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Consumption Pattern of Different Edible Oils in West Bengal

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Preface

The present study, titled ***"Consumption Pattern of Different Edible Oils in West Bengal"***, is a part of an All-India coordinated Study of the approved work plan for 2021–2022, which was undertaken at the instance of the Directorate of Economics and Statistics, Ministry of Agriculture & Farmers Welfare, Government of India, New Delhi. The task of coordination has been entrusted to the Institute of Economic Growth (IEG), University of Delhi, Delhi.

Edible oils hold significant importance in the dietary practices of Indian households, functioning as both a nutritional cornerstone and a cultural element. India's edible oil economy is suffering from persistent demand-supply asymmetries and price volatility. Although with over half of domestic requirements met through imports, India is the fourth largest vegetable oil producer next to the USA, China and Brazil. With this backdrop, the present study addresses two critical facets, i.e., the consumption pattern of edible oils and the production scenario of oilseeds across the rural-urban setup of diverse districts and agroclimatic zones in the state of West Bengal in India. Based on the primary data from 500 households across five geographically diversified districts, i.e., Darjeeling, Dakshin Dinajpur, Nadia, Paschim Barddhaman, and Purba Medinipur, this study examines the edible oil consumption pattern across different socio-economic profiles of the households, rural-urban divides in consumption volume, and changing dietary trends over time. Further, based on secondary data, this study explores the production scenario of oilseed in the state.

Findings highlight that mustard oil remains the preferred staple; however, total consumption varies across different socio-economic profiles of the households. Per capita consumption differs notably by district and rural-urban setup. On the production side, although districts like Murshidabad and Nadia perform strongly in terms of oilseed output, yield disparities remain stark across zones, suggesting underutilized production potential.

The study conducted by the research team led by Dr. Sreejit Roy and Mr. Kunal Saha merits recognition. The project was implemented under the supervision of Prof. Bidhan Chandra Roy, former Director (2018-2022), and was efficiently accomplished under the guidance of Prof. Debasis Bhattacharya, former Director (2022-2025), whose contributions are gratefully acknowledged. The effort of Dr. Achiransu Acharyya, Deputy Director, in reviewing this research report is appreciated. The earnest assistance and services provided by our Centre's administrative and support staff have aided in the conduct of this research. We gratefully acknowledge the insightful feedback provided by Prof. Sanjay Kumar Jha, Director (Hony.), AERC, TMBU, that enriched the quality of this report.

Our gratitude to Dr. Probir Kumar Ghosh, Hon'ble Vice Chancellor, Visva-Bharati, for his keen interest and insightful advice. We acknowledge the support and valuable guidance of Dr. Promodita Sathish, Adviser (AER Division), Ministry of Agriculture & Farmers Welfare, Government of India, New Delhi, in the completion of the study. The support of other officials in the Ministry is also invaluable to us in undertaking this research.

Most importantly, we sincerely thank all the respondents who spared their valuable time. We thank one and all who directly and indirectly supported this research.

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Executive Summary

Background

Edible oils are a vital component of Indian cuisine and a crucial source of dietary fats. India, being one of the world's largest producers and consumers of vegetable oil, faces a significant disparity between oilseed production and domestic demand, leading to substantial imports. The government has implemented various measures to boost production, including modernizing the National Food Security Mission (NFSM) and promoting the cultivation of oil palm. Despite these efforts, agricultural productivity remains low compared to that of the other developing economies; however, the demand for edible oils continues to rise due to population growth and changing dietary habits. Addressing this demand-supply imbalance is essential for achieving self-sufficiency in edible oils and ensuring food security in India. This study focuses on West Bengal, a state that has shown commendable growth in the area and production of oilseeds, yet faces challenges in enhancing yield rates. Understanding both the demand and supply side scenarios of edible oil in West Bengal is crucial for effective planning and production strategies.

Objectives of the Study

With the aforementioned background this study has been taken up to understand the consumption pattern of different edible oils and simultaneously aimed to examine the scenario of oilseed production in the different regions of West Bengal. The specific objectives of the present study are

1. To compare rural and urban preferences and consumption levels of the different types of edible oil in West Bengal
2. To understand the preferences and consumption level of the different types of edible oil with respect to the socio-economic status of the households in West Bengal
3. To analyze the trends in the consumption pattern of different edible oils in West Bengal
4. To examine the present scenario regarding the production of oilseed in West Bengal

Study Design

This study focuses on the edible oil sector of West Bengal, employing a mixed-method approach that integrates primary and secondary data to provide comprehensive insights. The research investigates both consumption patterns and production dynamics, with a targeted survey of 500 households distributed across five representative districts—Darjeeling, Dakshin Dinajpur, Nadia, Paschim Barddhaman, and Purba Medinipur. These districts were strategically selected to ensure coverage of the state's diverse agro-climatic zones and socio-economic status. The multistage random sampling framework encompassing six stages, ensuring a robust representation of rural and urban populations, has been concidered. One district was randomly selected from each of West Bengal's five administrative divisions, with further subdivision sampling tailored to each district's structure. Blocks and municipalities were chosen to distinguish rural and urban settlements, reflecting their population shares. Gram Panchayats, villages, and households were selected one after another randomly to achieve a balanced representation, of all possible variations in the units selected. Each district contributed an equal number of households (100), proportionally divided into rural and urban samples based on the demographic data.

Major Findings of the Study

- Edible Oil Consumption Patterns
  - Mustard oil dominates household preferences, and the other oils, viz., soybean, sunflower, and rice-bran oil follow. Urban areas generally consume more edible oil than rural regions.
  - Socioeconomic factors such as family size, income, and educational status influence consumption preferences.
  - District-specific variations exist, with Darjeeling leading in annual per capita consumption and Paschim Medinipur excelling in rice-bran oil adoption.
- Oilseed Production Trends
  - West Bengal has outperformed the national average in oilseed area and production growth, but yield rates remain a concern.
  - Murshidabad, Nadia, and Paschim Medinipur are prominent contributors to oilseed cultivation, while Purba Medinipur leads in yield.
  - Rapeseed & mustard dominate production, but groundnut offers the highest yield per hectare.
  - The Gangetic Alluvial Zone contributes the largest share to oilseed cultivation but struggles with yield rates.
  - Specific districts and agroclimatic zones excel in certain crops, highlighting the need for tailored regional strategies.

Policy Recommendation

- Addressing Consumption Inequalities
  - Launch educational campaigns and collaborate with NGOs to promote diverse and healthier oil consumption.
  - Enhance rural distribution networks and introduce subsidized pricing mechanisms for low-income households.
- Strengthening Agricultural Productivity
  - Invest in crop research for high-yield, drought-resistant varieties.
  - Provide financial incentives such as subsidies for eco-friendly inputs and crop insurance schemes.
- Optimizing Production and Supply Chains
  - Develop infrastructure for oilseed processing and storage to reduce post-harvest losses.
  - Facilitate market integration and adopt advanced technologies like AI for supply chain efficiency.
- Sustainable Agricultural Practices
  - Promote crop rotation, organic farming, and agroforestry to enhance soil health and build climate resilience.
  - Expand cultivation in underutilized high-potential zones, ensuring sustainable practices.
- Institutional Reforms
  - Foster public-private partnerships and strengthen farmer cooperatives.
  - Implement regulatory measures like Minimum Support Prices (MSP) and import controls to stabilize markets.

Conclusion

This study underscores the importance of a holistic, integrated approach to addressing challenges in edible oil consumption and production. By implementing these recommendations, West Bengal can enhance its agricultural efficiency, empower rural communities, and establish itself as a major contributor to the edible oil sector of India.

Chapter – I
Introduction

1.1 Background of the Study

Edible oils, an integral part of Indian cuisine, are significant sources of dietary fats, which are essential to meet the nutritional needs of the human body. In India, nine oilseed varieties are grown in various regions depending on the distinct agro-climatic conditions (NAAS, 2022). Hence, the choices for edible oil vary across the nation (Govindaraj & Suryaprakash, 2013). Due to the rapid increase in population and continuous urbanization, it is also anticipated that the consumption of vegetable oil in India will remain high[1].

India is one of the major producers of oilseeds and simultaneously the world's second-largest consumer of vegetable oil. There is almost a 43 per cent rise in oilseed production in 2020-21 compared to the production in 2015-16. However, the amount of oilseed produced in the economy is inadequate to meet the domestic demand for edible oil. This disparity between production and consumption calls for a significant importation of edible oil. As a consequence, India is currently the world's top importer of vegetable oil[1].

The government has been taking many steps to increase the production of edible oil because India imports a sizeable volume of edible oils (almost 56 per cent of the domestic requirement) and is therefore susceptible to fluctuations in global prices. Because of the marginal size of the land and the heavy reliance on rainfall for agriculture in India, the output of oilseeds has been stagnant over the past several years. In order to increase the country's production of oilseeds, the Department of Agriculture, Cooperation and Farmers' Welfare is taking necessary actions. It aims to modernize the NFSM through the NFSM Oilseeds and Oil Palm scheme in order to boost the output and productivity of oil seeds and area expansion for oil palm. In addition, The Department of Food & Public Distribution is taking crucial measures to increase the production of Rice Bran oil[2].

Indian agriculture has experienced a significant increase in productivity as a result of the introduction of high-yielding variety (HYV) seeds. However, not all of the crops have

[1] Economic Survey 2021-22, Govt. of India
[2] Annual Report 2020-21, Department of Food & Public Distribution (Ministry of Consumer Affairs, Food & Public Distribution)

experienced increased output. In contrast to cereals, productivity increase was slower for horticulture crops, oilseeds, pulses, and nutri-cereals. Agricultural productivity in India, however, is far lower than in many other developing market economies (Mukherjee et al., 2022).

The demand-supply imbalance of edible oils in India's domestic market is caused not only by supply-side factors but also by the increasing demand for edible oils. In India, the average annual per capita consumption of edible oil has increased massively from 3.8 kg in 1980–1981 to 19.2 kg in 2019–20, which is further expected to increase due to population growth, rapid urbanization, change in food habits and so on.

Considering the expected rise in demand for edible oils in the domestic market, policymakers are concerned about bringing India closer to self-sufficiency in edible oils, which is directly dependent on oilseed production within the country. Therefore, it is crucial to concentrate on the rise in oilseed output. Due to the competing demands on agricultural land placed by varied crops, increasing productivity is required to enhance oilseed production.

1.2 Relevance of the Study

According to the data[3] published by the Reserve Bank of India (RBI), West Bengal has consistently ranked among the top five Indian states in terms of the net value added (NVA) to the economy by agriculture from 2004–2005 to 2020–2021. From 2013-14 to 2020-21, Madhya Pradesh, Uttar Pradesh, Maharashtra, West Bengal, and Gujarat constantly recorded the highest NVA to the Indian economy by agriculture. Among these five states, West Bengal has the highest compound annual growth rate (CAGR) of the area under cultivation for oilseeds from 2010–2011 to 2019–2020, at 4.03 per cent and also has the highest CAGR of the production of oilseeds, at 4.16 per cent.

Unfortunately, West Bengal has a relatively poor CAGR of per hectare oilseed production over the same time period, at only 0.13 per cent (see Annexure 1: Table A1.1). Thus, it is important to understand both the demand and supply side scenarios of edible oil in West Bengal. An understanding of the consumption pattern of various edible oils in West Bengal will be helpful for the proper planning of production.

