune	41	23	23	6.5
	Gokul	0.6	3.9	5.9	3.1
	Himani Best Choice	3.9	4.5	5.6	5.9
	Local Ghani	1.1	0	9.6	0.6
	Mashal	0.6	1.1	5.9	2.8
	Saloni	3.9	3.4	9.9	7.5
	Saffola	1.7	3.4	0	0.6
	Dhara	18	3.9	0.6	0.3
Engine	8.4	6.2	0.9	0.6	

East Zone:

Finally, the rural households in West Bengal preferred fortune (23%), saloni (9.9%) and local ghani (9.6%) as their first choice of brand followed by 6.5% chose fortune and 5.9% preferring himami best choice brand as the second-best choice of oil. In urban areas, however, 41% preferred fortune oil brand, 18% dhara and 8.4% preferred emami and engine as their first choice of brand followed by 23% choosing fortune as second-best choice with 6.2% preferred emami and engine as their second choice of brand (Table 5.5.b).

5.2.5 Monthly per capita consumption of edible oil

This section discusses the monthly per capita consumption of edible oil in urban and rural households in different zones of India. The present consumption pattern is compared with the per capita consumption five years back. The monthly per capita consumption of different edible oils in north and west zone are illustrated in Table 5.6.a and that in north-west, central, south and east zone in Table 5.6.b.

North Zone:

In the north zone, it is observed that in urban Uttar Pradesh, the overall monthly per capita consumption of edible oil currently is 1.365 ltr as compared to 0.925 ltr five years ago. There is an increase of about 48% in consumption of edible in urban Uttar Pradesh in 5 years period. The per capita consumption of mustard oil increased from 0.704 ltr five years ago to 0.844 ltr. presently, that of sunflower oil from 0.086 ltr to 0.27 ltr and the consumption of soybean has remained constant. Recently, the per capita consumption of other edible oils has increased three times from 0.063 ltr five years ago to 0.182 ltr consumed per month.

In rural households, on the other hand, the monthly per capita consumption of mustard oil increased from 0.73 ltr five years ago to 0.92 ltr. presently, of sunflower oil from 0.03ltr to 0.09 ltr. Recently, palm oil and safflower oil has also made into the household consumption of oil in rural Uttar Pradesh, while the consumption of Vanaspati has declined in recent years. Overall, the monthly per capita consumption in Uttar Pradesh has increased by 29.6% from per capita consumption of 0.918 ltr per month five years ago to 1.19 ltr per month currently.

Table 5.6.a: Monthly per capita oil consumption of oil by households (in ltr.)

Zone	Oil	Urban		Rural		Total	
		5 years ago	Present	5 years ago	Present	5 years ago	Present
North	Uttar Pradesh						
	Mustard	0.704	0.844	0.73	0.919	0.725	0.902
	Soybean	0.072	0.069	0.003	0.003	0.018	0.018
	Sunflower	0.086	0.27	0.03	0.092	0.043	0.132
	Palm	0	0	0.001	0.005	0	0.004
	Safflower	0	0	0	0.021	0	0.016
	Vanaspati	0	0	0.057	0.014	0.045	0.011
	Others	0.063	0.182	0.094	0.086	0.087	0.107
	Subtotal	0.925	1.365	0.915	1.14	0.918	1.19
	Haryana						
	Mustard	0.538	0.577	0.504	0.531	0.514	0.544
	Soybean	0.092	0.076	0.023	0.021	0.043	0.037
	Sunflower	0.02	0.013	0	0	0.006	0.004
	Subtotal	0.65	0.666	0.527	0.552	0.563	0.585
West	Gujarat						
	Groundnut	0.978	1.04	0.423	0.494	0.637	0.705
	Mustard	0.159	0.142	0.124	0.153	0.138	0.149
	Soybean	0.041	0.03	0.005	0.005	0.019	0.015
	Sunflower	0.146	0.292	0.129	0.17	0.136	0.217
	Coconut	0.012	0.02	0.005	0.007	0.008	0.012
	Rice bran	0.017	0.02	0	0	0.007	0.008
	Corn/ maize	0.026	0.038	0.034	0.061	0.031	0.052
	Cotton	0.635	0.474	0.829	0.773	0.754	0.658
	Safflower	0.013	0.018	0.002	0.002	0.006	0.008
	Sesame	0	0	0.002	0.002	0.001	0.001
	Ramtil	0	0	0.02	0.019	0.012	0.012
	Palm	0	0	0.017	0.015	0.010	0.009
	Vanaspati	0	0	0.001	0.001	0.001	0.001
	Others	0	0	0.016	0.017	0.010	0.010
	Subtotal	2.027	2.074	1.608	1.72	1.770	1.857
	Maharashtra						
	Groundnut	0.220	0.104	0.122	0.045	0.161	0.068
	Mustard	0.011	0.000	0.001	0.018	0.005	0.011
	Soybean	0.892	1.044	0.716	0.761	0.786	0.874
	Sesame	0.010	0.025	0.005	0.016	0.007	0.020
	Sunflower	0.223	0.197	0.297	0.271	0.268	0.242
	Flaxseed	0.026	0.000	0.003	0.000	0.012	0.000
	Coconut	0.003	0.011	0.004	0.004	0.004	0.007
	Olive	0.008	0.011	0	0	0.003	0.005
	Rice bran	0.005	0.006	0	0	0.002	0.003
Safflower	0.011	0.002	0	0	0.005	0.001	
Palm	0.013	0.007	0.052	0.051	0.036	0.033	

	Cotton	0	0	0.013	0.010	0.008	0.006
	Vanaspati	0.001	0.000	0	0	0.000	0.000
	Subtotal	1.424	1.408	1.213	1.177	1.298	1.269

In Haryana, however, the overall monthly per capita consumption of oil has increased by 3.9%. Five years ago, the per capita consumption was 0.585 ltr per month and at present it is 0.563 ltr per month. In urban Haryana, the overall monthly per capita consumption of edible oil currently is 0.666 ltr as compared to 0.65 ltr five years ago. There is an increase of about 2.5% in consumption of edible in urban Haryana in 5 years period. The per capita consumption of mustard oil increased from 0.538 ltr five years ago to 0.577ltr presently.

Contrastingly, the per capita consumption of soybean oil has declined from 0.092 ltr to 0.076 ltr and that of sunflower oil from 0.02ltr per month to 0.013 ltr per month in five years. In rural Haryana, on the other hand, the monthly per capita consumption of mustard oil increased from 0.504 ltr five years ago to 0.531 ltr presently but the consumption of soybean has declined by 8.7% from 0.023 ltr per capita per month to 0.021 ltr per capita per month.

West Zone:

In west zone however, the image is quite different. It is observed that in Gujarat the overall per capita consumption is 1.857 ltr per month, which has increased from 1.77 ltr. per month in five years' time. In urban households, the overall monthly per capita consumption of edible oil currently is 2.074 ltr per month as compared to 2.027 ltr five years ago. There is an increase of about 2.3% in consumption of edible in urban Gujarat in the period of five years. The consumption of sunflower oil has nearly doubled to 0.292 ltr per capita per month presently from 0.146ltr per capita per month five years back. Similarly, consumption of coconut oil, corn/maize, safflower and rice bran increased by 66.7%, 46.2%, 38.5% and 17.6%, respectively. However, declining trend is observed in monthly per capita consumption of soybean oil by 26.8% from 0.041ltr five years ago to 0.03 ltr in recent times. Cotton oil declined by 25.4% and mustard oil by 10.7%.

On the other hand, in rural households of Gujarat, the monthly per capita consumption of edible oil has increased by 6.9% from 1.608ltr five years back to 1.72ltr presently. The consumption of corn/ maize oil has increased by 79.3% to 0.061 ltr per capita per month presently from 0.034 ltr per capita per month five years ago. Similarly, per capita consumption of groundnut oil, mustard, sunflower, coconut and other edible oils has increased by 16.9%, 23.3%, 32.4%, 30% and 4.2% in last five years, respectively. However,

a huge reduction in consumption of palm oil is observed, declining by 13.7% from 0.017ltr to 0.015 in five years period. Cotton oil and ramtil seed oil consumption decreased by 6.8% and 3.2%.

In Maharashtra, on the other hand, the overall monthly per capita consumption of edible oil currently is 1.269 ltr as compared to 1.298 ltr five years ago. There is a decrease of about 2.2% in consumption of edible oil in urban Maharashtra in 5 years period. The per capita consumption of mustard oil increased form 0.005 ltr to 0.011 ltr, soybean oil from 0.786 ltr to 0.874 ltr and sesame oil from 0.007 ltr per month to 0.02 ltr per month, that of coconut oil from 0.004 ltr to 0.007 ltr per month, olive oil from 0.003 ltr to 0.005 ltr per month and rice bran from 0.002 ltr to 0.003 ltr per month. The per capita consumption of groundnut oil, in five years, declined by 57.8% from 0.161 ltr to 0.068 ltr per month that of sunflower oil from 0.268 ltr to 0.242 ltr per month, flaxseed(Linseed) from 0.012 ltr per month to zero, safflower oil from 0.005 ltr to 0.001 ltr per month and palm oil from 0.036 ltr per month to 0.033 ltr and cotton oil from 0.008 ltr to 0.006 ltr.

In rural households, however, the per capita consumption decreased by 3% in five years period. The major decline is observed in consumption of groundnut oil from 0.122 ltr to 0.045 ltr per capita per month and flaxseed (Linseed) oil from 0.003 ltr per month to zero. On the other hand, per capita consumption of mustard oil increased from 0.001 ltr to 0.018 ltr per month. In urban households, however, the consumption declined by 1.1% with major decline in consumption of mustard oil, flaxseed (Linseed) oil and vanaspati, with the major increase in the consumption of sesame oil and cotton oil.

North-west Zone:

In the Rajasthan state of north-west zone, the overall monthly per capita consumption of edible oil increased by 9.7% from 1.015 ltr as compared to 0.925 ltr five years ago. There is an increase of about 5% in consumption of edible oil in urban Rajasthan in 5 years period. The per capita consumption of mustard oil, in urban households, increased from 0.279 ltr to 0.34 ltr. In five years, that of soybean oil from 0.196 ltr to 0.21 ltr, cotton oil from 0.047 ltr to 0.052 ltr per month and sesame oil from 0.008 ltr per month to 0.01 ltr per month. However, the per capita consumption of groundnut oil declined by 5%, in five years, from 0.45 ltr to 0.426 ltr per month and consumption of sunflower oil has remained unchanged.

In rural households, the per capita consumption increased by 11.6% in five years period. The major decline is observed in consumption of groundnut oil from 0.2 ltr to 0.138

ltr per capita per month and cotton oil from 0.051 ltr per month to 0.022 ltr per month. On the other hand, per capita consumption of soybean oil increased from 0.089 ltr to 0.162 ltr per month, mustard oil from 0.523 ltr to 0.641 ltr per month and consumption of sesame, sunflower and coconut oil has remained unchanged.

Table 5.6.b: Monthly per capita consumption of oil by households (in ltr.)