[3] https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=21418

1.3 Objectives of the Study

With the aforementioned background, this study has been taken up to understand the consumption pattern of different edible oils and simultaneously aimed to examine the scenario of oilseed production in the different regions of West Bengal. The specific objectives of the present study are

1. To compare rural and urban preferences and consumption levels of different types of edible oils in West Bengal
2. To understand the preferences and consumption level of different types of edible oils with respect to the socio-economic status of the households in West Bengal
3. To analyze the trends in the consumption pattern of different edible oils in West Bengal
4. To examine the present scenario regarding the production of oilseed in West Bengal

1.4 Review of Literature

The nutritional importance of edible oil has been advocated by ample literature (Čabarkapa-Pirković et al., 2021; Mandal et al., 2018; Savva & Kafatos, 2016; Zhao et al., 2021; Zhou et al., 2020). In India, several oilseed varieties have been grown in various regions depending on distinct agro-climatic conditions. However, the high reliance on rainfed agriculture causes the poor and inconsistent yield of the oilseed crops and the uncertainty of returns on investment. The increase in domestic oilseed output has not been sufficient to keep up with the country's rising demand. Vegetable oils and fats have seen a sharp increase in domestic demand, with a yearly growth rate of 6 per cent. Domestic output, meanwhile, has only been growing at a rate of roughly 2 per cent annually (Kumar & Tiwari, 2020).

The increasing demand for edible oil and lack of adequate production resulted in a massive import of edible oil (Sundaramoorthy et al., 2014). Since the 1980s, the country's export-import scenario for edible oils has seen significant changes. In spite of being the net importer in the 1980s, India switched to being the net exporter in 1989–1990. In a while, it was unable to retain the position and, during 1997 - 1998, it once more reverted to being a net importer. Yet again, the oilseed sector experienced net foreign exchange earnings in 2007–2008; however, this success was short-lived (Hegde, 2012).

In India, oilseed production is estimated to increase from 359.45 lakh metric tonnes in 2020–21 to 376.97 lakh metric tonnes in 2021–22. Compared to 111.51 lakh metric tonnes in 2020–21, the estimated total availability of edible oils from all domestic sources for 2021–22 is

115.71 lakh metric tonnes. Imports are used to bridge the approximately 55% supply-demand mismatch in the country (DFPD, 2023). During the oil year 2020-21 (November 2020-October 2021), India’s imports of edible oils have been the lowest in the last six years. However, in terms of value, it has increased by 63.5 per cent in 2020-21 compared to 2019-20, reflecting the rise in international prices of edible oils (GOI, 2022).

In India, approximately more than two-thirds of the population lives in rural areas. Edible oils, which are an important source of essential fat, are generally out of reach for poor rural people (Aneeja, 2001). The rural poor may therefore find it difficult to meet their nutritional requirements if domestic edible oil prices are unstable. Apart from the availability of edible oils domestically, the expansion of the area under oilseed production, instability in the production and productivity of oilseeds, and the change in domestic demand for edible oils, the instability of domestic prices of edible oils may also be affected by the linkages with international markets (Lijo et al., 2013). Thus, in order to control the instability of domestic prices of edible oils, the dependency on international markets should be reduced, which in turn requires an increase in oilseed production.

India has consistently kept an important position as one of the largest oilseed producers in the world. In parallel, India's varied agro-climate favours the growth of a variety of oilseed crops. A study in 2009 showed that India accounts for about 12–15% of the world's total oilseed area and produces 7-8% of the world's total oilseed output (Hegde, 2009). However, compared to other nations, India's average yield for most oilseeds is very poor. The area and production of oilseeds are concentrated in the Central and Southern parts of India, mainly in the states of Madhya Pradesh, Rajasthan, Maharashtra, Gujarat, Andhra Pradesh and Karnataka (Kumar & Tiwari, 2020).

Rathore et al. (2019) claimed that due to the poor use of efficient management techniques, the productivity of most of the oilseed crops produced in India is considerably less than expected. Apart from low productivity, the shortage of edible oil on the domestic market is stated to be a result of increased edible oil consumption (>50.0 g/capita/day), which is higher than the WHO/ICMR recommendation (>30.0 g/capita/day). Accordingly, the study emphasizes the need to expand the area under oilseed cultivation and to address various abiotic and biotic threats in kharif and rabi oilseed crops, which calls for the successful implementation of oilseed-based crop diversification strategies and expansion of the area under the fallow system.

However, Hegde (2012) asserted that there is limited potential to bring additional land under oilseeds. Hence, future increases in oilseed production will require the use of land-saving technologies, particularly a combination of high-yielding varieties, balanced and integrated crop nutrition, effective crop management, protective irrigation, integrated pest management, and selective farm mechanization. In a similar vein, Yadav et al. (2022) recommended mapping promising districts and prominently exhibiting available technology in order to narrow down the demand-supply gap for edible oil domestically by boosting the productivity of oilseed.

In India, West Bengal's diverse agro-climatic conditions are also conducive to the growth of all nine oilseeds, viz., groundnut, rapeseed-mustard, soybean, sunflower, sesame, safflower, niger, castor, and linseed. Although rapeseed-mustard alone contributed 53% of the state's total oilseed production in 2008–09, the other main oilseed crops cultivated in the state include groundnut, sesame, and sunflower (Dutta, 2014). West Bengal has shown a consistent expansion in oilseed output, area, and yield rate since the 1960s. Particularly during the 1970s, there was a significant increase in the area and production of oilseeds, where the area under oilseeds more than doubled and production increased by nearly four times (Roy & Khan, 2013).

According to Singh et al. (2013), West Bengal had the highest area under oilseed production (0.63 Mha), highest oilseed output (0.73 Mt), and highest productivity (1158.7 kg/ha) among the states of Eastern India (i.e., Assam, Bihar, Chhattisgarh, Jharkhand, Odisha, and the eastern part of Uttar Pradesh) in the year 2010-2011. However, the same study predicted that West Bengal will have relatively poor growth in oilseed productivity among all the states in Eastern India by the year 2050–2051.

The potential of improvised production technology in West Bengal was evaluated through a ten-year study of front-line demonstrations on rapeseed & mustard (Dutta, 2016). The study found that productivity may be greatly increased with more sophisticated technology. Additionally, improved cultivation techniques, the ideal time to sow, integrated irrigation and fertilizer management, and the adoption of seed treatment practices can all help farmers make additional revenue from oilseed cultivation. It is important to note that the study calls for increasing the state's as well as the nation's overall oilseed production through improved technologies without expanding the area under these crops.

From the rationale provided above, it can be concluded that a reduction in reliance on foreign markets, which in turn necessitates an increase in oilseed output, is necessary to regulate the volatility of domestic edible oil prices. The increase in output through the expansion of the area under oilseed production has serious limitations. Thus, it is important to mark the potential states and districts so that the district-specific measures can be taken to increase the productivity of oilseeds. In a similar vein, it is seen that West Bengal has the potential to contribute significantly to the oilseed production of the country. Which in turn might be helpful to reduce the demand-supply gap of edible oil in the domestic market. However, predictions about the oilseed productivity for West Bengal reflect the need for greater emphasis and effective governmental initiatives in this area. Hence, it is important to understand the present scenario of oilseed production and edible oil consumption within the state.

1.5 Sampling and Spatial Coverage of the Study

This study is exclusively focused on the Indian state of West Bengal. A combination of both

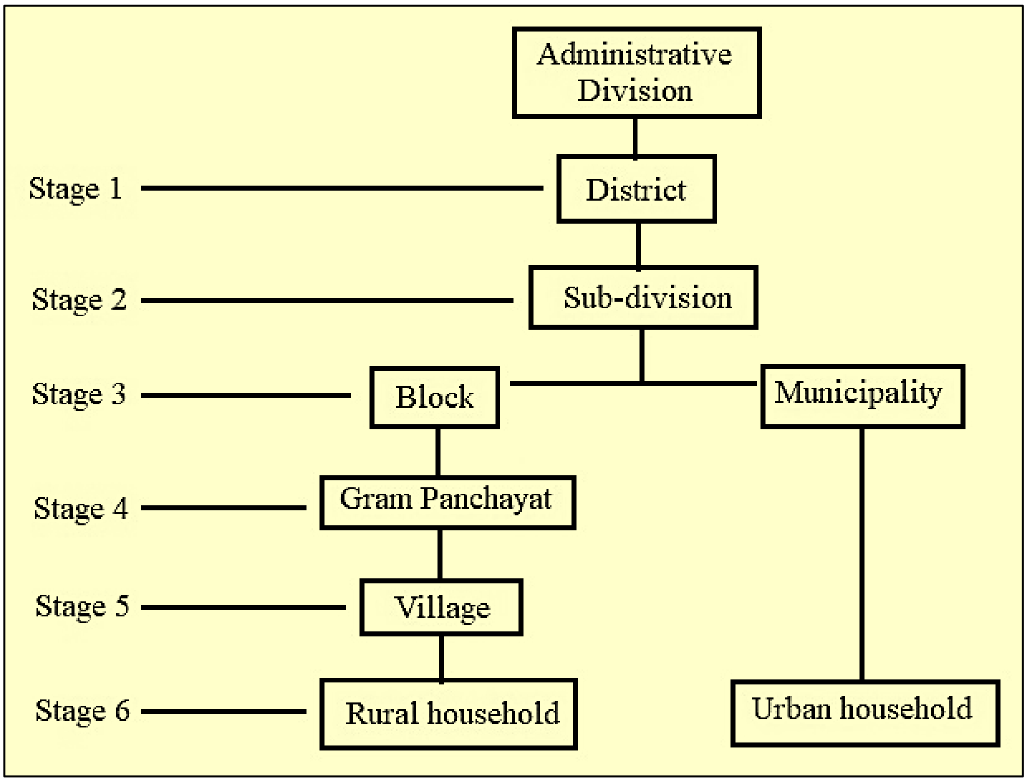

Figure 1.1: Stages of sample selection

primary and secondary data are used in order to fulfil the objectives of the study. For the primary data, a total of 500 households were chosen in rural and urban areas using a multistage random sampling method. The selection of the household was made through six stages that are depicted in the following figure.

It is seen in the above figure (Figure 1.1) that the sample districts and sub-divisions were selected in the 1st and 2nd stages, respectively. After that, in order to choose rural and urban samples, blocks and municipalities were selected respectively in the 3rd stage. The 4th and 5th stage is only focused on the selection of the rural samples. Finally, in the 6th stage, sample households from the rural and urban areas were selected. All the stages, as seen in the above figure, are explained in the following sections.

Stage 1 & 2: Selection of Districts and Sub-divisions

West Bengal is divided into five administrative divisions. All the districts of West Bengal are under the territorial jurisdiction of these divisions. This study covers all the administrative divisions of West Bengal. The following table shows the list of five divisions as well as the names of the districts under these divisions.

Table 1.1: Administrative divisions and districts of West Bengal

Sl.	Name of the Division	Districts under the Division
1.	Presidency Division	North 24 Parganas, South 24 Parganas, Howrah, Nadia
2	Burdwan Division	Burdwan, Hooghly, Birbhum
3.	Midnapore Division	Purba Medinipur, Paschim Medinipur, Bankura, Purulia
4.	Malda Division	Murshidabad, Malda, Uttar Dinajpur, Dakshin Dinajpur
5.	Jalpaiguri Division	Darjeeling, Alipurduar, Jalpaiguri, Coochbehar

Source: The Kolkata Gazette[4]

In the first quarter of 2017, three existing districts—Darjeeling, Paschim Medinipur, and Barddhaman—were further broken down into three new districts, namely Kalimpong, Jhargram, and Paschim Barddhaman respectively. By splitting the Darjeeling district, the 21st district, Kalimpong[5], was created on 14th February 2017. After that, on 4th April 2017, the 22nd district of West Bengal, Jhargram,[6] was formed by splitting the Paschim Medinipur district. Again, on 7th April 2017, by splitting Barddhaman (also known as Burdwan) district, Paschim

[4] The Kolkata Gazette (WB(Part-I)/2017/SAR-106), Govt. of West Bengal, 2017

[5] https://kalimpong.gov.in

[6] https://jhargram.gov.in

Barddhaman district[7], which is the 23rd district of West Bengal, was formed. The remaining portion of the Barddhaman district is now referred to as Purba Barddhaman.

One district is selected randomly from each of the five divisions of West Bengal. Therefore, five districts are chosen for this study out of a total of 23 districts. The sample districts are Darjeeling from the Jalpaiguri division, Dakshin Dinajpur from the Malda division, Paschim Barddhaman from the Burdwan division, Purba Medinipur from the Midnapore division, and Nadia from the Presidency division. The administrative divisions of West Bengal, along with the five sample districts selected for the study, are shown on the map provided in Annexure 1.

It is important to note that the sample size for each selected district, along with their rural and urban proportions, was determined at this stage. It was resolute to survey an equal number of

Table 1.2: District-wise rural-urban population and targeted sample size of West Bengal

Selected Districts	Total population, 2011[8] (in lakhs)			Rural-urban[9] share (%)		The targeted number[9] of sample household		
	Rural	Urban	Total	Rural	Urban	Rural	Urban	Total
Darjeeling	9.2	6.7	16.0	57.9	42.1	58	42	100
Dakshin Dinajpur	14.4	2.4	16.8	85.9	14.1	86	14	100
Nadia	37.3	14.4	51.7	72.2	27.8	72	28	100
Paschim Barddhaman	5.3	23.5	28.8	18.4	81.6	18	82	100
Purba Midnapore	45.0	5.9	51.0	88.4	11.6	88	12	100
Total number of sample households						322	178	500

households, i.e., 100 households, from each chosen district. Moreover, the size of the rural and urban samples in each district was determined depending on the district's rural-urban

[7] https://paschimbardhaman.gov.in

[8] Statistical Abstract of West Bengal, 2015

[9] Own calculation

population share. The following table shows the rural-urban population, along with the rural-urban sample size of each selected district.

The districts are further divided into several sub-divisions. Among all the sub-divisions of a district, two subdivisions were selected randomly. However, it was found that two of the selected districts, i.e., Paschim Barddhaman and Dakshin Dinajpur consist of two sub-divisions only. Therefore, both sub-divisions were chosen for these two districts. Consequently, a total of 10 sub-divisions were selected from the five districts.

Stage 3: Selection of Blocks and Municipalities

The sub-divisions comprise several blocks and municipalities. Blocks in a sub-division represent the rural areas, while municipalities represent the urban settlements. For this study, one block and one municipality were selected randomly. It was observed that some selected sub-divisions consisted of only one municipality, so that particular municipality was chosen directly. Consequently, a total of ten blocks and ten municipalities were selected at this stage.

Stage 4 & 5: Selection of Gram Panchayats (GPs) and Villages

The rural samples were drawn from the selected blocks. Initially, from each selected block, two GPs were selected randomly. After that, from each selected GP, two villages were also chosen randomly. This way, eight villages were selected for each district to conduct the survey.

Stage 6: Selection of Households

Up to the 5th stage, for each district, eight villages and two municipalities were selected for the final selection of sample households. At this stage, an equal number of households were selected randomly from each of the eight villages in a given district so that their combined number equaled the targeted size (Table 1.2) of the district's rural sample. However, with the exception of Purba Medinipur and Nadia, minor adjustments were made as the targeted sample size was not exactly divisible by the number of chosen villages. Similarly, to select the targeted size (Table 1.2) of the district's urban sample, an equal number of households were also randomly selected from each of the two municipalities within a specific district.

1.6 Analytical Methods

This study is based on both primary as well as secondary data. To evaluate the specific objectives of the study, the household-level primary data have been collected through a structured questionnaire from the rural and urban areas of five sample districts of West Bengal, viz. Darjeeling, Dakshin Dinajpur, Nadia, Paschim Barddhaman, and Purba Medinipur. The secondary information concerning the area, production and yield of the oilseed in the state has been collected from the Evaluation Wing, Directorate of Agriculture, Government of West Bengal.

In the analytical stage, descriptive statistics are mainly used to accomplish the objectives of the study. Apart from the descriptive statistics, Compound Annual Growth Rate (CAGR), Yield Gap, and Instability in oilseed production has been calculated throughout this study. Additionally, the Decomposition Analysis has also been carried out to understand the effect of area and yield rate on the oilseed production. The mathematical expression of the analytical tools used in this study are described in the following sections.

Compound Annual Growth Rate (CAGR): The following formula is used to compute the CAGR.

$$CAGR_{[01]} = \left[\left(\frac{V_1}{V_0}\right)^{1/p} - 1\right] \times 100$$

where,

V_1 represents the final value at the end of the period

V_0 represents the initial value as of the beginning of the period

p represents the total number of compounding periods

Instability: The instability in terms of area, production and yield of different oilseeds considering the years from 2017-2018 to 2021-2022 is computed for all the districts and agroclimatic zones of West Bengal. The instability for a particular district/agroclimatic zone is calculated by using the following formula.

$$I_{Xi} = \left(\frac{SD_{Xi}}{Mean_{Xi}}\right) \times 100$$

Where,

X represents area/production/yield of a particular oilseed crop

I_{Xi} represents the instability in area/production/yield of i^{th} district/agroclimatic zone

SD_{Xi} represents the standard deviation of area/production/yield of i^{th} district/agroclimatic zone over a five-year period (i.e., from 2017-2018 to 2021-2022)

$Mean_{Xi}$ represents the five-year (i.e., from 2017-2018 to 2021-2022) simple average of area/production/yield for the i^{th} district/agroclimatic zone.

Decomposition analysis: The decomposition analysis is used to measure the district/agroclimatic zone-wise relative contribution of the area and yield to the total output change for various oilseed crops produced in West Bengal. Through this method, the total change in production can be decomposed into three components, viz., yield effect, area effect and the interaction effect due to change in yield and area. It can be written as,

Production = Yield Effect + Area Effect + Interaction Effect

Mathematically, it can be expressed as follows.

$$P = \frac{A_0 \times \Delta Y \times 100}{\Delta P} + \frac{Y_0 \times \Delta A \times 100}{\Delta P} + \frac{\Delta A \times \Delta Y \times 100}{\Delta P}$$

Where,

A_0 and Y_0 represent the area and yield of the oilseed crop at the base year

ΔA and ΔY represents the difference between the area and yield of the oilseed crop of the analysis period and base year.

ΔP represents the difference between the production of the oilseed crop of the analysis period and the base year.

The findings derived from both primary and secondary data, utilizing the analytical techniques outlined here, are succinctly detailed in the subsequent chapters.

1.7 Organization of the Report

The present report is organized into five chapters. The background and relevance of the study are discussed in the present chapter (Chapter I), along with an overview of the objectives, a review of some pertinent literature, and information on the sampling and analytical approach used in the study. The socio-economic profile of the sample households is covered in the second chapter (Chapter II). The third chapter (Chapter III) discusses a comparative analysis of the preferences and consumption of the various types of edible oil in rural and urban areas, as well as the preferences and consumption of the various types of edible oil in relation to the socio-economic status of the sample households in West Bengal. Additionally, the third chapter examines changes in the patterns of edible oil use among the sample households of West Bengal over the last five years. Chapter IV explores the agro-climatic zone as well as the district-wise present scenario of oilseed production in West Bengal. Finally, major findings of the study along with policy suggestions and conclusion are covered in Chapter-V.

Chapter – II

Socio-economic Characteristics of Sample Households

The current chapter provides a succinct discussion of the socioeconomic profile of the sample households. The consumption patterns of a particular household are significantly influenced by both its economic as well as social standing. While contemplating consumption patterns, the most important factor can be considered as the monetary income of a household, which is directly related to consumption expenditures. Income serves as a crucial component of socioeconomic status as it reflects the financial resources accessible to a household. Generally, higher income levels indicate a higher socioeconomic status, providing households with improved access to a wider range of goods, services, and opportunities. A higher income can lead to a better quality of life, increased educational opportunities, and greater social mobility for individuals and their families. Conversely, Lower income households may face challenges in accessing quality education, healthcare, and other essential services, impacting their potential for social mobility and economic advancement.

On the other hand, the occupational involvement of a household also has a significant role in determining their socioeconomic profile because it not only affects their level of income but also reveals their level of knowledge and experience. Different occupations may come with varying levels of job security, benefits, and social status, all of which contribute to the overall socioeconomic standing. Along with the monetary income and occupational involvement of a household, socioeconomic status also includes various other factors like education, religion, caste, family size and so on. Along with these factors, the geographic location of the household, specifically whether it is in an urban or rural area, also plays a significant role in determining a household's tastes and preferences since they have an impact on the cultural practices, social networks, and resources available to that particular household.

In addition to the aforementioned factors, the influence of the decision-maker of a household on its expenditure pattern is significant. It is essential to emphasize in this context that while the age of the household head represents his or her experience in the decision-making process, simultaneously, the educational status of the household head is also a crucial factor that contributes significantly to their ability to make wiser decisions and better choices. In the ensuing sections, the profile of the sample household is discussed briefly.

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The religion and caste-wise distribution of sample households is shown in the following figures, i.e., Figure 2.1 and Figure 2.2.

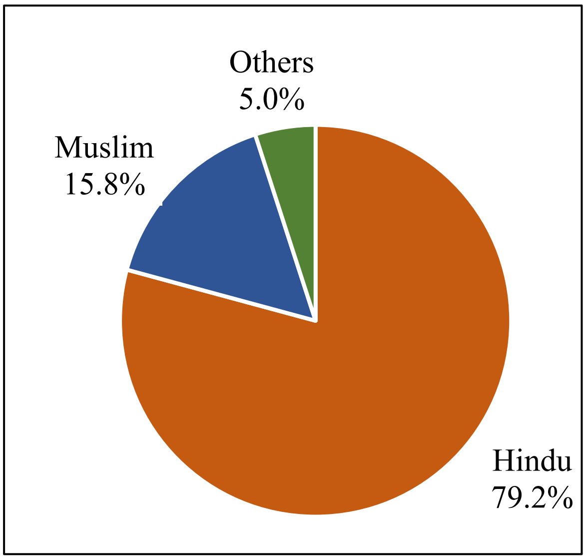

Figure 2.1: Religion-wise distribution of sample households

Data Source: Primary Survey

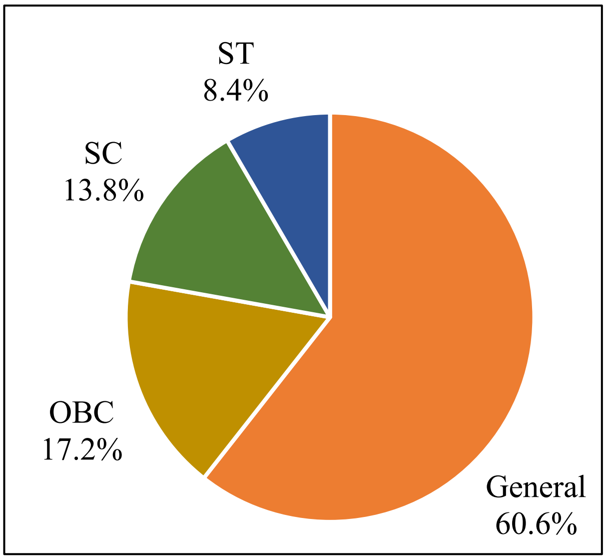

Figure 2.2: Caste-wise distribution of sample households

Data Source: Primary Survey

The religion-wise distribution of the sample households in Figure 2.1 shows that Hindu households make up the largest portion of the sample, accounting for about 79.2 per cent of the entire sample. The proportion of Muslim households comes in second, making up about 15.8 per cent of the households, and only a small proportion, i.e., 5 per cent of the sample households, belongs to other religions. On the other hand, the caste-wise distribution of the sample households in Figure 2.2 reveals that the majority of the sample households, comprising 60.6 per cent, belong to the General category. Among the entire sample households, 17.2 per cent belong to the Other Backwards Classes (OBC) category, followed by 13.8 per cent under the Scheduled Caste category, and the Scheduled Tribes category accounts for only 8.4 per cent.