Zones	Oil	Urban		Rural		Total	
		5years ago	Present	5 years ago	Present	5years ago	Present
North-West	Rajasthan						
	Groundnut	0.450	0.426	0.2	0.138	0.262	0.209
	Mustard	0.279	0.34	0.523	0.641	0.463	0.567
	Soybean	0.196	0.21	0.089	0.162	0.115	0.174
	Sesame	0.008	0.01	0.006	0.006	0.007	0.007
	Sunflower	0.099	0.099	0.005	0.005	0.028	0.028
	Coconut	0	0	0.001	0.001	0.001	0.001
	Cotton	0.047	0.052	0.051	0.022	0.05	0.029
	Subtotal	1.079	1.137	0.874	0.975	0.925	1.015
Central	Madhya Pradesh						
	Soybean	0.662	0.289	0.628	0.308	0.642	0.300
	Groundnut	0.113	0.169	0.083	0.122	0.095	0.141
	Mustard	0.098	0.419	0.204	0.456	0.161	0.440
	Sunflower	0.075	0.118	0.032	0.052	0.050	0.079
	Rice bran	0.01	0.038	0.002	0.021	0.005	0.028
	Ramtil	0.02	0.017	0.018	0.03	0.019	0.021
Subtotal	0.978	1.05	0.967	0.988	0.972	1.010	
South	Tamil Nadu						
	Groundnut	0.247	0.225	0.4	0.367	0.323	0.295
	Sunflower	0.673	0.72	0.415	0.442	0.545	0.582
	Sesame	0.018	0.018	0.011	0.014	0.014	0.016
	Safflower	0.008	0.008	0.003	0	0.005	0.004
	Coconut	0.413	0.587	0.168	0.147	0.291	0.369
	Palm	0.032	0.065	0.261	0.336	0.146	0.199
	Ramtil	0	0	0	0.025	0	0.012
	Canola	0	0	0.006	0.006	0.003	0.003
	Other	0	0.004	0.003	0.006	0.001	0.005
Subtotal	1.39	1.626	1.267	1.342	1.329	1.485	
East	West Bengal						
	Mustard	0.784	0.716	0.85	0.76	0.827	0.744
	Soybean	0.34	0.352	0.202	0.234	0.251	0.276
	Sunflower	0.18	0.181	0.066	0.062	0.107	0.104
	Olive	0.001	0.001	0	0.0004	0.001	0.001
	Rice bran	0.058	0.064	0.04	0.044	0.047	0.051
	Palm	0.01	0.01	0.01	0.011	0.01	0.011
	Vanaspatti	0	0.003	0.0008	0	0.001	0.001
Subtotal	1.375	1.327	1.170	1.111	1.243	1.188	

Central Zone:

Similarly in the Madhya Pradesh state of central zone, the monthly per capita consumption of oil increased by 3.9%. In urban households, the overall monthly per capita consumption of edible oil currently is 1.05 ltr per month as compared to 0.978 ltr five years ago, with an increase of about 7.4% in consumption of edible oil in 5 years period. The consumption of mustard oil has increased to 0.419 ltr per capita per month presently from 0.098 ltr per capita per month five years ago. Similarly, consumption of rice bran oil, sunflower and groundnut oil has also increased.

However, declining trend is observed in monthly per capita consumption of soybean oil by 56% from 0.662ltr five years back to 0.289 ltr in recent times. Ramtil (nigerseed)oil also declined by 15% from 0.02 ltr per capita per month to 0.017 ltr per capita per month. On the other hand, in rural households the monthly per capita consumption of edible oil has increased by 2.2% from 0.967 ltr five years ago to 0.988 ltr presently. The consumption of rice bran oil has increased ten folds from 0.002ltr to 0.021 ltr per capita per month in five years' time. Similarly, per capita consumption of mustard oil has nearly doubled and increasing trends were observed in groundnut, sunflower and ramtil (nigerseed) oils in last five years. However, huge decline in consumption of soybean oil is observed, declining by 51% from 0.628 ltr to 0.308 in five years. (Table 5.6.b).

South Zone:

In Tamil Nadu, the overall monthly per capita consumption of edible oil currently is 1.485ltr as compared to 1.329ltr five years ago. There is an increase of about 17% in consumption of edible oil in urban Tamil Nadu in 5 years period. The per capita consumption of palm oil increased from 0.032 ltr five years ago to 0.065 ltr presently, that of sunflower oil from 0.673 ltr to 0.72 ltr and the consumption of coconut oil from 0.413 ltr to 0.587ltr per month. The per capita consumption of groundnut oil, in five years, declined by 9% from 0.247 ltr to 0.225ltr per month and consumption of sesame and safflower oil has remained unchanged.

In rural households, the per capita consumption increased by only 5% in five years period. The major increase is observed in consumption of other edible oils from 0.003 ltr to 0.006 ltr per capita per month, palm oil from 0.261 ltr per month to 0.336 ltr per month,

sesame oil from 0.011 ltr to 0.14 ltr per capita per month and that of sunflower oil from 0.415 ltr per month to 0.442 ltr per month. However, a major decline in per capita consumption of safflower and coconut oil is observed in rural households.

East Zone:

In West Bengal, however, the overall monthly per capita consumption of edible oil declined by 4% to 1.188 ltr as compared to 1.243 ltr five years ago. There is decrease of about 3.5% in consumption of edible oil in urban West Bengal in 5 years period. The per capita consumption of rice bran oil increased from 0.058 ltr five years ago to 0.064 ltr presently, that of soybean oil from 0.34 ltr to 0.352 ltr and sunflower oil from 0.18 ltr per month to 0.181 ltr per month. The per capita consumption of mustard oil, in five years, declined by 9% from 0.784 ltr to 0.716 ltr per month and consumption of palm oil has remained unchanged. In rural households, the per capita consumption decreased by only 5% in five years period.

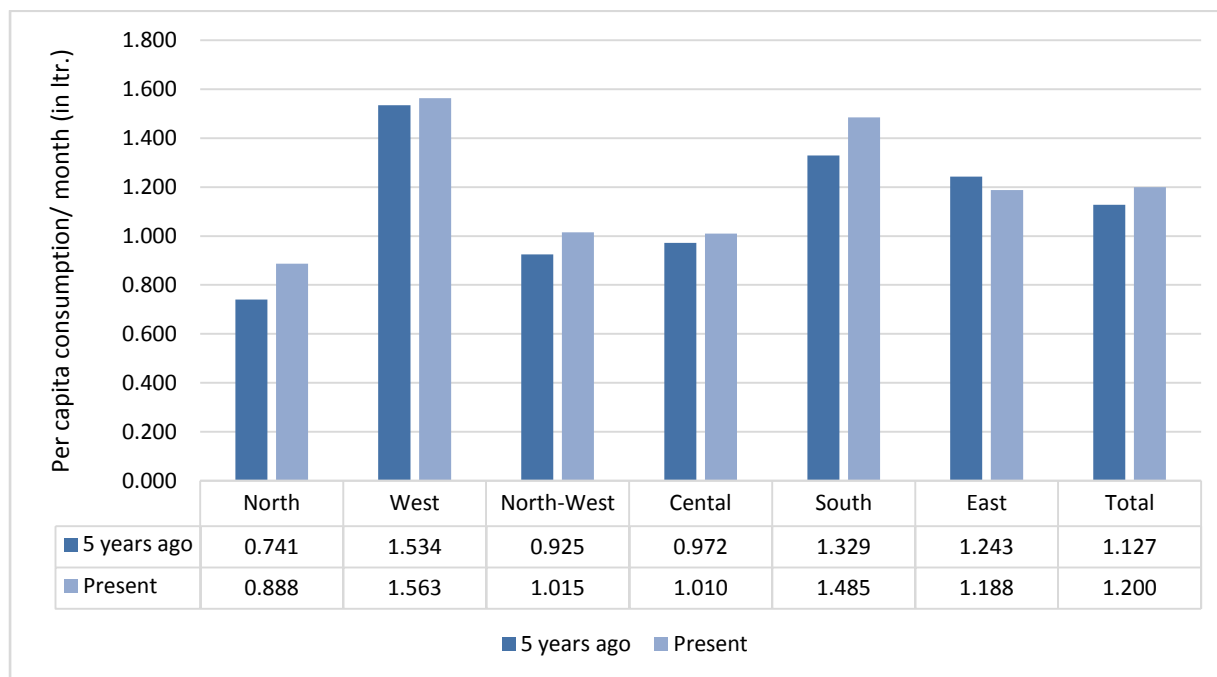
The major decline is observed in consumption of mustard oil from 0.85 ltr to 0.76 ltr per capita per month and sunflower oil from 0.066 ltr per month to 0.062 ltr per month. On the other hand, per capita consumption of soybean oil increased from 0.202 ltr to 0.234 ltr per month, rice bran from 0.044 ltr to 0.047 ltr per month and palm oil from 0.1 ltr to 0.011 ltr per month and vanaspati declined from 0.0008 ltr per month to zero.

The findings from the survey thus suggests that the households in Uttar Pradesh, Haryana, Rajasthan and West Bengal consume mustard oil the most. Soybean oil is a major part of cooking in Maharashtra and Madhya Pradesh households. On the other hand, sunflower oil is consumed by Tamil Nadu. However, the urban and rural households in Gujarat have different preferences of oil consumed. Groundnut oil is predominant oil consumed in urban Gujarat, but cotton oil is largely consumed in the rural households of Gujarat.

From the above discussion it can be inferred that after Gujarat, the per capita consumption is maximum in Tamil Nadu and minimum in Haryana. Maharashtra rank third followed by Uttar Pradesh, West Bengal, Rajasthan and Madhya Pradesh. In terms of six zones of India, the overall per capita consumption of edible oil has increased from 1.127 ltr per month to 1.2 ltr per month. Five years back, the per capita consumption has been maximum in west zone (1.534 ltr per month), followed by south (1.329 ltr per month), east (1.243 ltr per month), central (0.972 ltr per month), north-west (0.925 ltr per month) and

north (0.741 ltr per month) zone. Similar trends in per capita consumption of edible oil have been observed presently, however consumption in the north-west zone has surpassed the central zone to become the fourth major consumer of oil after west, south and east zone (Figure 5.16).

Figure 5.16: Per capita consumption of edible oil in different zones of India



These estimated consumption trends are in line with the production pattern of oilseeds in the respective states (Table 4.16). As of 2019-20, R&M oilseeds rank fifth most cultivated crops in Uttar Pradesh and has the fourth largest area under cultivation in Haryana. In Rajasthan, it is the third most produced crop after bajra and wheat and rank second in West Bengal after rice. Soybean oilseeds, on the other hand, has the second most area under cultivation in Madhya Pradesh and Maharashtra. In Tamil Nadu, groundnut occupies third position in area after rice and jowar and its oil also the second most consumed oil in the state after sunflower oil. However, groundnut followed by cotton are the two most cultivated crop in Gujarat which also explains the consumption of groundnut oil and cotton oil in the state.

5.2.6 Quantity of edible oil consumed and income of the households

This section classifies the households in urban and rural areas based on income level and quantity of oil consumed per month in different zones of India. This is done to shed light on consumption pattern based on income of the households. Quantity consumed and income of the households per month in north and west zone are illustrated in Table 5.7.a and that in north-west, central, east and south zone in Table 5.7.b.

North Zone:

It can be observed that more than half of the rural households in Uttar Pradesh consume less than 5 litres of oil out of which 83% belong to the income band of below ₹ 15,000 per month. Households whose monthly income is above ₹ 15,000, majorly consumed 5-10 litres of oil. In urban areas, less quantity of oil (below 5 litre) was consumed by people in income level of ₹ 15,000 to ₹ 30,000, however, people with monthly income below ₹ 15,000 consumed 5 to 10 litre oil.

However, monthly consumption of oil in Haryana is upto 10 ltr, with the majority of the households consuming oil below 5ltr per month. It is also observed that the households who consumed oil below 5 ltr per month belonged to income group of ₹ 15000-30000 per month. Whereas, in urban Haryana, households consuming less than 5 ltr of oil per month mostly belonged to the income band of ₹ 15000-30000 followed by ₹ 30000-50000 and above ₹ 80000 per month. On the other hand, households consuming between 5-10 ltr of oil per month mostly belonged to the income band of ₹ 15000-30000 followed by ₹ 50000-80000.

West Zone:

In Gujarat state of the west zone, 45% of the rural households consumes at most 5 to 10 litres of oil per month and 43.5% of them belongs to the monthly income group of ₹ 15,000-₹ 30,000. However, in urban Gujarat, 42% of the households consume upto 5litres of edible oil per month and 40% reports the consumption of oil between 5 to 10 litres. It is also evident that majority of these urban consumers belongs to the income group of ₹ 15,000 to ₹ 30,000. Another finding is that the majority of the urban households that earn above ₹ 80,000 consumes upto 5litres of edible oil. This suggests that income is not directly proportional to consumption of edible oil in urban Gujarat.

In Maharashtra, on the other hand, households consume maximum of 15 ltr of oil per month with majority consuming below 5 ltr per month. It is evident that in urban Maharashtra those who consumed oil below 5 litres majorly belonged to income band of below ₹ 15,000 and those who consumed between 5-10 litres were mainly in income band of ₹ 15,000 to ₹ 30,000. In rural areas, less quantity of oil (below 5litre) was majorly consumed by households with the income level of below ₹ 15,000, however, those who consumed between 5-10 litres and 10-15 litres oil were mainly in income band of ₹ 15,000 to ₹ 30,000.

Table 5.7.a: Quantity consumed and Income of the households per month

North	Uttar Pradesh								
	Quantity (in ltr./month)	5 and below		5-10		10-15		15 above	
	Income band (□ /month)	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
	Below 15,000	20	181	30	101	1	1	0	0
	15,000-30,000	22	30	18	41	5	4	1	0
	30,000-50,000	3	4	9	13	1	1	0	0
	50,000-80,000	0	3	1	8	0	1	0	1
	Total	45	218	58	163	7	7	1	1
	Haryana								
	Quantity (in ltr./month)	5 and below		5-10		10-15		15 above	
Income band (□ /month)	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	
Below 15,000	13	106	0	9	0	0	0	0	
15,000-30,000	41	107	4	2	0	0	0	0	
30,000-50,000	36	56	0	1	0	0	0	0	
50,000-80,000	23	43	1	2	0	0	0	0	
Above 80,000	28	27	0	0	0	0	0	0	
Total	141	339	5	15	0	0	0	0	
West	Gujarat								
	Quantity (in ltr./month)	5 and below		5-10		10-15		15 above	
	Income band (□ /month)	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
	Below 15,000	20	60	12	44	2	18	1	1
	15,000-30,000	30	32	41	60	13	13	2	1
	30,000-50,000	15	15	13	25	5	11	2	0
	50,000-80,000	3	4	8	8	7	3	2	2
	Above 80,000	13	2	3	1	1	4	0	3
	Total	81	113	77	138	28	49	7	7
	Maharashtra								
Quantity (in ltr./month)	5 and below		5-10		10-15		15 above		
Income band (□ /month)	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	
Below 15,000	63	114	16	23	0	2	0	0	
15,000-30,000	43	97	18	25	1	5	0	0	
30,000-50,000	21	11	7	8	0	1	0	0	
50,000-80,000	14	7	4	1	1	1	0	0	
Above 80,000	8	3	4	2	0	0	0	0	
Total	149	232	49	59	2	9	0	0	

Table 5.7.b: Quantity consumed and Income of the households per month

		Rajasthan							
		5 and below		5-10		10-15		Above 15	
North-West	Quantity consumed (in ltr./month)	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
		Income band (□ /month)							
	Below 15,000	13	27	11	30	4	2	3	0
	15,000-30,000	8	38	5	21	0	4	0	0
	30,000-50,000	28	61	14	21	1	5	1	0
	50,000-80,000	19	82	4	20	0	1	0	0
	Above 80,000	8	47	2	13	3	1	0	3
	Total	76	225	36	105	8	13	4	3
		Madhya Pradesh							
		2 and below		2-3		3-4		4 and above	
Central	Quantity consumed (in ltr./month)	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
	Income band (□ /month)								
	Below 15,000	7	18	6	24	2	39	2	34
	15,000-30,000	6	13	15	37	16	41	9	28
	30,000-50,000	2	11	13	13	22	17	14	4
	50,000-80,000	3	1	11	2	19	6	15	4
	Above 80,000	5	0	3	3	23	1	11	0
	Total	23	43	48	79	82	104	51	70
		Tamil Nadu							
		5 and below		5-10		10-15		Above 15	
South	Quantity consumed (in ltr./month)	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
	Income band (□ /month)								
	Below 15,000	14	126	3	8	0	3	0	0
	15,000-30,000	67	64	8	12	0	0	0	0
	30,000-50,000	43	15	25	6	2	1	0	0
	50,000-80,000	24	2	41	5	0	0	0	0
	Above 80,000	8	1	14	0	1	5	2	0
	Total	156	208	91	31	3	9	2	0
		West Bengal							
		5 and below		5-10		10-15		Above 15	
East	Quantity consumed (in ltr./month)	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
	Income band (□ /month)								
	Below 15,000	32	137	6	34	1	0	0	0
	15,000-30,000	36	43	14	45	1	1	0	1
	30,000-50,000	22	15	10	16	1	4	0	1
	50,000-80,000	29	4	10	9	1	3	0	0
	Above 80,000	10	3	5	5	0	1	0	0
	Total	129	202	45	109	4	9	0	2

North-west Zone:

In Rajasthan state of north-west zone, the majority of the rural households consume below 5ltr per month and majorly belonged to income band of below ₹ 50,000 to ₹ 80,000, followed by those who consumed between 5-10 litres oil were mainly in income band of ₹ 15,000 to ₹ 50,000 and those who consumed 10-15 litres oil were earning between ₹ 30,000 to ₹ 50,000 and above 15 litres of oil consumption were earning above ₹ 80,000. In urban areas, less quantity of oil (below 5litre) was majorly consumed by households with the income level of ₹ 30,000 to ₹ 50,000, those who consumed between 5-10 litres oil were mainly in income band of ₹ 30,000 to ₹ 50,000, who consumed 10-15 litres oil were earning below ₹ 15,000 and who consumed more than 15 litres per month were also earning below ₹ 15,000 per month.

Central Zone:

In central zone, however, it is observed that majority of the Madhya Pradesh state households consumes 3-4 litres of oil per month (urban: 40% and rural: 35%). The majority of rural households belonged to income group of ₹ 15,000-₹ 30,000 and the urban households belonged to the income group of ₹ 80,000 and above who consumed 3-4 litres of oil per month. It is also evident that majority of the rural consumers belongs to the income group of ₹ 15,000 to ₹ 30,000 who consumes more than 2 litres of oil per month except for those consuming less than 2 litres, belonged to income group of below ₹ 15,000. However, consumption pattern is varied in urban areas, where households that consumed oil less than 2 litres per month were majorly in income group of below ₹ 15,000. Those who consumed 2 to 3 litres of oil belonged to ₹ 15,000 to ₹ 30,000 group and who consumed more than 4 litres per month belonged to ₹ 50,000 to ₹ 80,000 group

South Zone:

In Tamil Nadu state also it is observed that the rural households consume maximum of 15 ltr of oil per month with majority consuming below 5ltr per month. It is evident that in those who consumed oil below 5 litres majorly belonged to income band of below ₹ 15,000, who consumed between 5-10 litres oil were mainly in income band of ₹ 15,000 to ₹ 30,000 and those who consumed 10-15 litres oil were earning between ₹ 50,000 to ₹ 80,000. In urban areas, less quantity of oil (below 5litre) was majorly consumed by households with the income level of ₹ 15,000 to ₹ 30,000, however, those who consumed between 5-10 litres oil were mainly in income band of ₹ 50,000 to ₹ 80,000, who consumed 10-15 litres oil were

earning between ₹ 30,000 to ₹ 50,000 and who consumed more than 15 litres per month were earning above ₹ 80,000 per month.

East Zone:

Finally in east zone, it is observed that the rural households of West Bengal majorly consume below 5ltr of oil per month. It is evident that in those who consumed oil below 5 litres majorly belonged to income band of below ₹ 15,000, who consumed between 5-10 litres oil were mainly in income band of ₹ 15,000 to ₹ 30,000 and those who consumed 10-15 litres oil were earning between ₹ 30,000 to ₹ 50,000. In urban areas, those who consumed below 5ltr and between 5-10 litres majorly belonged to the income level of below ₹ 15,000 and in ₹ 15,000 to ₹ 30,000, respectively.

5.2.7 Other features of consumption of edible oils in different states

This section discusses the factors influencing the household consumption of edible oil in urban and rural areas. Table 5.8.a lists the factors in north and west zones, and Table 5.8.b represents consumption pattern of edible oil in north-west, central, east and south zones of India.

In the north zone of India, the households mainly consume oil twice a day with 64.9% of the urban Uttar Pradesh, 90.7% of the rural Uttar Pradesh and 63% of rural Haryana households as compared to 70.6% of the urban Haryana households that consume oil at least 3 times a day. Similarly, in west zone, 61.1% of the urban and 69.4% of the rural Gujarat households, 65.5% of the urban and 70% of the rural Maharashtra households mainly consume oil twice a day (Table 5.8.a). Similar trends are observed in the north-west zone (urban Rajasthan: 58.9%, rural Rajasthan: 90.4%), central (urban Madhya Pradesh: 8.7%, rural Rajasthan: 83.8%) and south (urban Tamil Nadu: 70.2% rural Rajasthan: 90.4%) zones of India. However, in the West Bengal state of east zone, it is observed that about half of the households in both urban (51.1%) and rural (50.6%) households consumed oil three times and more per day (Table 5.8.b).