The following figure (Figure 2.3) shows the distribution of sample households across their total number of family members. It can be seen from the figure that there are different sizes of households in the sample, with the smallest having just one person living there and the largest having 15 people. It is clear from Figure 2.3 that approximately one-third of the sample households are made up of four people. While the majority of households have more than four people, 30 per cent of households have fewer than four people.

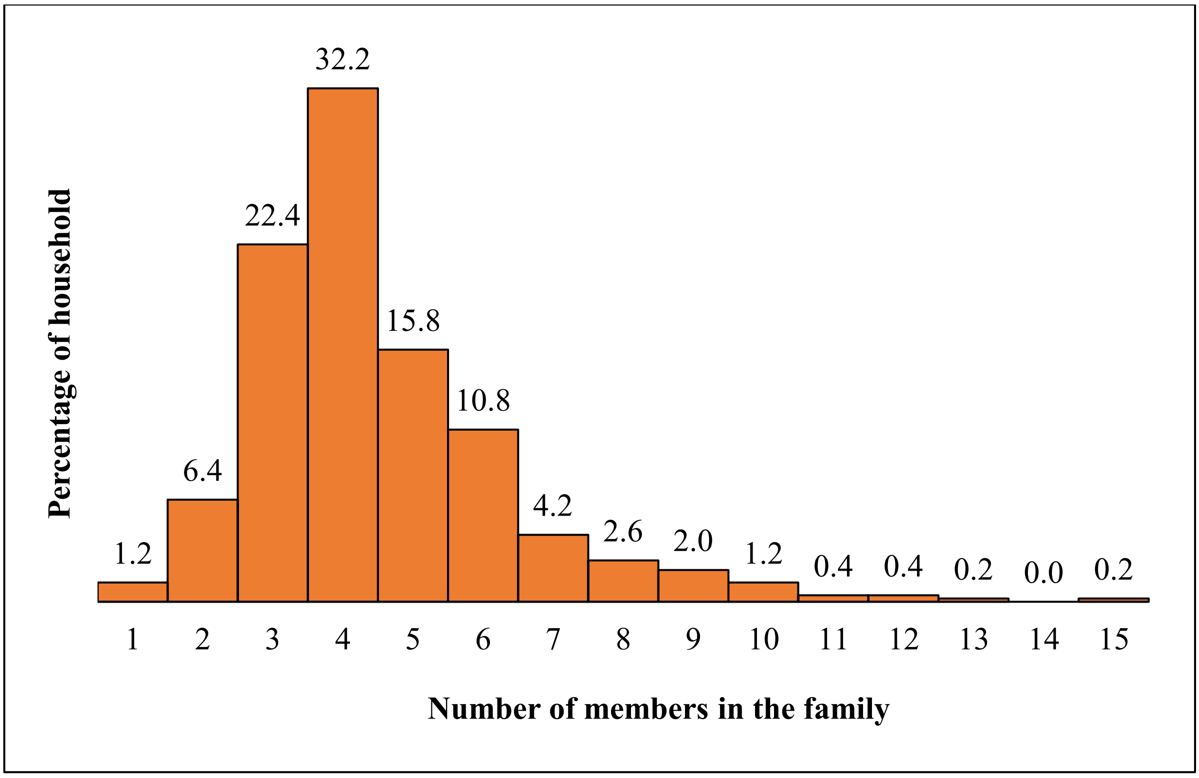

Figure 2.3: Family size-wise distribution of sample households

Data Source: Primary Survey

For the sake of simplifying further analysis, the family size is categorised into three groups. Firstly, we have "Small" families, which are defined as those with fewer than four people. Secondly, we have "Medium" families consisting of exactly four members. Finally, we have "Large" families, encompassing those with more than four members. These categories will aid in a more convenient and streamlined analysis of the data.

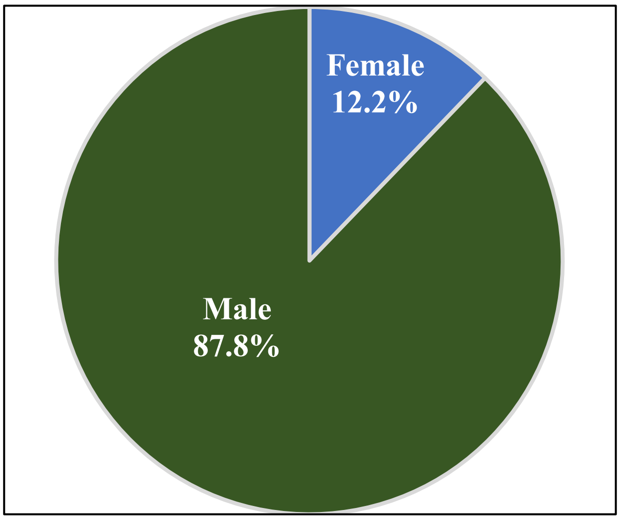

Figure 2.4: Distribution of households across the gender of the household head

Data Source: Primary Survey

The distribution of the sample households across the gender of the household head is shown in Figure 2.4. It is seen in the figure that the majority of the households, i.e., 87.8 per cent, are headed by male members. Contrarily, the percentage of households headed by female members makes up a lesser portion, accounting for only 12.2% of the sample households.

The age of the household head is categorised into four groups, i.e., up to 40 years, 41-50 years, 51-60 years, and above 60 years. The distribution of sample households across different age categories of the household head is plotted in the following figure (Figure 2.5).

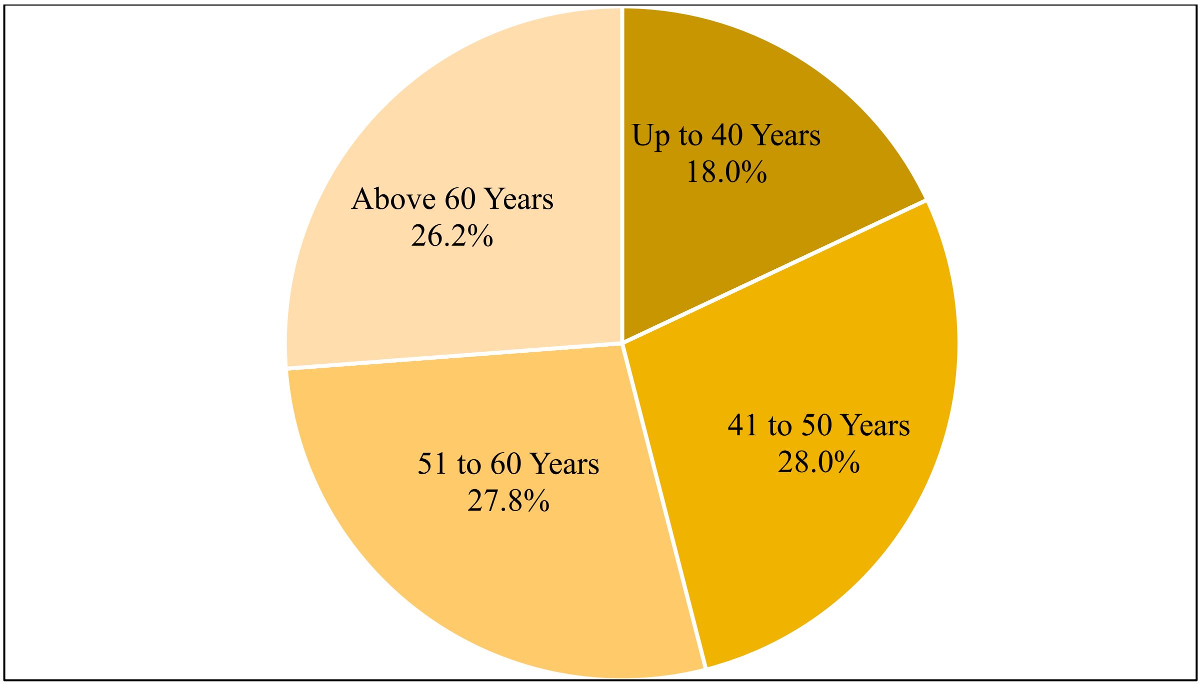

Figure 2.5: Distribution of households across age categories of the household head
Data Source: Primary Survey

It can be seen in the above graph that less than one-fifth, i.e., 18 per cent of the sample households are headed by members with the age of less than or equal to 40 years. Although most of the household heads, i.e., 28 per cent, are between the ages of 41 and 50, the percentage of households with heads who are between the ages of 51 and 60 is nearly equal, at 27.8 per cent. However, the percentage of household heads older than 60 years of age follows closely, accounting for 26.2 per cent of the total sample. Thus, it is evident from the figure that, with the exception of the household head age category up to 40 years, the overall sample consists of almost an equal proportion of households in each of the other age categories.

The following figure shows the distribution of the sample households across the educational qualification of the household head, which is important to get insights into the educational background of the surveyed households. The highest class passed in formal school by the household head is considered in order to understand their educational qualification. Further, the educational qualification of the household head has been bifurcated into the following six categories.