Table 5.8.a: Other features of consumption of edible oils in different states(%)

Zone		North						West					
Item	Response	Uttar Pradesh			Haryana			Gujarat			Maharashtra		
		U	R	T	U	R	T	U	R	T	U	R	T
Number of times a day oil consumed	1	1.8	0	0.4	0	0	0	1	1	1.0	6.5	5	5.6
	2	64.9	90.7	85	28.8	63	53	61.1	69.4	66.2	65.5	70	68.2
	3 +	33.3	9.3	14.6	70.6	36.7	46.6	37.3	28.7	32.0	28	24.7	26
Additional fat	Ghee	84.7	78.9	80.2	87	85.6	86	95.9	82.7	87.8	54.5	46	49.4
	Butter	44.1	18	23.8	63	68.6	67	68.9	37.1	49.4	12	3	6.6
	Others	0	0	0	0	0	0	0.5	0	0.2	0	0	0
Number of times a month out for lunch	0	29.7	86.4	73.8	80.8	94.6	90.6	58	75.9	69.0	19	31.7	26.6
	1	9	4.6	5.6	6.8	1.4	3	23.3	16.9	19.4	18	8.7	12.4
	2	49.5	5.7	15.4	4.8	1.4	2.4	15.5	6.5	10.0	56.5	58.7	57.8
	3	11.7	3.1	5	0.7	1.7	1.4	2.1	0	0.8	0.5	0.7	0.6
	4 +	0	0.3	0.2	7	0.9	2.6	1	0.6	0.8	5.5	0.3	2.6
Number of times a month out for dinner	0	29.7	88.2	75.2	52.1	88.4	77.8	38.9	65.1	55.0	45	77	64.2
	1	0.9	2.6	2.2	23.3	8.8	13	25.9	14.7	19.0	3.5	0.3	1.6
	2	37.8	4.1	11.6	12.3	1.7	4.8	25.4	16	19.6	46.5	22	31.8
	3	27.9	3.3	8.8	4.1	0.3	1.4	2.1	3.3	2.8	1.5	0.3	0.8
	4	3.6	1.5	2	0.7	0	0.2	1	0.7	0.8	2.5	0.3	1.2
	5 +	0	0.3	0.2	7.6	0.9	2.8	4.1	0.3	1.8	1	0	0.4
Medium of cooking	LPG gas	100	97.2	97.8	97.3	29.9	49.6	100	88.9	93.2	98	96	96.8
	Firewood	0	2.8	2.2	1.4	65	46.4	3.6	43.6	28.2	6	38	25.2
	Cow dung	0	0	0	0	2.5	1.8	1	6.5	4.4	0	0.7	0.4
	Electric heater	0	0	0	0	0	0	6.7	0	2.6	5	3	3.8
	Induction stove	0	0	0	0	0	0	0.5	0	0.2	3	0.3	1.4
	Others	0	0	0	0	0	0	0	0	0.0	0	1.3	0.8
How choose oil	Price of oil	57.7	73.5	70	26	25.4	25.6	17.6	41	32.0	61	64.3	63
	Health	41.4	26.5	29.8	70.5	73.4	72.6	50.8	29	37.4	35	30.7	32.4

It is observed that majority of the households consume ghee in India (Uttar Pradesh: 80.2%, Haryana: 86%, Gujarat: 87.8%, Maharashtra: 49.4%, Rajasthan: 90.4%, Madhya Pradesh: 91.6%, Tamil Nadu: 68.7% and West Bengal: 49.4%) followed by butter. However, 0.2% of the Gujarat, 15% of the Rajasthan and 37.8% of the Madhya Pradesh consumes other additional fats.

Table 5.8.b: Other features of consumption of edible oils in different states (%)

Zone		North-west			Central			South			East		
Item	Response	Rajasthan			Madhya Pradesh			Tamil Nadu			West Bengal		
		U	R	T	U	R	T	U	R	T	U	R	T
Number of times a day oil consumed	1	0	0.3	0.2	0	0.3	0.2	16.5	10.6	13.8	2.2	2.5	2.4
	2	58.9	90.4	82.6	87.7	83.8	85.4	70.2	73.4	73.3	46.6	46.9	46.8
	3+	40.3	9.3	17	12.3	15.9	14.4	12.9	15.8	14.7	51.1	50.6	50.8
Additional fat	Ghee	99.2	87.5	90.4	92.6	90.9	91.6	59.7	74.8	68.7	70.8	37.6	49.4
	Butter	80.6	38	48.6	26	27.4	26.8	20.2	33.4	27.4	40.4	5.6	18
	Others	29.8	0	15	43.6	33.8	37.8	0	0	0	0	0	0
Number of times a month out for lunch	0	27.4	55.3	48.4	20.6	64.9	46.8	25	18	21.9	90.4	71.7	78.4
	1	21.8	5.6	9.6	14.7	8.4	11	24.2	17.8	21.4	3.9	18.9	13.6
	2	10.5	39.1	32	28.9	19.9	23.6	19.4	14.8	17.4	5.1	6.2	5.8
	3	6.5	0	1.6	10.3	5.1	7.2	3.6	5	4.4	0.6	0.3	0.4
	4 +	33.9	0	8.4	6.4	1.7	3.6	13.7	37.2	26.1	0	2.8	1.8
Number of times a month out for dinner	0	46.8	54.3	52.4	1	25.7	15.6	39.1	25	32.6	33.1	99.1	75.6
	1	21	7.7	11	13.2	15.2	14.4	16.5	12.4	14.7	33.7	0.6	12.4
	2	0.8	38	28.8	40.7	19.6	28.2	17.3	13.8	15.8	11.8	0.3	4.4
	3	0.8	0	0.2	21.6	11.1	15.4	2.8	5.4	4.2	0	0	0
	4	7.3	0	1.8	12.3	8.8	10.2	3.2	7.2	5.3	2.8	0	1
	5+	23.4	0	5.8	11.3	3	6.4	4.8	16.4	10.9	1.7	0	0.6
Medium of cooking	LPG gas	79.8	68.1	71	98	90.2	93.4	95.6	96.8	98.1	98.9	51.2	68.2
	Firewood	21	86.7	70.4	20.1	71.6	50.6	4	2	3	9.6	44.7	32.2
	Cow dung	0.8	4	3.2	17.2	37.8	29.4	0.4	0.2	0.3	1.7	13.7	9.4
	Kerosene oil stove	0	0.3	0.2	0.5	0.3	0.4	0	0	0	2.8	1.9	2.2
	Electric heater	1.6	0	0	8.3	4.1	5.8	0	0	0	2.2	0	0.8
	Induction stove	0	0	0	23.5	12.8	17.2	0	0	0	15.2	0.3	5.6
	Others	0	0	0	1	0	0.4	0	0	0	2.8	1.6	2
How choose oil	Price of oil	5.6	17.3	14.4	26	44	30.6	46.8	38.6	43.5	42.1	13.1	37.4
	Health	94.4	83.5	86.2	19	8	69.4	53.2	61.4	58.5	54.5	16.9	38.2

In the west (Gujarat and rural Maharashtra), north (Haryana and rural Uttar Pradesh), central (rural Madhya Pradesh), north-west, south and east zones of India, it is found that majority of the households do not go out for lunch and dinner. However, in Uttar Pradesh state of the north about 49.5% of the urban go out for lunch and 37.8% go out for dinner twice a month. In Maharashtra also, more than half of the households go out for lunch and only 46.5% of the urban go out for dinner twice a month. Similarly in urban Madhya Pradesh, 28.9% of the households go out for lunch and 40.7% go out for dinner twice a month.

It is observed that majority of households in India uses LPG gas for cooking except for rural Haryana and Madhya Pradesh where 65% and 86.7% of the households uses cow dung and firewood, respectively for the cooking. Other popular choices for cooking food were electric heater, induction stove and kerosene oil stove. The majority of the households choose oil based on health impact as compared to Uttar Pradesh (Urban: 57.7%, Rural: 73.5%), Gujarat (Rural: 41%), Maharashtra (Urban: 61%, Rural: 64.3%), Madhya Pradesh (Urban: 26%, Rural: 44%) households that select oil based on its price.

Sarwade (2011) also suggests that households consume 1-2 litres of oil per month and that branded oil is preferred over loose oil in Maharashtra. Similarly, Arya and Vipin (2021) in a study in Hisar, Haryana have found preference for local edible oil, followed by branded oil. Both studies have found that health is the major factor in purchase of oil.

To analyse the influence of socioeconomic variables on edible oil expenditure, ANOVA (Analysis of Variance) is conducted. The socioeconomic variables included in the study are food identity, nature of the family, social category, households that are BPL category, religion of the households, decision of the household's expenditure, covered area of the house, zones to which households belong, Area (Urban/ Rural) and score of wealth and assets of the households. Score of wealth and asset is the value estimated for the 22 wealth and assets that are owned by households. The score is on the scale of 0-100 where 0 means no assets owned and 100 suggests that households own all type of assets. To test the null hypothesis that,

H_0 : there is no significant difference in expenditure on edible oil with regard to the socioeconomic status of the households, as compared to,

H_1 : there is significant difference in expenditure on edible oil with regard to the socioeconomic status of the households.

The p-value is less than significance level leads to rejection of null hypothesis suggesting that there are significant differences in oil expenditure in different socioeconomic groups. The findings from the Table 5.9 suggest except for ration card, all the other variables significantly affect differential expenditure on edible oils by the households.

Table 5.9: ANOVA test for impact of socioeconomic variables on expenditure of edible oil by households

Variables	Degree of freedom	Sum of Squares	Mean sum of squares	F-value	Pr (>F)
Food Identity	1	1264013	1264013	4.637	0.031348*
Nature of Family	1	13339171	13339171	48.939	3.13E-12***
Social category	3	1758101	586034	2.15	0.091845 .
Ration card	1	108949	108949	0.4	0.527277
Household BPL category	1	2735822	2735822	10.037	0.001547**
Religion	5	6698813	1339763	4.915	0.000174***
Decision of household expenditure	5	22987913	4597583	16.868	<2.00E-16****
Covered Area of house	1	3405961	3405961	12.496	0.000413***
Score	1	11147716	11147716	40.899	1.81E-10***
Area	1	17041700	17041700	62.522	3.46E-15***
Zones	5	66000591	13200118	48.428	<2.00E-16****
Residuals	3647	994060113	272569		
Shapiro-Wilk normality test:		W=0.88101, p-value<2.2E-16			

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

5.3: Comparative analysis of preference of edible oil with respect to socio economic factors in India using Logistic regression models

In this section, a comparative assessment of preference of edible oil with respect to socio economic factors in rural and urban zones of India is carried out. In this regard, binary logistic regression model is utilised to fit the regression model to the dichotomous response variable.

Here, in this study, the dependent variable is the consumption of edible oils, where $x=1$, if the households are consuming the specified type of oil and $x=0$, otherwise. The edible oils used for regression are groundnut, soybean, mustard, sunflower, rice bran and cotton oil. Other oils are not included because of the limited value. Independent variables considered in this analysis are: zones in India (central, east, north, northwest, south and west), area (rural and urban), food identity of the households (vegetarian and non-vegetarian), social category (general, OBC, SC and ST), if they have ration card or not, score of wealth and asset, type of oil consumed (branded, loose and both), religion (Hindu, Muslim and others) and household income (divided in 5 categories).

The findings from the logistic regression models are depicted in Table 5.10.a and 5.10.b. Inferences are made only on the significant values of the study. The findings suggest that as compared to the central zone, the consumers of the groundnut oil in northwest and west zone are comparatively less by approximately 40%. It is also found out that the households that are non-vegetarian are 50% less likely to consume groundnut oil as compared to the households that are vegetarian. It is also observed that the odds of consuming groundnut oil is 40% less in households that belong to SCAs compared to the households that belongs to general category. Also, one unit increase in score of assets owned increases the odds of more households consuming groundnut oil by 1%. It is also observed that household that choose loose oil are 68% less likely to consume groundnut oil and those who choose both types of oils have been 62% more likely to consume groundnut oil as compared to those who prefer branded oil. The results from the model also suggest that odds of consuming groundnut oil by Muslim is 40% less as compared to the households belonging to other categories of religion and the odds of consuming groundnut oil by households whose income lies between ₹ 50,000- ₹ 80,000 per month is 46% lower as compared to the households whose income is below ₹ 15,000 per month (Table 5.10.a).

The logistic regression model with the consumption of mustard oil as the dependent variable suggests that the consumers of mustard oil in east and north zone are 30 and 47 times more than the central zone. However, households that consume mustard oil in west zone are 93% less as compared to the central zone. As compared to the rural areas, the consumers of mustard oil in urban areas are 40% lower. Similarly, odds of consuming mustard oil by households belonging to ST category are 70% lower and that by ST category is 52% higher as compared to the households that belong to the general category. It is also observed that the likelihood of consuming oil is 62% less in households that have ration cards as compared to those who do not have ration card. Another finding from the analysis is that as compared to the households that consume branded oil, the consumer of mustard oil are five times more who prefer loose oil and 67% more who prefer both type of oil. Also, the odds of consuming mustard oil by households whose income lies between ₹ 50,000- ₹ 80,000 per month is 95% higher as compared to the households whose income is below ₹ 15,000 per month (Table 510.a).