1. Illiterate : No experience of formal education
2. Primary : Class I to IV
3. Middle : Class V to VII
4. Secondary : Class IX to X
5. Higher Secondary : Class XI to XII
6. Graduation and above: Above Class XII

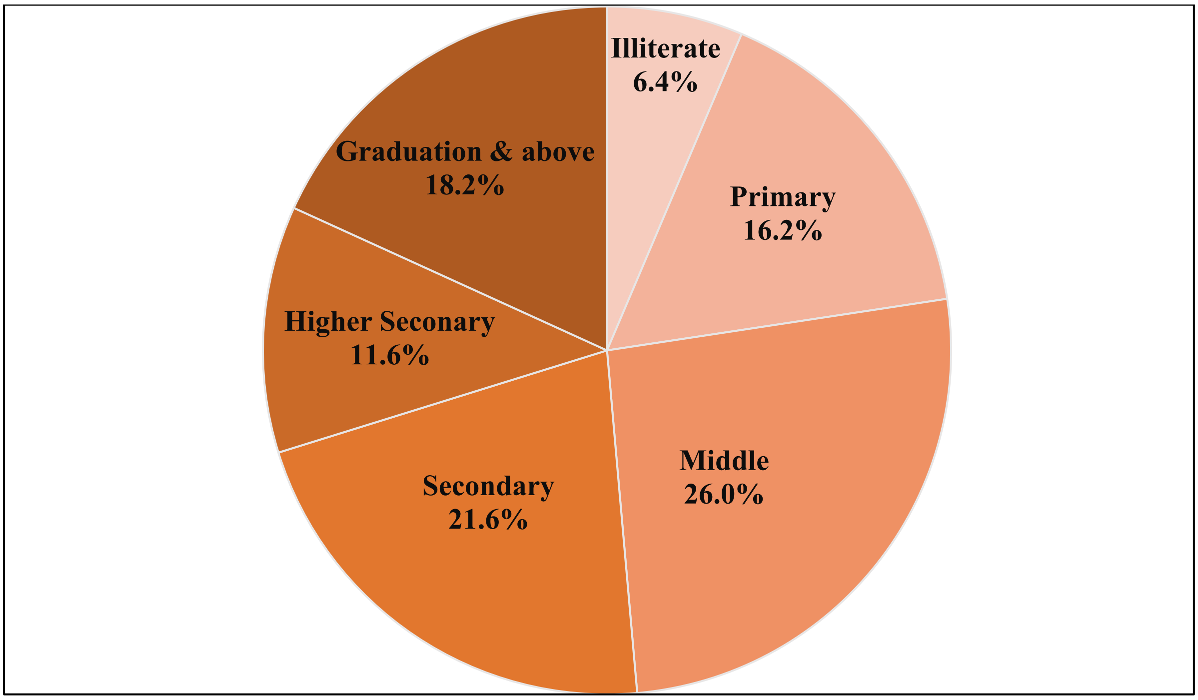

Figure 2.6: Distribution of households across the education level of the household head

Data Source: Primary Survey

Figure 2.6 highlights the diverse literacy levels among household heads of the entire sample, ranging from those with no experience of formal education to those with more than a higher secondary level educational qualification. It can be observed from the figure that only 6.4 per cent of the household heads have no experience of formal schooling. In the sample, 16.2 per cent of the household heads have only an elementary education. However, the decision-makers of almost one-fourth of the sample households have academic qualifications ranging from class 5^{th} to 8^{th}, followed by 21.6 per cent with academic qualifications ranging from class 9^{th} to 10^{th}. Almost 30 per cent of the sample households are headed by members with more than a secondary level of education, where the majority have an educational qualification more than a higher secondary level.

The following figure (Figure 2.7) shows the distribution of sample households according to their monthly income. The monthly income of the household, as reported by the respondents, has been categorised into the following five categories.

Category 1: Below 15,000 Rs.
Category 2: 15,000 Rs. to 30,000 Rs.
Category 3: 30,000 Rs. to 50,000 Rs.
Category 4: 50,000 Rs. to 80,000 Rs.
Category 5: Above 80,000 Rs.

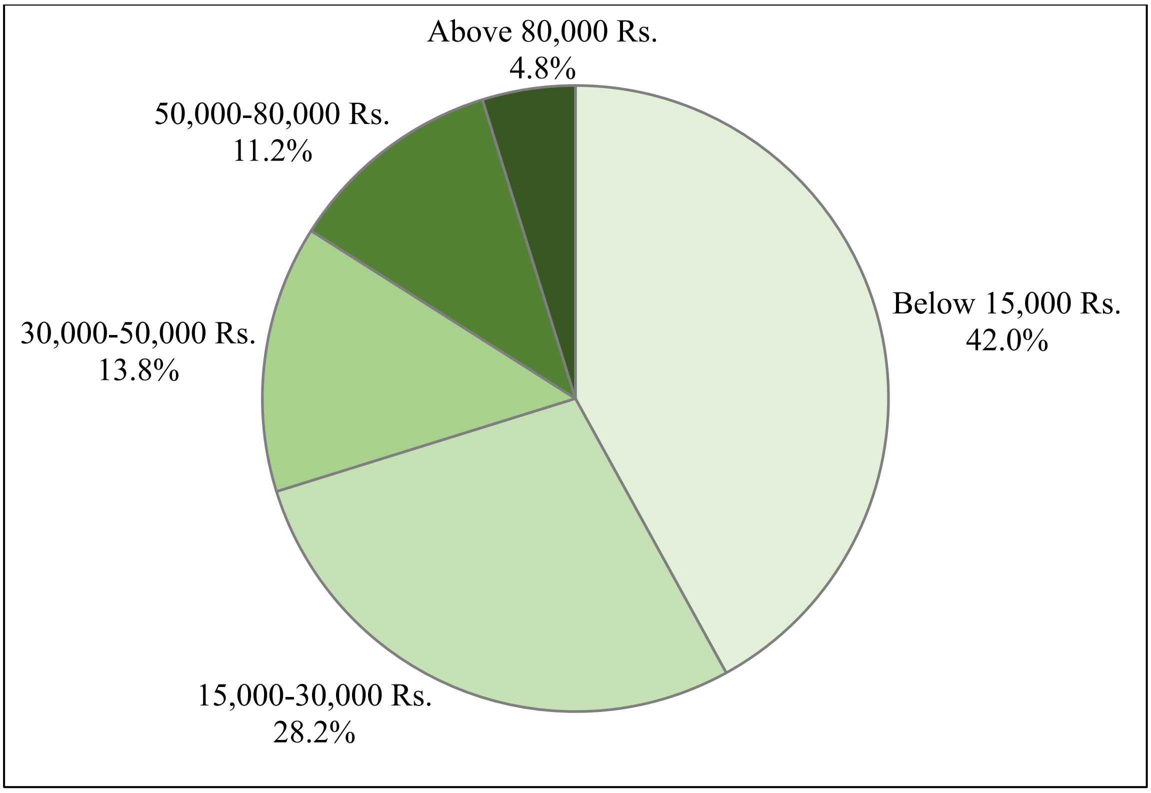

Figure 2.7: Distribution of households across monthly income category

Data Source: Primary Survey

Based on the data presented in Figure 2.7, it can be observed that the distribution of the sample households across their monthly income category follows a specific pattern, i.e., the percentage of households consistently declines as we move up the income tier. The highest proportion, i.e., 42 per cent of the sample households, reported earning less than 15,000 Rs. monthly. Around 28.2 per cent of the sample households earn a monthly income ranging from 15,000 to

30,000 Rs. The proportion declines further, with 13.8 per cent of the households having a monthly income between 30,000 to 50,000 Rs. Moving higher, 11.6 per cent of households earn an income of 50,000 to 80,000 Rs. Finally, the highest income category, earning more than 80,000 Rs. monthly, is reported by the lowest proportion, i.e., only 4.8 per cent of the sample households.

It is noteworthy to observe that the scenario depicted in the previous diagram (Figure 2.7) is significantly different for households in rural and urban areas. The rural-urban distribution of sample households across their monthly income category is illustrated in Figure 2.8. The following figure shows a similar pattern for rural households, as shown in Figure 2.7.

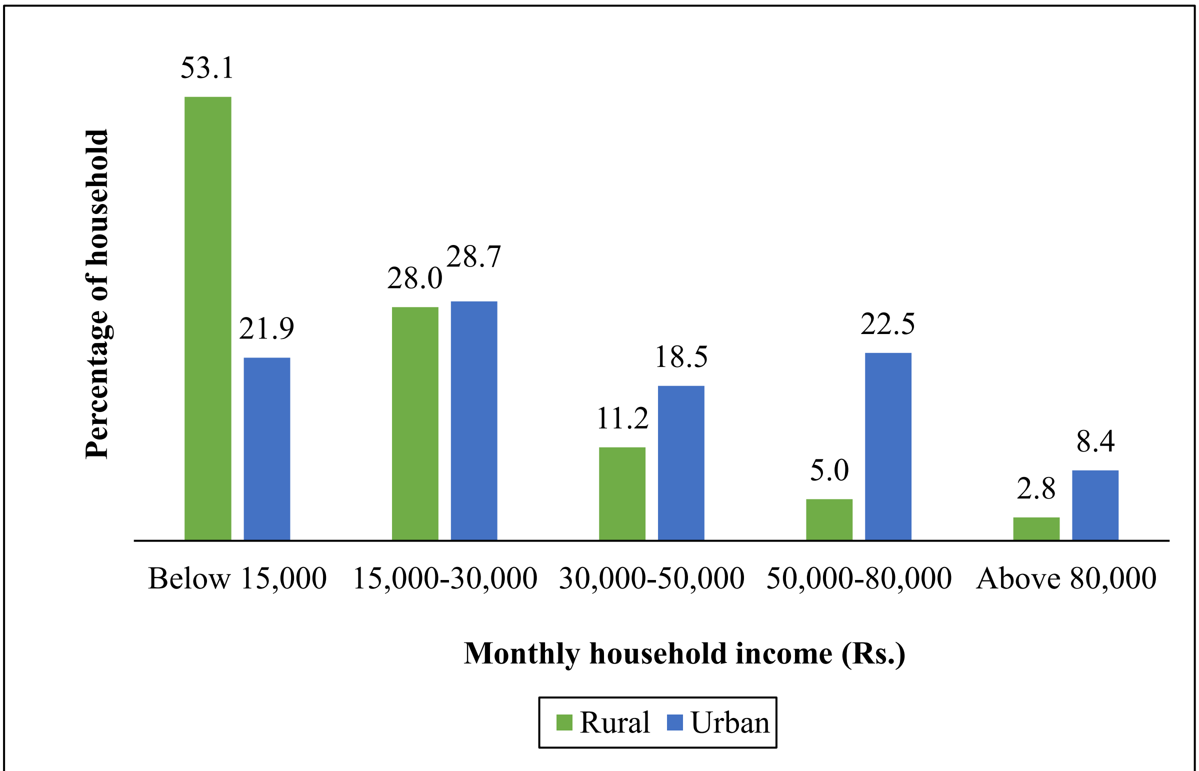

Figure 2.8: Rural-urban distribution of households across the monthly income category

Data Source: Primary Survey

Looking at the distribution of all rural households across the whole sample, it is clear that the percentage of households continually decreases as we move up the income tier. However, there is no such pattern for urban families. Again, it is also evident from the figure that more than half of the rural households belong to the lowest income group category, where only about one-fifth of the urban households fall under that category.

Although almost an equal percentage of rural as well as urban households have a monthly income between 15,000 Rs. and 30,000 Rs., urban households outperform their rural counterparts in the upper-income brackets. In the income range of 30,000 to 50,000 rupees, the proportion of urban households is more than 1.5 times higher than that of rural households, while for the range of 50,000 to 80,000 rupees and beyond 80,000 rupees, it is more than four times and nearly three times higher, respectively. In a nutshell, the data shows that a higher number of wealthier families are concentrated in urban areas, reflecting the economic disparities between rural and urban regions.

The rural-urban distribution of sample households across all of the sample districts, along with their respective income levels, is shown in Table 2.1. The table shows that, in the Darjeeling district, the majority of households, both rural and urban areas, belong to the 15,000 to 30,000 income group, comprising approximately 39.7 per cent and 47.6 per cent, respectively. In the district, no rural household earns above 80,000 Rs. per month, while 2.4 per cent of urban households fall in this income category.

The scenario is different for the Dakshin Dinajpur district. The district stands out with the highest percentage of households earning below 15,000 rupees per month, where 69.8 per cent of rural households and 28.6 per cent of urban households belong to this category. Contrary to Darjeeling, there are no households in the highest income level among urban residents; nonetheless, 2.3 per cent of rural households fall into this category.