The results from the analysis with soybean as dependent variable suggests that as compared to the central zone, the odds of consuming soybean oil by north, northwest and west zone is 83%, 60% and 37% lower, respectively. However, the likelihood of consuming oil by urban households are 75% higher than rural households, that by non-vegetarians is 35% higher than the vegetarian households and four times higher in households that belong to ST category as compared to the general category households. It is also found out that households that prefer loose oil are 48% less likely to consume soybean oil and those who prefer both type of oil are 55% more likely to consume soybean oil as compared to the households that prefer branded oil. On the other hand, households that are religiously Muslim have 64% lower odds of consuming oil as compared to those who belong to other religious group (other than Hindus). Similarly, the odds of consuming soybean oil by households whose income lies between ₹ 15,000- ₹ 30,000, ₹ 50,000- ₹ 80,000 and above ₹ 80,000 per month is 22%, 48% and 62% lower, respectively, as compared to the households whose income is below ₹ 15,000 per month (Table 5.10.a).

The model fitted to consumption of sunflower oil shows that income has no significant impact of sunflower oil consumption. The findings suggest that as compared to the households in central zone, the odds of consuming sunflower oil by households in east, northwest and west zone is 45%, 86% and 50% lower, respectively. However, odds of consuming oil in south zone are two times than that in the central zone. It is also observed that the likelihood of sunflower oil consumption is 93% higher in urban areas as compared to the rural areas and 95% higher in households that are non-vegetarian as compared to the vegetarian households. Another finding from the study is that as compared to the households that belong to the general category, the odds of consuming oil by ST category households is 69% lower. On the other hand, households that have ration card have twice the likelihood of consuming sunflower oil as compared to the households that do not have ration card. It is also evident that one percent increase in the households' assets score increases the odds of consuming oil by 0.87%. However, as compared to the households that prefer branded oil, the odds of consuming the sunflower oil is 73% and 32% lower in households that prefer loose and both type of oil, respectively. It is also observed that households that are religiously Muslims have twice the odds of consuming sunflower oil as compared to the households belonging to other religious category other than Hindus (Table 5.10.b).

The findings suggest that the zone, religion and income do not have any significant impact on the consumption of coconut oil by the households. However, it is observed that as compared to the rural households the likelihood of consuming cotton oil is 31% lower in urban households. Also, the likelihood of consuming edible oil is 49% lower in case of households whose food identity is non-vegetarian to those who are vegetarians. It is interesting to note that as compared to the households that belong to the general category likelihood of consuming cotton oil is more than twice in the households that belong to OBC, SC and ST category. On contrary, the odds of consuming cotton oil are 70% and 92% lower in the households prefer loose and both type of oil, respectively, as compared to the households that prefer branded oil (Table 5.10.b).

The logistic regression model suggests that except for the zones of India, no other variable included in the study have any significant impact on the consumption of ramtil oil by the households. The findings suggests that as compared to the central zone, the odds of consuming ramtil oil by the south and west zone is 93% and 95% lower, respectively (Table 5.10.b).

Table 5.10.a: Logistic regression of oil preferences

		Groundnut			Mustard			Soybean		
		Odds ratio	Beta	Pr(> Z)	Odds ratio	Beta	Pr(> Z)	Odds ratio	Beta	Pr(> Z)
Zone	East	8.42E-09	-18.59	0.96787	30.1259	3.4054***	<2.00E-16	0.9342	-0.0680	0.68517
	North	8.70E-09	-18.56	0.95436	47.7998	3.8670***	<2.00E-16	0.1716	-1.7627***	<2.00E-16
	Northwest	0.6038	-0.50**	0.01367	1.4297	0.3574	0.060881	0.4057	-0.9021***	6.39E-7
	South	1.4371	0.36	0.07769	5.89E-09	-18.9492	0.945369	0.0000	-18.2677	0.94885
	West	0.6077	-0.50***	0.00548	0.0767	-2.5681***	<2.00E-16	0.6298	-0.4624***	0.00173
Area	Urban	1.2036	0.19	0.09739	0.6198	-0.4784***	6.58E-4	1.7493	0.5592***	3.77E-9
Food identity	Non-vegetarian	0.5006	-0.69***	4.3E-9	1.1187	0.1122	0.453897	1.3544	0.3034***	0.00288
Social category	OBC	0.9256	-0.08	0.5251	1.2290	0.2062	0.172627	1.0908	0.0869	0.40964
	SC	0.5986	-0.51***	0.0032	1.5219	0.4199**	0.028633	1.2117	0.1920	0.14007
	ST	0.6451	-0.44	0.07291	0.3076	-1.1788***	3.62E-7	4.6482	1.5365***	<2.00E-16
Ration card	Yes	1.3230	0.28	0.12046	0.3885	-0.9454***	1.83E-7	1.1496	0.1394	0.33364
Score		1.0114	0.01***	0.00491	1.0021	0.0021	0.673162	1.0052	0.0052	0.16462
Oil type	Loose	0.3216	-1.13***	<2.00E-16	5.7798	1.7544***	<2.00E-16	0.5207	-0.6526***	2.44E-9
	Both	1.6242	0.49**	0.0178	1.6737	0.5150**	0.010902	1.5520	0.4396***	0.00373
Religion	Hindu	1.0194	0.02	0.94967	1.1523	0.1417	0.657023	0.6994	-0.3575	0.18046
	Muslim	0.3993	-0.92**	0.04152	1.4193	0.3502	0.442501	0.3673	-1.0017***	0.00233
Income (in ₹)	15000-30000	1.0011	0.00	0.99312	1.2975	0.2605	0.108214	0.7809	-0.2473**	0.02225
	30000-50000	0.9908	-0.01	0.95341	1.0762	0.0734	0.697418	0.8287	-0.1879	0.17489
	50000-80000	0.5418	-0.61***	0.0022 **	1.9505	0.6681***	0.002037	0.5202	-0.6535***	0.00014
	Above 80000	1.1581	0.15	0.48984	1.2133	0.1934	0.431983	0.3848	-0.9550***	1.02E-5
AIC		2585.6			1929.6			3438.9		

Significance codes: '***' ≤0.01; '**' (0.01,0.05]; 'not significant (NS)' (> 0.05)

Table 5.10.b: Logistic regression of oil preferences

		Sunflower			Cotton			Ramtil		
		Odds ratio	Beta	Pr. (> Z)	Odds ratio	Beta	Pr. (> Z)	Odds ratio	Beta	Pr. (> Z)
Zone	East	0.5524	-0.5934***	0.003313	1.0314	0.0309	0.999986	3.42E-09	-19.4947	0.992355
	North	1.2247	0.2027	0.261003	0.5935	-0.5216	0.999727	2.06E-09	-20.0011	0.989181
	Northwest	0.1494	-1.9011***	3.38E-09	5.53E+07	17.8300	0.988546	1.46E-09	-20.3464	0.992114
	South	2.4647	0.9021***	6.17E-6	0.7221	-0.3255	0.999854	0.0777	-2.5548***	0.000312
	West	0.5043	-0.6845***	2.83E-4	3.21E+08	19.5900	0.987414	0.0492	-3.0128***	7.89E-6
Area	Urban	1.9275	0.6562***	3.59E-11	0.6982	-0.3593**	0.043041	0.3710	-0.9916	0.053876
Food identity	Non-vegetarian	1.9513	0.6685***	9.57E-10	0.5097	-0.6740***	0.000167	0.9778	-0.0225	0.959232
Social category	OBC	0.8135	-0.2064	0.063753	2.9751	1.0900***	7.84E-9	3.2997	1.1938	0.076503
	SC	1.0553	0.0538	0.693414	2.6829	0.9869***	0.000152	3.5596	1.2696	0.105761
	ST	0.3170	-1.1490***	0.000193	2.2785	0.8235**	0.015072	4.6073	1.5276	0.051351
Ration card	Yes	2.0828	0.7337***	1.59E-5	1.0990	0.0944	0.80293	0.7382	-0.3035	0.51005
Score		1.0087	0.0087**	0.019115	0.9861	-0.0140	0.051903	1.0160	0.0159	0.346779
Oil type	Loose	0.2722	-1.3013***	<2.00E-16	0.3004	-1.2030***	7.59E-7	1.0604	0.0586	0.899592
	Both	0.6878	-0.3743**	0.044106	0.0886	-2.4240**	0.020308	0.3430	-1.0700	0.096504
Religion	Hindu	1.4012	0.3374	0.242792	0.9370	-0.0650	0.911438	0.3200	-1.1396	0.310773
	Muslim	2.2769	0.8228**	0.01512	2.7779	1.0220	0.113135	0.7197	-0.3289	0.82886
Income (in ₹)	15000-30000	1.1687	0.1559	0.174644	0.8822	-0.1254	0.525587	1.0680	0.0658	0.882431
	30000-50000	1.0414	0.0405	0.788463	0.8191	-0.1996	0.475343	0.9315	-0.0710	0.906022
	50000-80000	0.9578	-0.0432	0.814809	1.0389	0.0382	0.915307	0.3118	-1.1653	0.304661
	Above 80000	1.1866	0.1711	0.416848	1.0339	0.0333	0.934551	2.1233	0.7530	0.356618
AIC		3357.8			1074.6			325.23		

Significance codes: '***' <=0.01; '**' (0.01,0.05]; 'not significant (NS)' (> 0.05)

5.4 Purchase decision of edible oils

In this section, the purchase decisions of edible oil in urban and rural households of different zones of India are discussed in Table 5.11. The place from where edible oil is purchased and the factor that influence purchase decision are important as it provides insights to consumer behaviour and purchasing power of the households. This will help to understand which area to focus on and can help in providing tools for spreading awareness regarding the consumption of oil.

It is observed that overall, the majority of households in north (Uttar Pradesh: 42.6% and Haryana: 70.4%), west (Maharashtra: 62.4%), central (Madhya Pradesh: 92%), east (West Bengal: 83%), north-west (54.6%) and south (Tamil Nadu: 59.4%) purchase oil from the local store. However, more than half of the Gujarat households (60.6%) of the west, 69.4% of the rural Rajasthan of the north-west and 75.8% of the rural Tamil Nadu of the south zone purchase oil from the shopping mall.

However, the image in urban and rural households in different zones is quite contrasting. It is observed that in Uttar Pradesh, after local stores, 33.3% of the urban households purchase from shopping malls and 36.5% of the rural households from ration shops. Similar trends are observed in Madhya Pradesh as well. Similarly, in Haryana, after local stores, 6.2% of the urban households purchase from shopping malls and 23.7% of the rural households are self-producers of oil. It is to be noted that Haryana is the only state where the majority of the rural households are the self-producers of the oil. In the Gujarat, however, the households (urban: 32.1% and rural: 42.3%) purchase from local stores after shopping malls. Whereas in Maharashtra, after local stores, 26% of the urban households purchase from shopping malls and 26% of the rural households from the ration shops.