In the instance of just the Nadia district, it has been found that even while most urban and rural households fall into the lowest income category, the proportion of urban households is higher than that of rural households, at 64.3 per cent against 54.2 per cent. Again, there is no household falling into the highest income group category in the district.

In the Paschim Bardhhaman district, it can be seen that the majority of rural households, with an identical proportion of 44.4 per cent, belong to the lowest and second-lowest income groups. However, while considering the urban households, there is the highest representation among all the sample districts in 30,000-50,000 Rs. and 50,000-80,000 Rs. monthly income groups, with 23.2 per cent and 32.9 per cent, respectively.

Purba Medinipur district shows the least representation of urban households in the lowest income category and the highest representation of both the rural as well as urban households in the highest income category across all the sample districts.

Table 2.1: Rural-urban distribution of sample households across districts and monthly income categories

(Values are in %)

	Darjeeling		**Dakshin Dinajpur**		**Nadia**		**Paschim Bardhaman**		**Purba Medinipur**	
Monthly Household Income (Rs.)	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Below 15,000	37.9	14.3	69.8	28.6	54.2	64.3	44.4	12.2	47.7	8.3
15,000-30,000	39.7	47.6	22.1	42.9	20.8	14.3	44.4	20.7	28.4	33.3
30,000-50,000	13.8	16.7	4.7	7.1	18.1	21.4	5.6	23.2	11.4	NA
50,000-80,000	8.6	19.0	1.2	21.4	6.9	NA	5.6	32.9	4.5	16.7
Above 80,000	NA	2.4	2.3	NA	NA	NA	NA	11.0	8.0	41.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Data Source: Primary Survey

Figure 2.9 shows the distribution of sample households across different earning activities. The earning activities are categorised into six different categories, i.e., Agriculture and allied (Cultivation of own land or livestock rearing), Farm labour (Daily labour associated with farming), Non-farm labour (Daily labour associated with other than farming activities), Salaried (Govt. as well as Pvt.), Business, and Remittance. It should be noted here that some of the sample households are associated with multiple earning activities, so the percentage shown in the figure adds up to more than 100.

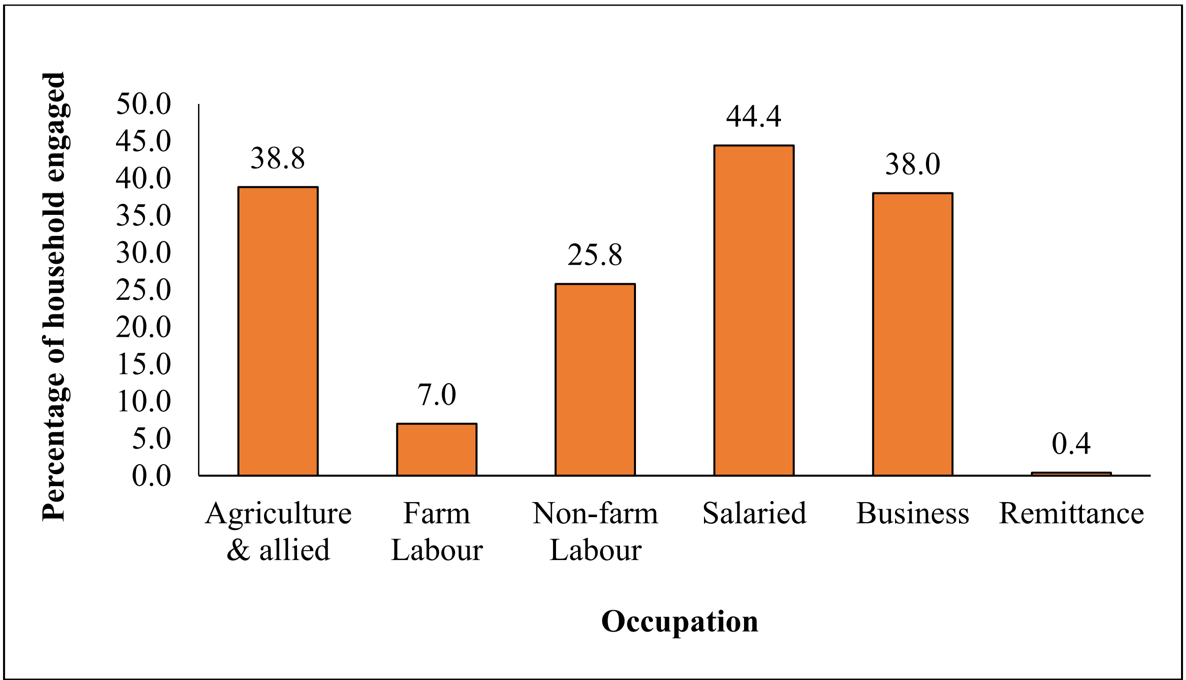

Figure 2.9: Distribution of sample households across different earning activities

Data Source: Primary Survey

It can be seen from the above figure (Figure 2.9) that the source of income for the majority of the sample households, about 44.4 per cent, is salary-based employment. Another significant portion, comprising 38.8 per cent, is involved in the agriculture and allied sectors. Around 38 per cent of households earn their income through various businesses. Regarding daily labour income, it is further sub-categorized into farm labour and non-farm labour. Farm labour includes individuals employed in the farming sector who earn wages through agricultural and allied work. This category constitutes 7 per cent of the total sample households. On the other hand, non-farm labour encompasses individuals employed in non-agricultural sectors, and it accounts for 25.8 per cent of the total households. A very small proportion of households, only 0.4 per cent, rely on remittances as their source of income.

A close perusal of the earning activities of the sample households across rural and urban areas is depicted in the following figure (Figure 2.10).

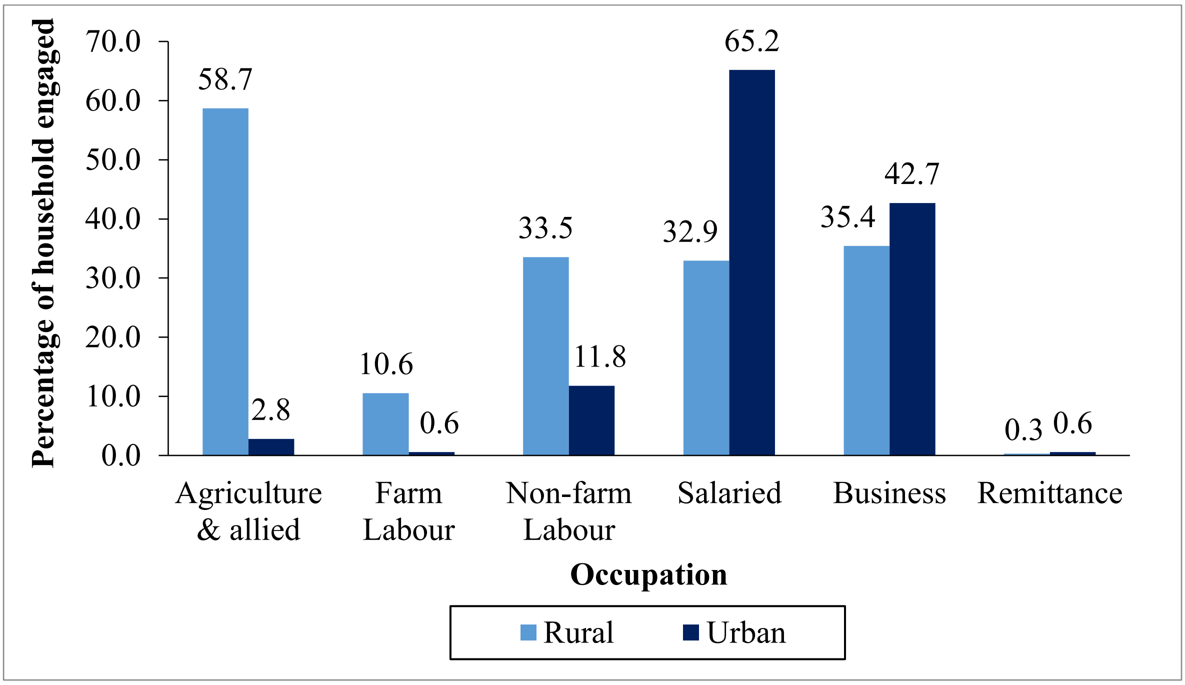

Figure 2.10: Rural-urban distribution of sample households across occupation

Data Source: Primary Survey

It is seen in Figure 2.10 that agriculture and allied sector employment, as expected, is more prevalent in rural areas, with 58.7 per cent of rural households earning through this sector. In contrast, only 2.8 per cent of urban households are involved in agriculture-related activities. Regarding farm labour, rural households dominate at 10.6 per cent, while urban households have a significantly lower representation at 0.6 per cent. Non-farm labour occupation is more common in rural areas, constituting 33.5 per cent of rural households, compared to urban areas, where it accounts for 11.8 per cent of urban households. Salaried occupations, on the other hand, are much more prominent in urban areas, with 65.2 per cent of urban households engaged in such employment. In contrast, only 32.9 per cent of rural households have salaried jobs. Regarding business occupation, the urban area exhibits a higher percentage, with 42.7 per cent of families involved in business, slightly surpassing the rural area, where 35.4 per cent of households are engaged in business activities. Interestingly, remittance plays a minor role in both rural and urban areas, with 0.3 per cent of rural households and 0.6 per cent of urban households relying on it as a source of income.

Chapter – III

Consumption Pattern of Different Edible Oils in West Bengal

This chapter provides the empirical results obtained in relation to the first three study objectives. These are:

1. To compare rural and urban preferences and consumption levels of the different types of edible oil in West Bengal
2. To understand the preferences and consumption level of the different types of edible oil with respect to the socio-economic status of the households in West Bengal
3. To analyze the trends in the consumption pattern of different edible oils in West Bengal

3.1 Rural-urban preferences and consumption level of different edible oils

This section presents the preferences and consumption levels of various edible oils in rural and urban areas of the five sample districts of West Bengal. In order to comprehend the preferences for various edible oils, the percentage of sample households that consume each type of edible oil is taken into account. On the other hand, in order to figure out the levels of consumption for different edible oils, the annual per capita consumption of various edible oils is taken into consideration. This section is divided into two subsections, 3.1.1 and 3.1.2, in which 3.1.1 addresses preferences for various edible oils, and 3.1.2 examines the annual per capita consumption of various edible oils of rural and urban sample households.

3.1.1 Rural-urban preferences of various edible oils

It is evident from the primary data that mustard oil, soybean oil, sunflower oil, rice-bran oil, palm oil, olive oil, and vanaspati are the seven different kinds of edible oils used by the sample households. As stated earlier, the proportion of sample households using each type of edible oil is taken into account in order to understand preferences for different types of edible oils. In this line, the accompanying figure (Figure 3.1.1.1) illustrates household preferences for various types of edible oils.

The following figure demonstrates that mustard oil is the most popular cooking oil among the sample households, being used by 93.2 per cent of the households. In spite of being the second most popular edible oil, soybean oil is only utilised by 44.8 per cent of households, representing less than half of the percentage of those who opt for mustard oil. Sunflower oil is the third most popular edible oil, being used by 22.2 per cent of the sample households, albeit this figure is less than half of the percentage of the soybean oil-using households. Only

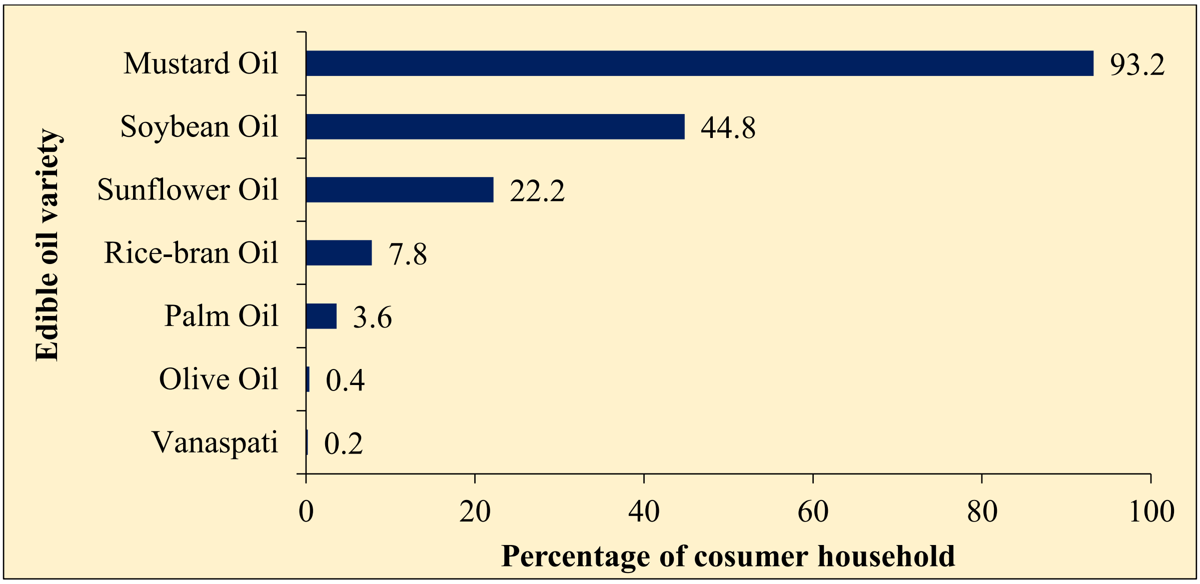

Figure 3.1.1.1: Percentage of consumer households across different edible oil varieties

Data Source: Primary Survey

a small percentage, i.e., 7.8 per cent of the sample households, use rice-bran oil, followed by palm oil with 3.6 per cent. On the other hand, olive oil and vanaspati are consumed by a very small portion of households, indicating their comparatively lower preference.

From the above figure, it is clear that mustard oil, soybean oil, sunflower oil, and rice-bran oil are the four most preferred edible oils among the sample households. The distribution of consumer households for the four major types of edible oil across the sample districts is shown in Figure 3.1.1.2a.

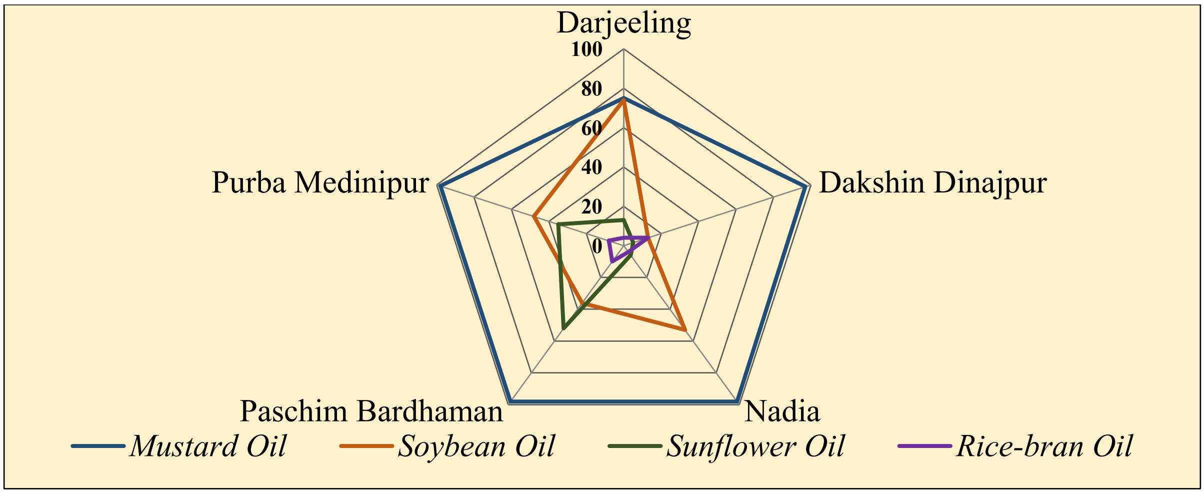

Figure 3.1.1.2a: District and edible oil type-wise percentage of consumer households

Data Source: Primary Survey

The graph above shows that, aside from Darjeeling, almost all sample households in the other four sample districts consume mustard oil, while more than 20 per cent of the sample households in Darjeeling do not. Conversely, the Darjeeling district has the highest percentage of sample households consuming soybean oil, followed by Nadia, Purba Medinipur, Paschim Bardhaman, and Dakshin Dinajpur. Even though soybean oil is the second most popular edible oil and more households use it than either sunflower oil or rice-bran oil, the situation in the Paschim Bardhaman district is different. The graph clearly shows that more households in the Paschim Bardhaman district favour sunflower oil over soybean oil. Again, rice-bran oil is the fourth preferred edible oil used by 7.8 per cent of all sample families, although in Dakshin Dinajpur, a greater percentage of households prefer rice-bran oil to sunflower oil. Therefore, it is clear from the figure that preferences for various types of edible oil vary noticeably between districts.

It is important to observe how the scenario shown in the above figure varies across rural and urban areas. Figures 3.1.1.2b and 3.1.1.2c, respectively, show the proportion of consumer households in rural and urban areas across all of the sample districts for the four major edible oils described above.

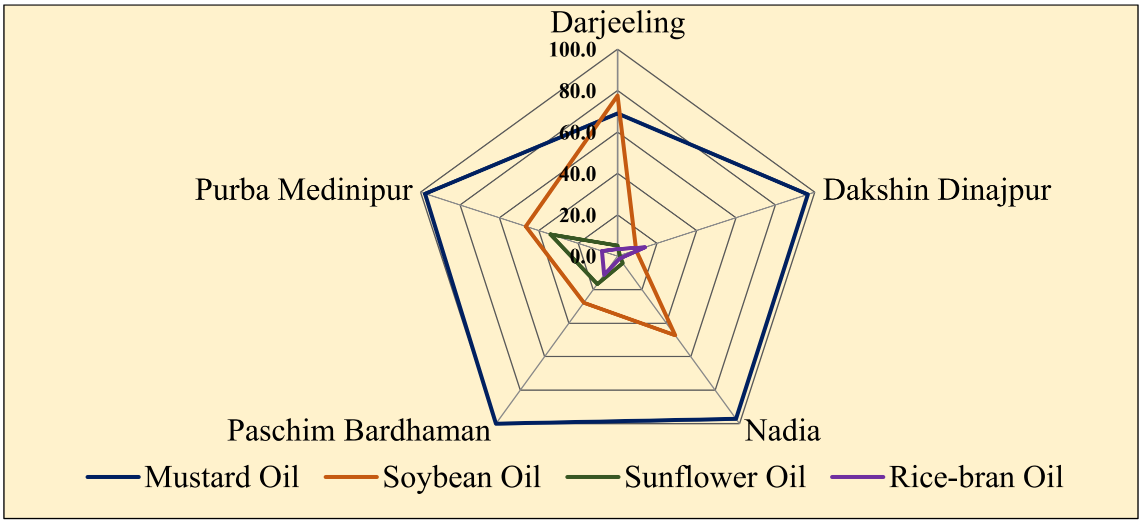

Figure 3.1.1.2b: District and edible oil type-wise percentage of rural consumer households

Data Source: Primary Survey

Figure 3.1.1.2b demonstrates that the rural situation for mustard oil is nearly identical to the overall scenario shown in Figure 3.1.1.2a. However, in rural areas of the Darjeeling district, the percentage of consumer households of soybean oil is higher than that of mustard oil. Although the overall circumstance indicates that Paschim Bardhaman has the highest percentage of families making use of sunflower oil and that it is also preferred over soybean oil, the situation is different in rural regions. In the rural areas of Paschim Bardhaman, the percentage of sample households consuming sunflower oil is lower than soybean oil. Moreover, among the rural households of all the sample districts, the percentage of sample households consuming sunflower oil is the highest in Purba Medinipur. Again, only among the rural households of Dakshin Dinajpur, the percentage of households consuming rice-bran oil is higher than that for soybean and sunflower oil.

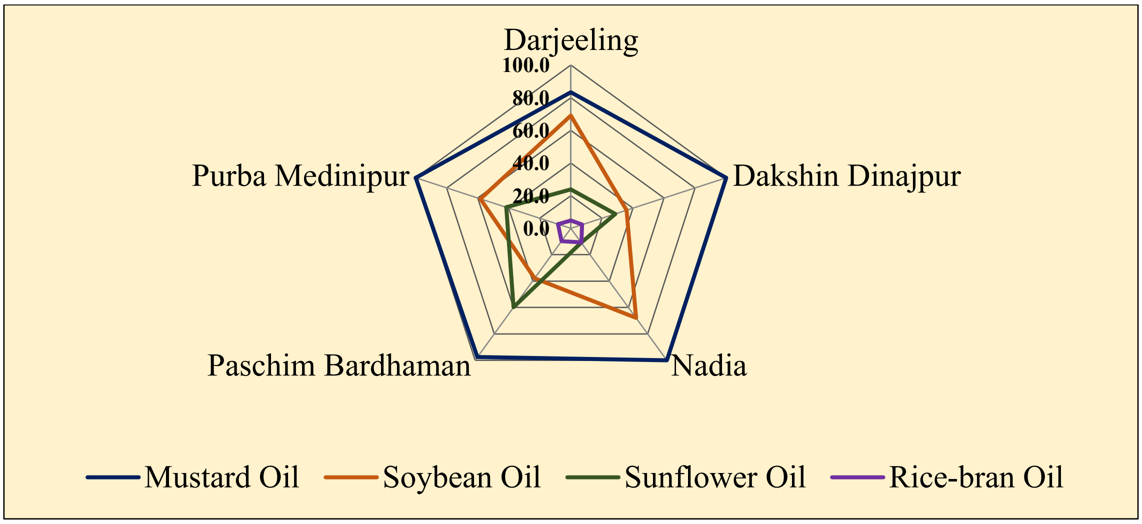

Figure 3.1.1.2c: District and edible oil type-wise percentage of urban consumer households

Data Source: Primary Survey

The urban preference for the four major types of edible oil depicted in Figure 3.1.1.2c maintains almost a similar pattern for all the sample districts except Paschim Bardhaman. It is clear from the figure that, with the exception of Paschim Bardhaman, mustard oil is the most preferred cooking oil in each of the sample districts, followed by soybean oil, sunflower oil, and rice-bran oil. Although similar to other sample districts, mustard oil is the most preferred edible oil among the urban households of Paschim Bardhaman district; the second most preferred edible oil is sunflower oil rather than soybean oil.

District-wise total as well as rural-urban percentage of consumer households of different edible oils is depicted in Table 3.1.1.1. It is important to remember that while some households choose to use only one kind of edible oil, many prefer to use a variety of edible oils for different purposes. For instance, a household that uses mustard oil may also utilise sunflower and/or soybean oil. Hence, the values in the column of the table add up to more than 100.