In Rajasthan however, 9.7% of the urban households purchase from local stores after shopping malls and in rural households 4% purchase from wholesales after majority purchasing from the local store. It is interesting to note that in urban Tamil Nadu, 43.3% purchase from local stores after shopping malls, and 15.7% of the rural households purchase from shopping mall after majority purchasing from local stores. In West Bengal after local stores, 18.5% of the urban households purchase from shopping mall and 1.9% of the rural households from the wholesalers.

Family is the major factor that influences the purchasing habits of the households followed by the retailers and friends. TV advertisements newspaper and doctor's prescription

are the other factors that influence the purchasing habits of households. However, the image is quite different in different zones of India. It is observed that in the north zone, 53.6% of the Uttar Pradesh is influenced by the retailers and 38% by family with only 5.4% by friends as compared to Haryana where, 84.2% of the households are influenced by family with only 7% by retailers and only 3.8% by friends.

In the west zone, more than three fourth of the households in Gujarat are influenced by the family followed by 23.8% by friends, 92.2% reports to be influenced by TV advertisements as compared to only half of the households of Maharashtra influenced by friends, 21.2% by TV advertisement, 16% by retailers and 10.4% by friends. Similar patterns are observed in the north-west Rajasthan and the central Madhya Pradesh state where majority of the people are influenced by family followed by friends, TV advertisements and retailers. However, in Tamil Nadu state of the south zone, about 85% of the households are influenced by family followed by 40.4% by TV advertisement and 12.6% by friends as compared to the West Bengal state of the eastern zone where after family, retailers and TV advertisement are the major factors that influence the purchase decision in these households.

Table 5.11: Factors affecting purchase decision of edible oils

Zones		North						West					
Item	Response	Uttar Pradesh			Haryana			Gujarat			Maharashtra		
		Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Purchase place of edible oil	Shopping mall/ supermarket	33.3	0	7.4	6.2	0.6	2.2	76.2	50.8	60.6	26	4.7	13.2
	Local store	45.9	41.6	42.6	79.5	66.7	70.4	32.1	42.3	38.4	53.5	68.3	62.4
	Wholesaler	12.6	21.9	19.8	2.7	1.7	2	11.9	16.6	14.8	23	26	24.8
	Ration shop	7.2	36.5	30	0	0	0	28.5	16.3	21.0	1	1.7	1.4
	Extractor	0	0	0	4.1	3.7	3.8	0	0	0	0	0	0
	Self-produce	0	0	0	3.4	23.7	17.8	0	0	0	0	0	0
	Others	0	0	0	0	0	0	1.6	5.9	4.2	0	0	0
Influence on purchasing habit	Family	56.8	32.6	38	80.8	85.6	84.2	78.2	78.5	78.4	48.5	54.3	52
	Friends	22.5	0.5	5.4	3.4	4	3.8	33.2	17.9	23.8	8.5	11.7	10.4
	Retailers	25.2	61.7	53.6	9.6	5.9	7	7.3	12.4	10.4	11.5	19	16
	TV advertisement	0	5.7	4.4	0.7	0.8	0.8	30.1	16.9	22.0	29	16	21.2
	Newspaper	0	0	0	0.7	0	0.2	17.1	12.4	14.2	7.5	5	6
	Doctor prescription	0	0	0	0	0	0	2.1	1.3	1.6	3	4.3	3.8
Zones		North-west			Central			South			East		
Item	Response	Rajasthan			Madhya Pradesh			Tamil Nadu			West Bengal		
		Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Purchase place of edible oil	Shopping mall/ supermarket	85.5	3.2	23.6	43	8	22.3	67.1	15.7	41.6	18.5	1.2	7.4
	Local store	9.7	69.4	54.6	89	94	92.0	43.3	75.8	59.4	79.2	85.1	83
	Wholesaler	4.8	4	4.2	17	13	14.6	5.6	6.9	6.2	2.2	1.9	2
	Ration shop	0	2.9	2.2	32	18	23.7	7.9	12.9	10.4	0	0	0
Influence on purchasing habit	Family	87.1	73.4	76.8	95	94	94.4	75	96.8	85.8	45.5	45.3	45.4
	Friends	10.5	10.9	10.8	34	38	36.4	16.3	6.5	12.6	20.2	10.6	14
	Retailers	0	4.3	3.2	27	32	30.0	6.7	3.6	8.4	41	49.4	46.4
	TV advertisement	0.8	6.9	5.4	34	31	32.2	24.6	0.8	40.4	42.7	7.8	20.2
	Newspaper	0	1.9	1.4	18	8	12.1	0	0	0	7.9	0	2.8
	Doctor prescription	0.8	0	0.2	16	8	11.3	0	0	0	3.4	1.2	2

5.5 Health and consumption of edible oil

Edible oil is an essential part of Indian diet and therefore it is necessary to understand its impact on health. Edible oils are important for meeting nutritional needs and growth of the body as well as proper functioning of the brain and nervous system. Risk of diseases such as cardio-vascular diseases, blood pressure problems and obesity is increased due to excessive consumption of edible oils.

Method of cooking in Indian diet is different from that in other countries, as it involves deep frying at high temperatures. Further, heating of oil repeatedly is common in Indian cooking and this can produce compounds like polycyclic aromatic hydrocarbons (PAH), some of which are reported to potentially cause cancer. Edible oils are a source of saturated fatty acids (SFA), monosaturated fatty acids (MUFA) and polyunsaturated acids (PUFA). High intake of SFA is known to increase cholesterol levels and risk of cardiovascular disease. However, both MUFA and PUFA can lower cholesterol levels and reduce the risk of heart disease.

Some studies in India have suggested that edible oils such as mustard oil, olive oil and flaxseed oil are healthy options for consumption. Also, blending of oils in the right proportion such as rice bran with safflower oil, coconut and sesame oil, canola and flaxseed oil etc is another choice that can be useful to reduce the risk of heart diseases.

5.5.1. Health and awareness of edible oils

This section describes awareness regarding health and consumption of edible oil among urban and rural population of various states in different zones of India which are depicted in Table 5.12.a and 5.12.b.

In the north zone only 2% households of the Uttar Pradesh and 10% of the households in Haryana go for health check-up regularly as compared to the west zone, where 30% of households in Gujarat and 57% of households in Maharashtra go for regular health check-up. On the other hand, in the central zone, 48% of the households in Madhya Pradesh, in the north-western zone, 31% of Rajasthan, 39% of Tamil Nadu and 23% of West Bengal households go for health check-up regularly. It is also observed that more than two-fifth of the urban households in west, northwest, central and south zone and less than one fourth of the rural households regularly get health check-up.

It is also inferred that in the north zone, in Uttar Pradesh and Haryana, households reported to have health problem are 28% and 33%, respectively, with higher percentage of households in urban Uttar Pradesh (45%) and Haryana (37.7%). In west zone however, 20% of Gujarat and 23% of the Maharashtra households reported health problems. Also, 46% of the Madhya Pradesh of central zone, 28% of the Rajasthan of the north-west zone and 49% of the Tamil Nadu in the south zone households have the health problem. In the east zone, West Bengal has the highest number of households with health problems, that is, 57%.

Households reported to have blood pressure problems with 9% in Uttar Pradesh, 10% in Haryana, 10% in Maharashtra, 9% in Rajasthan, 27% in Tamil Nadu and 31% in West Bengal, as the main issue followed by diabetes. Further, Gujarat (14%) and Madhya Pradesh (18%) have reported heart problems and diabetes, respectively, as the major health problems in their households.

In the north and west zones, the doctor has asked 29% in Uttar Pradesh, 28% in Haryana, 21% in Gujarat and 30% in Maharashtra to reduce the oil consumption. In the north-west zone, 26% in Rajasthan and in the east zone, 40% in West Bengal have been advised to reduce the consumption of oil. These values are higher for households in the central zone, Madhya Pradesh (49%) and in the south zone Tamil Nadu (46%).

It has also been observed that households have a high awareness regarding excess use of edible oils. In the east zone, about 92% in West Bengal are aware that high consumption of edible oils is bad for health. This is followed by Rajasthan (87%) in the north-west zone. In the north zone, the awareness is present in 85% in Uttar Pradesh and 71% in Haryana. In the central zone, Madhya Pradesh (73%) and the south zone, Tamil Nadu (73%) also have high level of awareness. However, the figures are lower in the western zone, being 57% in Gujarat and 43% in Maharashtra.

Regarding the awareness of expiry date, weight, ingredients and nutritional benefits of the oil, it is found that most households have knowledge about this. The highest is in the central zone, in Madhya Pradesh (83%), followed by Uttar Pradesh (76%), Haryana (74%), Rajasthan (73%), Tamil Nadu (68%), Gujarat (66%), Maharashtra (56%), and West Bengal (42%). Further, awareness of nutritional benefits of edible oils is the highest in Madhya Pradesh (83%) and lowest in Uttar Pradesh (14%). Regarding knowledge about blended oil

among households, highest percentage is seen in Madhya Pradesh (52%) followed by Gujarat(46%), Tamil Nadu (40%) and Maharashtra (33%). The lowest is in West Bengal (15%), Rajasthan (12%), Uttar Pradesh (12%) and Haryana (10%)

Majority of the households have never changed their preferences for cooking oil in north – Uttar Pradesh (91%), Haryana (87%), in the west – Gujarat (80%) and Maharashtra (62%), north-west – Rajasthan (90%), south – Tamil Nadu (75%), east – West Bengal (56%) and central Madhya Pradesh (63%)

Majority of the households have very limited awareness about programmes related to production in the north, west and east zones, while 43% in Rajasthan from north-west, 31% in Madhya Pradesh from central and 20% in Tamil Nadu from south zones have such awareness programmes. Similarly, households have reported that there limited awareness programmes related to consumption of edible oils in the west and northwest zones, with none in north and east zone. They are mostly in Madhya Pradesh (21%) and Tamil Nadu (17%).

Table 5.12.a: Health impact and awareness regarding edible oil (in %)

Zone	Response	North						West					
		Uttar Pradesh			Haryana			Gujarat			Maharashtra		
		Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Heath check-up regularly	Yes	0	2	2	21	6	10	45	22	30	41	68	57
Health problem	Yes	45	23	28	38	31	33	22	19	20	22	24	23
Name disease	Diabetes	3	5	5	20	3	8	6	3	4	2	4	3
	Heart problems	5	4	4	7	3	4	21	9	14	2	3	3
	Liver problems	5	4	4	0	3	2	0	0	0	1	0	0
	BP problem	17	7	9	14	8	10	6	5	5	8	12	10
	Others	15	5	8	6	13	11	1	3	2	7	5	6
Doctor asked to minimise oil	Yes	45	24	29	40	23	28	32	21	25	29	30	30
Awareness:													
Excess oil bad	Yes	72	89	85	78	68	71	64	52	57	40	45	43
Awareness programme in area	Production	10	0	2	0	1	0	7	9	8	3	3	3
	Consumption	0	0	0	0	1	0	10	6	7	6	1	3
Nutritional benefits	Yes	23	11	14	79	65	69	75	60	65	40	43	42
Expiry date, weight and ingredients	Yes	70	77	76	83	71	74	79	57	66	50	59	56
Blend oil	Yes	13	12	12	19	6	10	62	36	46	26	38	33
Numberof times changed cooking oil	Half year	9	0	2	1	1	1	2	2	2	18	7	11
	One year	8	0	2	1	1	1	11	3	6	18	13	15
	Two-three year	14	3	5	25	5	11	17	9	12	8	15	12
	Never	69	97	91	72	93	87	69	87	80	58	65	62

Table 5.12.b: Health impact and awareness regarding edible oil (in %)

Zone		North-West			Central			South			East		
Item	Response	Rajasthan			Madhya Pradesh			Tamil Nadu			West Bengal		
		Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Health check-up regularly	Yes	74	17	31	51	46	48	55	22	39	30	19	23
Health problem	Yes	53	19	28	50	44	46	68	31	49	60	55	57
Name disease	Diabetes	17	5	8	19	17	18	14	11	12	19	17	18
	Heart problems	14	6	8	3	2	2	6	1	3	7	9	8
	Liver problems	2	2	2	0	0	0	0	1	0	10	5	7
	BP problem	19	6	9	17	14	15	38	17	27	33	30	31
	Others	0	0	0	26	20	22	14	13	13	17	20	19
Doctor asked to minimise oil	Yes	52	17	26	46	51	49	62	29	46	49	35	40
Awareness:													
Excess oil bad	Yes	98	82	87	75	72	73	89	57	73	97	89	92
Awareness programme in area	Production	20	51	43	35	28	31	30	10	20	0	0	0
	Consumption	0	2	2	40	8	21	33	1	17	0	0	0
Nutritional benefits	Yes	89	51	61	88	79	83	64	25	45	60	36	44
Expiry date, weight and ingredients	Yes	94	66	73	85	81	83	87	50	68	57	34	42
Blend oil	Yes	13	11	12	46	56	52	59	22	40	20	12	15
Number of times changed cooking oil	Half year	2	0	1	19	29	25	2	6	4	3	2	2
	One year	6	3	4	39	35	37	4	25	14	2	1	2
	Two-three year	14	3	6	39	29	33	6	7	6	10	7	8
	Never	77	94	90	31	30	30	88	62	75	60	54	56

5.5.2. Consumption of edible oils and ICMR recommendation

The Indian Council of Medical Research (ICMR) recommends edible oil consumption of 30g per person per day, i.e., 12kg per person per year. In this regard, assuming that the average size of a household is 4, then total consumption at household level should be 48kg per year. In this study, for the selected states, the per capita consumption of edible oil is 14.4 kg in a year, that is, 57.6kg per household per year. This value is higher than the recommended consumption of oil by ICMR. Higher consumption needs by households would mean increase in demand for edible oils, which would lead to increase in reliance on imports from other countries. Thus, there is a need for more awareness regarding optimum consumption of edible oils as excessive use of oils can lead to increase in risk of health problems in the long run and reduce import dependence.

5.5.3. Views of the households regarding edible oils

During the survey of the different states, households were asked about their views regarding edible oils and if they had any suggestions. Mostly households have awareness regarding consumption of edible oils. They have knowledge about impact of excess intake of oil and quality of oil. In their view, there should be more awareness regarding expiry date, ingredients and packaging as well as information about presence of adulteration in case of loose oils. Few have also suggested introduction of a quality index of edible oils. Some states have shown preference for oils in smaller packaging. Households have also suggested that cooking oils should be a part of public distribution system. Good quality of edible oils at a fair price should be provided. In rural areas, households reported that promotion of good quality of oilseeds, better irrigation and technology, soil testing and input subsidies as well as oil extraction machines, if installed by the government, would be beneficial for them.

Chapter 6

Demand and Supply Scenario of Edible oils in India

This section analyses the household demand and supply projection for edible oil in India on the basis of this study based on selected eight states of six zones of the country. Even though the domestic production of oilseeds and the domestic availability of oil is increasing, the increase in per capita consumption of edible oil in the nation has led to increase in imports of edible oil. As per the primary data collected, the per capita consumption rose by 7% in past five years. Looking at the demand and supply patterns in the country for the period of 7 years, it is evident that since 2012-13, the domestic demand of the edible oil rose by 26% from 19.82 MT in 2012-13 to 25 MT by 2019-20 (Table 6.1). The domestic supply, on the other hand, has also increased by 14% from 9.23 Mt in 2012-13 to 10.53 MT in 2019-20. However, the gap between demand and supply is more than 50% which is met through imports.

Table 6.1: Demand and Supply of vegetable oils in India over last 7 years

Year	Domestic demand	Domestic availability	Import	Import (%)	Qty. in million tonnes
					Value of import (Rs. in crore)
2012-13	19.82	9.23	10.81	54.54	53562
2013-14	21.06	10.08	10.98	52.14	44038
2014-15	21.71	8.95	12.71	58.54	64894
2015-16	24.04	9.19	14.85	61.77	68677
2016-17	24.75	10.75	14	56.57	73048
2017-18	25.74	10.38	15.36	58.43	74996
2018-19	25.92	10.35	15	57.87	68072
2019-20	25	10.53	14.46	57.8	68558

Source: Dept. of sugar and vegetable oils, DG, CI&S, Dept of Commerce,

The increase in demand is due to the rise in population, urbanization and increase in income and living standards as well as change in price of edible oils. The demand and supply projection of oil is necessary for proper planning of the future to reduce the gap between the future demand and supply. This section, thus, attempts to project the demand and supply of edible oils in India. The demand projection is carried out by using the primary data collected on eight states. This is done as the NSSO data related to consumption of edible oil in India is

available till the period of 2011-12. The per capita consumption of the surveyed states is used a proxy for all India per capita consumption in the period of 2019-20. The projections are worked out for different growth scenarios of the economy, including the growth rate, 7.3%, and higher growth rates.

As per the survey, the per capita consumption of edible oil for total population in 8 states is estimated as 14.4 kg/annum, which has been used in projecting the future requirement. The elasticity of total expenditure is estimated to be 0.59. The baseline GDP growth rate is assumed to be 7.3% per annum for the forecast period, that is, from 2022-23 to 2029-30. The high growth scenarios are worked out for 9% per annum and 10% per annum. The projected demand of edible oil in India is mentioned in Table 6.2. It can be observed that the per capita demand for edible oil is projected to increase to 14.9 kg/annum by 2022- 23 and to 19.5 kg/annum by 2029- 30 when the GDP growth rate is assumed to be 7.3%. The total demand for edible oil in India is estimated to increase to 20.7 MT by 2022-23 to 28.6 MT in 2029-30. The demand projections by NITI Aayog (2018) are based on the 2011-12 consumption data. As per the report, at 6% GDP growth rate, the demand of edible oil will be 22.73MT in 2028-29. However, at the GDP growth rate of 8%, the demand will be reach to 28.66MT in 2028-29.

Further, the supply projection of the edible oil is worked out using two approaches to estimate CAGR of production of oilseeds in India for the period of 2000-01 to 2019-20. The first approach is based on the procedure mentioned in equation (3.1). It is observed that during this period the area, production and yield of the oilseeds grew with the rate of 0.5 per cent, 2.7 per cent and 2.15 per cent, respectively. A norm of 28% of gross output was used for oil recovery rate from oilseeds. It is observed that the domestic supply of edible oil in 2022-23 is estimated to be 10.3 MT and 12.5 MT in 2029-30 when the economy is growing at 7.3% (Table 6.2).

Another technique used for supply estimation is parametric nonlinear growth models, via monomolecular, Gompertz and logistic models. The best fitted model is selected based on the minimum AIC value. The logistic model has the minimum AIC value (380.1594) as compared to monomolecular (380.3673) and Gompertz (380.2369) model. The growth rate of production of oilseeds from logistic growth model is estimated to be 3.18 per annum. It is observed that the domestic supply of edible oil in 2022-23 is estimated to be 10.5 MT and 13.1 MT in 2029-30.

Table 6.2: Demand and supply projections for edible oils in India

Year	Per capita consumption (kg/annum)	Total demand of edible oil (MT)	Total supply of edible oil (MT) (Approach I)	Total supply of edible oil (MT) (Approach II)
7.3% GDP (% p.a.)				
2022-23	14.9	20.7	10.3	10.5
2023-24	15.5	21.7	10.6	10.9
2024- 25	16.1	22.7	10.9	11.2
2025-26	16.7	23.8	11.2	11.6
2026-27	17.4	25.0	11.5	12.0
2027-28	18.1	26.1	11.8	12.3
2028-29	18.8	27.3	12.1	12.7
2029-30	19.5	28.6	12.5	13.1
9% GDP (% p.a.)				
2022-23	15.1	20.9	10.3	10.5
2023-24	15.8	22.1	10.6	10.9
2024- 25	16.6	23.4	10.9	11.2
2025-26	17.3	24.7	11.2	11.6
2026-27	18.3	26.2	11.5	12.0
2027-28	19.1	27.6	11.8	12.3
2028-29	20.1	29.2	12.1	12.7
2029-30	21.1	30.8	12.5	13.1
10% GDP (% p.a.)				
2022-23	15.2	21.0	10.3	10.5
2023-24	16.0	22.4	10.6	10.9
2024- 25	16.8	23.8	10.9	11.2
2025-26	17.7	25.3	11.2	11.6
2026-27	18.8	26.9	11.5	12.0
2027-28	19.8	28.6	11.8	12.3
2028-29	20.9	30.4	12.1	12.7
2029-30	22.0	32.2	12.5	13.1

Chapter 7

Policies regarding Edible Oils

India is one of the major producer and importer of edible oils in the world. India's vegetable oil economy is fourth largest after USA, China and Brazil. Various policy decisions have been taken by the government over the years. In 1986 government of India established the Technological Mission on Oilseeds and Pulses (TMOP). Following this, the production of India's oilseeds surpassed the target of 18MT. India changed its status from net importer in the 1980s to a net exporter during 1989-90. The highest production achieved was 24.75 MT during 1994-95 against 11MT in 1986-87. In the mid-1990s, liberalisation of import of edible oils took place in a phased manner and import of palmolein was placed under Open General License (OGL) subject to 65% import duty. As a result, substantial part of the domestic demand was met by imports. Before this, edible oil was on the negative list of imports. During the early 2000s, import of other edible oils were also placed under OGL, with the import duty of 80% and 90% being imposed on crude oil and refined edible oils, respectively. Further, these import duties were reduced to zero percent for crude oils and 7.5% for refined oils, beginning April 2008.

Self-sufficiency in oil seeds and edible oils is a major goal for India. This was attained through "Yellow Revolution" during early 1990s; however, it could not be sustained beyond a certain period as country began to depend on imports to meet domestic needs since late 90s. Thus, in order to gain self-sufficiency and reduce the imports, the National Food Security Mission (NFSM) was introduced to enhance the production of oilseeds in the Country. The scheme is being implemented with the objective to increase the availability of vegetable oils and to reduce the import of edible oils by increasing the production and productivity of oilseeds. The interventions under NFSM (Oilseeds) are in the area of seeds, fertilizers, farm implements and technology along with training of farmers, training of officers/ extension workers etc.

A support scheme known as Pradhan Mantri AnnadataAaySanrakshan Abhiyan (PMAASHA), announced in 2018, intends to provide remunerative returns to farmers for their crops via a Price Support Scheme which involves physical procurement of pulses, oilseeds, and copra by central government agencies, Price Deficiency Payment Scheme to cover all oilseeds for which MSP is notified and farmers will get direct payments when the

sales price is below the MSP and Private Procurement and Stockist Scheme where Private sector participates in procurement operations.

In order to limit dependence on imports of import oil, the government has announced a policy related to palm oil production, called National Edible Oil Mission-Oil Palm (NMEO-OP). The aim is to achieve self-reliance in edible oils and involves investment of over Rs. 11,000 crores. The main purpose of the scheme is to control domestic edible oil prices affected by expensive palm oil imports and to raise the domestic production to 11 lakh MT by 2025-26. This will be done by raising the area under oil palm cultivation to 10 lakh hectares by 2025-26 and 16.7 lakh hectares by 2029-30. The focus will be given to the north-eastern states and the Andaman and Nicobar Islands, since they have the necessary weather conditions in the regions. Under the scheme, oil palm farmers will be provided financial assistance and will get remuneration under a price and viability formula.

Another policy used by the government is the announcement of Minimum Support Price (MSP) before sowing in both rabi and kharif seasons. From time to time, a higher MSP is set to encourage farmers and increase production. A higher MSP will ensure that the farmer receives an assured price for his produce and it will also increase the income and purchase power. For the 2022-23 kharif marketing season, the MSP of Soyabean is Rs 4,300 per quintal, Sunflower is Rs 6,400 per quintal, Groundnut is Rs 5,850 per quintal, Sesamum is Rs 7830 per quintal and nigerseed is Rs 7287 per quintal. The percentage change for these crops over the 2021-22 prices, is 8.86%, 6.40%, 5.41%, 7.16% and 5.15% respectively. For 2023-24 rabi marketing season, the MSP of Rapeseed-Mustard is Rs 5450 per quintal and Safflower is Rs 5650 per quintal. The percentage change for the two crops over the year 2021-22 prices is 7.92% and 3.84%, respectively.

Chapter 8

Conclusion

India is agriculturally and geographically a diverse country where various types of oilseeds are cultivated in different regions and have specific preference for edible oils. Thus, it is important to understand the trends and patterns of production and consumption of different edible oils. India is the one of largest producer of oilseeds after USA, China and Brazil. It is also a major importer of edible oils and it accounted 17.4% of the world imports during 2020-21. As per second advance estimates for 2022-23, the estimated production of oilseeds is 40 million tonnes, this is higher than the production of 37.95 million tonnes during 2021-22. Out of the nine oilseeds cultivated in India, share of soyabean is the highest in terms of area, followed by rapeseed and mustard and groundnut during 2019-20. In terms of production, soyabean has the largest share, followed by groundnut and rapeseed and mustard. However, groundnut has the highest share in yield.

The relationship between domestic and international prices of oilseeds is studied and there exists a weak correlation between the two. The highest figure of 0.4 is for soyabean, followed by rapeseed and mustard, 0.11, sunflower and groundnut having the same correlation of 0.09. Domestic wholesale price of soyabean has remained higher than the international price during the period 2013-2020. The gap between the two widened from 2019. It is found that international price of soyabean is less volatile than soyabean meal.

The monthly per capita consumption of mustard oil is the highest in the households in the north zone – Uttar Pradesh and Haryana. Similarly, in the west zone, in Gujarat, mainly groundnut oil is consumed followed by cotton oil and in Maharashtra it is soyabean. In Rajasthan of the north-west zone, mustard is the most consumed oil. In central zone, Madhya Pradesh per capita consumption per month is highest for mustard, followed by soyabean. In Tamil Nadu of the south zone, sunflower oil is highly consumed, with coconut oil being a second choice. In the east zone, West Bengal mustard oil has the highest per capita consumption in a month. An interesting finding has been that, in some states, oilseeds that are cultivated are also consumed. In case of the state of Gujarat, groundnut and cotton are the two most grown crops, soyabean is dominantly grown in Maharashtra and Madhya Pradesh. Thus, there is a strong relationship between production and consumption.

Income is not a strong determinant when choosing the quantity of edible oil to be consumed per month. In most states, consumption of edible oils remains below 5 litres per month, except in case of Uttar Pradesh, in the north zone, where the consumption is in the range of 5 to 10 litres per month for households belonging to lower income group. Preference for branded oil exists, especially for Fortune in different zones of India, except in rural Uttar Pradesh, Madhya Pradesh and Maharashtra and Gujarat. Mostly oils are purchased from the local store, however, in urban Gujarat, Rajasthan and Tamil Nadu high percentage of households purchase oils from the supermarket. Apart from this, some households also purchase from ration shops. In rural Haryana, there is also a small percentage of households that produce oils themselves.

Apart from edible oil, most households consume additional fats like ghee and butter. LPG is the main medium of cooking in the households except in states of rural Haryana and Madhya Pradesh, where cow dung and firewood are still the most utilised medium of cooking. The high coverage of LPG gas in rural and urban India can be attributed to the efforts by government under 'Pradhan Mantri Ujjawala Yojna (PMUY)', which targeted to release LPG connections to the deprived households in India. However, more efforts are required in rural areas as it is not good for health in the long run.

Maximum number of households are aware that excess oil consumption is harmful for health. In the east zone, about 92% in West Bengal are aware that high consumption of edible oils is bad for health. Overall, more than one fourth of the households are advised by the doctor to reduce their oil intake, especially in urban areas. Households have also shown awareness for expiry date, weight and ingredients of edible oil. Awareness of nutritional benefits of edible oils is the highest in Madhya Pradesh (83%) and lowest in Uttar Pradesh (14%). Knowledge about existence of blended oil is very low for north, northwest and east zone. The awareness programmes of production and consumption is very limited in both urban and rural areas. Blended oil combines the potency of two edible oils and offers a balance of fatty acids (Upadya et al, 2015). Thus, the awareness programmes are needed to educate the people about the quantity and healthy use of oil, blend oil, regular changing of cooking oil and regular health check-up.

The ICMR recommends edible oil consumption of 30g per person per day, i.e., 12kg per person per year. For the selected states, the per capita consumption of edible oil is 14.4 kg in a year, that is, 57.6kg per household per year. This value is higher than the recommended

value. Increase in demand for edible oils would lead to increase in reliance on imports from other countries. From the projected figures calculated for demand and supply of edible oils, it can be said that the supply of edible oils is increasing, but it is not able to keep in pace the growing demand of edible oils in case of present (7.3%) and higher growth rate scenarios. Though various government policies have been undertaken to meet the growing demand, but there is also need for awareness regarding optimum consumption of edible oils in order to reduce import dependence and lower the gap between demand and supply.

From the study it is found out that consumption of edible oils is mostly dependent on the production in the respective states. Therefore, there is a need to increase production of oilseeds by expanding the area under oilseed cultivation. Farmers should be encouraged to diversify their cropping patterns to include oilseeds. Access to low-cost technologies and distribution of high yield variety of seeds can help with increasing productivity as well as generate higher income for farmers. Increase in area under oilseed can boost production and thereby reduce the dependency on imports and help in achieving self-sufficiency.

Further, awareness programs among farmers to adopt new technology and financial assistance for purchase of seeds, farm equipment and other inputs would also be useful. As many households consume loose edible oil purchased from local shops, distribution of edible oil through public distribution system (PDS) can help to ensure reduction in adulteration both rural and urban areas.

This study mainly focuses on consumption of edible oil at household level. However, there is also consumption of edible oil by industries producing processed food and other items that use it as an ingredient. This needs to be studied to give a clearer picture of the total demand of edible oil in the nation. Further edible oil consumed by households through such processed food cannot be quantified but have various health implications. It is observed that the household's per capita consumption is higher than the recommended consumption by ICMR. Thus, more awareness programmes for consumer are highly recommended for health benefits. Use of blended oil and frequently changing the oil should be encouraged.

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Reviewers' comments on Draft Report and Action taken

CONSUMPTION PATTERN OF DIFFERENT EDIBLE OILS IN INDIA

Submitted by: AER Unit, IEG Delhi

Abbreviations: LT - abbreviation Lakh tonnes should be included.

Reponse: Abbreviation have included in the list.

Abstract: The content is concise.

Introduction: The introduction part clearly states about the status and importance of oil seeds in India. It is well narrated but the author has to cite references to his/her statement. The author has to update the recent statistics of oil seeds production. As per the Directorate of Economics and Statistics (First Advance Estimates of Production of Oilseeds and Commercial Crops for 2022-23) indicates that India's oil seeds production was 35.946 MT during 2020-21. Researchers may replace the fourth advance estimate of 2021-22 (31.20 MT) or first advance estimates of 2022-23 (34.19 MT).

Reponse: The relevant references in the introduction and the estimates of Production have been updated.

Review of Literature: The author has an extensive literature review on the trend pattern of edible oils, consumer behaviour in choice of brands and the health implications of edible oil products. The Author may present it under sub-headings and present it in chronological order.

Reponse: The subheadings have been added.

Methodology: The methodology part includes the main objective of the study as “to understand the present consumption pattern of edible oil of rural and urban population of India”. It is good to stick to the objectives of the study. Both primary and secondary data was used in this study. Compound annual growth rate, logistic regression and behaviouristic approaches were adopted in this study.

Page number	Particulars
9	The reference year has to be mentioned for the percentage share of oil seeds production.
15	Equation 3.2, change log to ln (natural logarithm) In variable description mention the units of area, production,

	productivity and time.
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Reponse: The mentioned changes have been incorporated.

Results & Discussion

The author has analysed well, but failed to substantiate his/her results. An author may find reasons and substantiate his/her results by citing relevant studies.

Page number	Particulars
25	Table 4.12, percentage share of oil seeds for yield is meaningless and remove it from the table and discussion part.
27	Table 4.13, remove the yield share column from the table. For area and production you will total 100 % but you won't get it for yield.
28	Figure 4.4 a&b, Better change the line graph's built-in type into different symbols (when you're printing it in mono-colour it will, be helpful to differentiate the variables)
30	Table 4.14, mention the unit of growth rate
36	Table 4.17, remove the percentage share of yield
45	Figure 4.9, instead of plotting imported values, author may plot deflated import price with import quantity
49	Figure 4.13,4.14 and 4.15, whether MSP, domestic price and international prices are deflated or not?
53	Table 4.28, mention about the significant percentage along with the correlation co-efficient
72	Table 5.1 a&b, t-test may be performed for socio-economic variables of the household
75,77,78,79,80 and 81	Figure 5.3 to 5.8, fill with patterns instead of colours
78	Kindly mention on what basis you have classified them as BPL The reference period for food and non-food consumption is missing (whether the reference period is 30 days or 365 days)
95 and 96	Table 5.4 a&b, Ranking preference is not clear

118	Took logistic regression to the methodology part
122	Table 5.9 a&b, put star symbols to beta values, not to the probability value Change the significant codes as given below
122 and 123	Put stars to beta coefficients not to probability value Change the significant codes *** indicates 1% significant (p value ≤ 0.01) ** indicates 5% significant (p value > 0.01 to ≤ 0.05) NS indicates Not significant (p value > 0.05) It is not necessary to discuss about the variables which are significant @10%
134	To forecast the demand and supply of edible oils in India, author has adopted a behavioural and CAGR approach, but these are all linear and inferior. The author may adopt some advanced statistical approach for this projection.

Reponse:

The necessary changes have been made as per the reviewer's comments. Changes in tables and text as well as the patterns (figures 5.3 to 5.8) have been updated as per suggestions.

To forecast the supply, we have added the non-linear model (Logistic growth model by eliminating Gompertz and monomolecular growth models).

Conclusion and policy recommendations

The author has to recommend policy based on his/her research study. Policies should be specific and not general.

Reponse: Kindly refer to Chapter 8.

References

Relevant and well organized.

Figures & Tables

The figures and tables fitted well. They are clear and well defined.

Language

Simple and easy to understand for common reader.

Overall view on acceptability of report

Authors are requested to incorporate all the comments and submit the final report to the Ministry.

Reponse: We appreciate the reviewer's comments from ISEC, Bengaluru.