Table 3.1.1.1: District-wise rural-urban percentage of consumer households of different edible oils

(Values are in per cent)

	Darjeeling			**Dakshin Dinajpur**			**Nadia**			**Paschim Bardhaman**			**Purba Medinipur**		
Edible oil variety	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
Mustard Oil	75.0	69.0	83.3	97.0	96.5	100.0	98.0	97.2	100.0	98.0	100.0	97.6	98.0	97.7	100.0
Soybean Oil	74.0	77.6	69.0	13.0	9.3	35.7	53.0	47.2	67.9	36.0	27.8	37.8	48.0	46.6	58.3
Sunflower Oil	13.0	5.2	23.8	5.0	1.2	28.6	6.0	4.2	10.7	52.0	16.7	59.8	35.0	34.1	41.7
Rice-bran Oil	4.0	3.4	4.8	13.0	14.0	7.1	4.0	1.4	10.7	10.0	11.1	9.8	8.0	8.0	8.3
Palm Oil	-	-	-	2.0	2.3	-	-	-	-	11.0	33.3	6.1	5.0	5.7	-
Olive Oil	-	-	-	-	-	-	1.0	1.4	-	1.0	-	1.2	-	-	-
Vanaspati	-	-	-	-	-	-	-	-	-	1.0	-	1.2	-	-	-

Data Source: Primary Survey

Given that a household often makes use of more than one type of edible oil, the scenario would be clearer when we observe the frequency of different combinations of these edible oil types. The combination of different edible oils used by households can provide insights into diverse culinary preferences. A visualisation of the various combinations of different types of edible oil, along with the percentage of consumer households, is shown in Figure 3.1.1.3a. Moreover, the same for rural and urban areas are shown in figures 3.1.1.3b and 3.1.1.3c, respectively.

Even though mustard oil is the most preferred edible oil among all the sample households, Figure 3.1.1.3a reveals that more than one-third of them prefer the combination of mustard and soybean oil. Moreover, about one-fourth of the sample households consume only mustard oil. The combination of mustard and sunflower oil follows closely behind, accounting for approximately one-fifth of the sample households. Again, a combination of mustard and rice-bran oil is preferred by 5.6 per cent of households, and notably, 5.4 per cent of households consume only soybean oil. There are many other combinations that can be seen in the graph, which are altogether preferred by less than 10 per cent of the sample households. The point to keep in mind is that with the exception of three combinations, mustard oil is present in every other combination, demonstrating that mustard oil is widely used among the sample households.

On the other hand, Figure 3.1.1.3b shows that more than one-third of rural households use exclusively mustard oil, and a further one-third use both mustard and soybean oil. Again, 10.6 per cent of rural households use mustard and sunflower oil, making it the third most frequently utilised pairing of edible oil. Approximately 6.5 per cent of rural families utilise only soybean oil. In comparison to the entire sample as well as urban households, rural households are more likely to use soybean oil exclusively. Rice-bran oil in rural households is consumed by 5.6 per cent of households, though not exclusively; mustard oil is also used in these households.

The urban scenario in Figure 3.1.1.3c demonstrates that most of the households, i.e., 42.1 per cent, consume both mustard as well as soybean oil simultaneously. Mustard and sunflower oil, which are used by around 31.5 per cent of households, are the second most popular pair of edible oils in urban areas. Only 6.2 per cent of the urban families in our sample use mustard oil exclusively, which is the third most preferred option, while around three-fourths prefer to use either soybean oil or sunflower oil along with mustard oil.

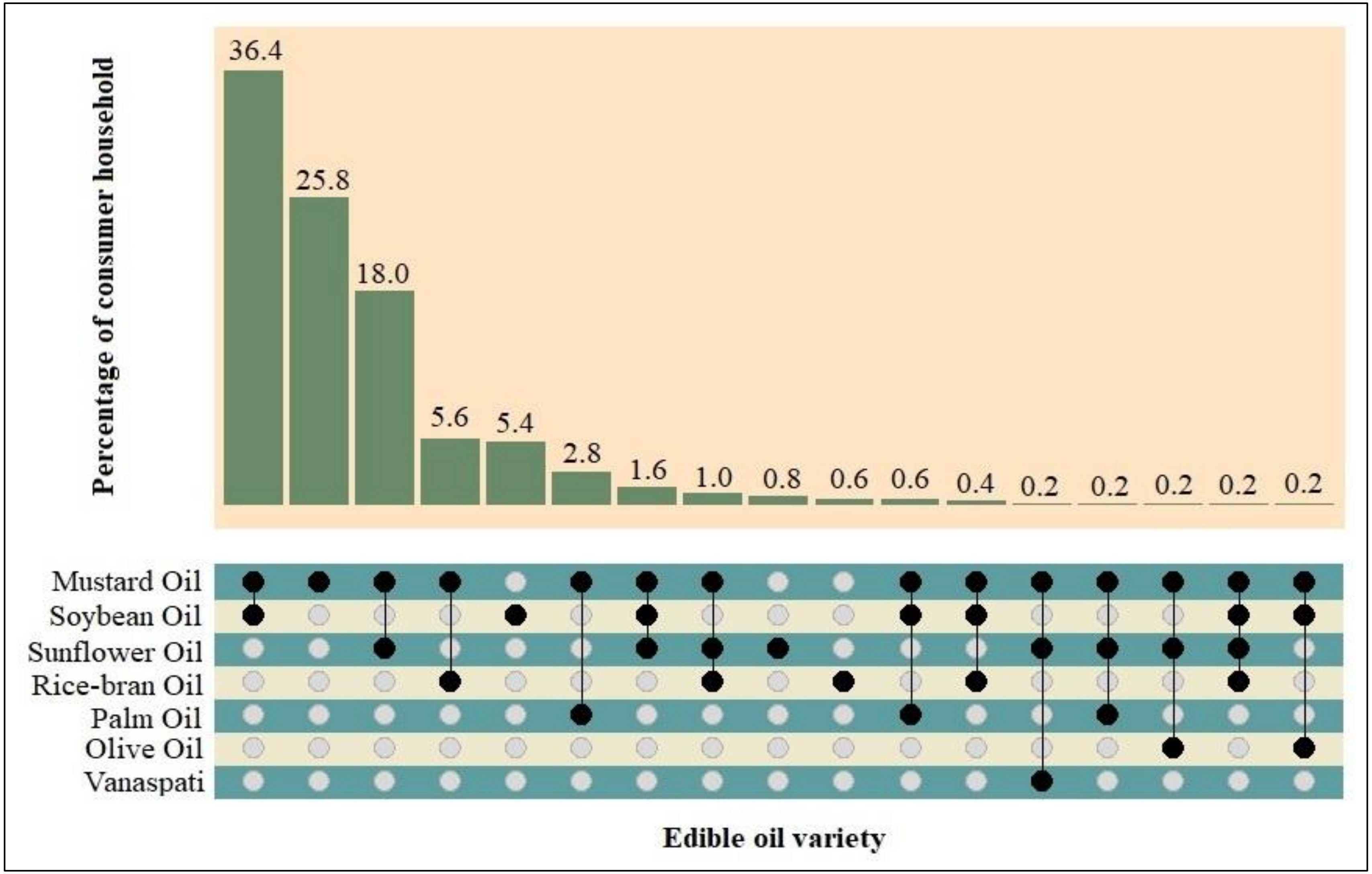

Figure 3.1.1.3a: Percentage of households consuming different combinations of edible oil

Data Source: Primary Survey

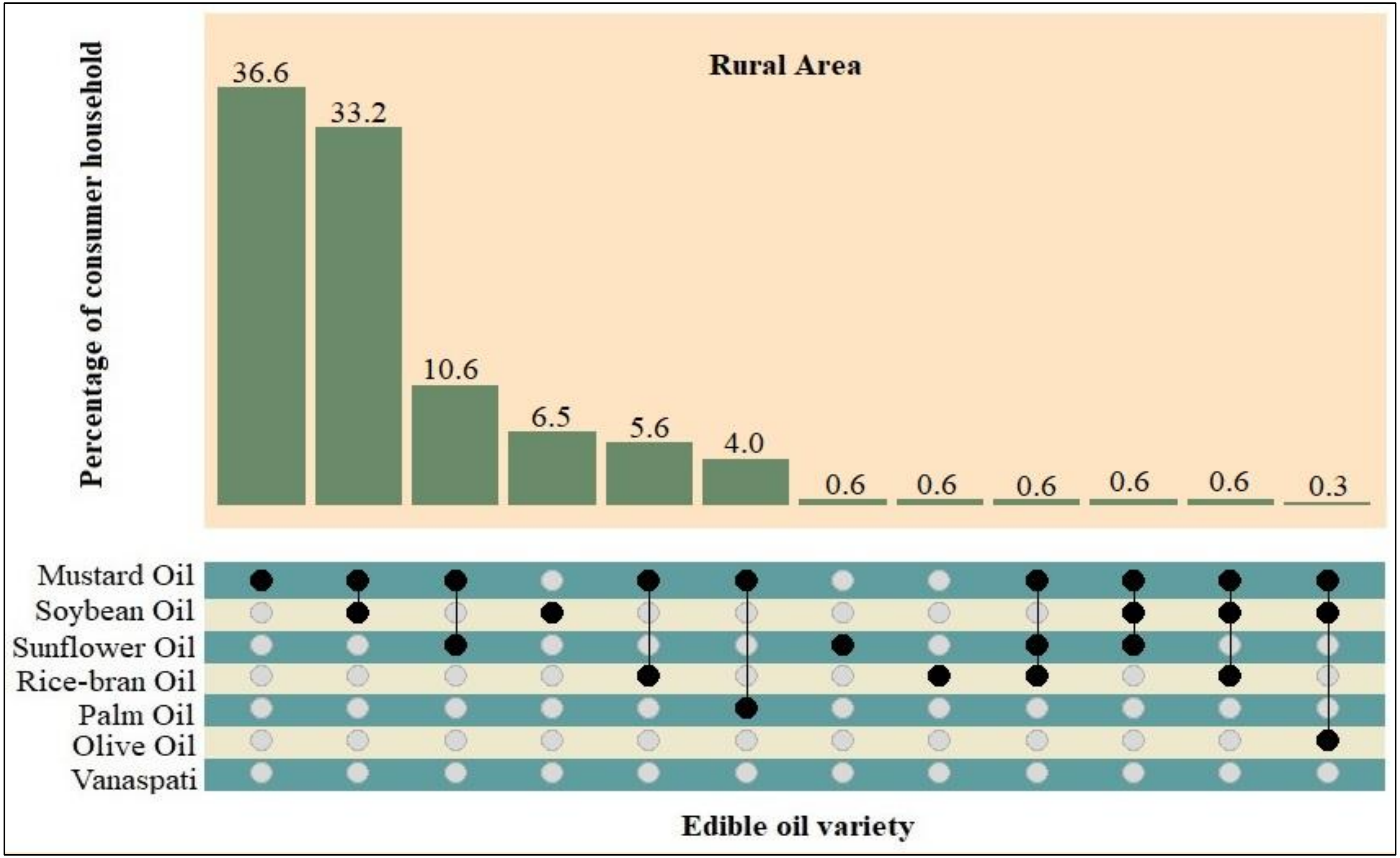

Figure 3.1.1.3b: Percentage of rural households consuming different combinations of edible oil

Data Source: Primary Survey

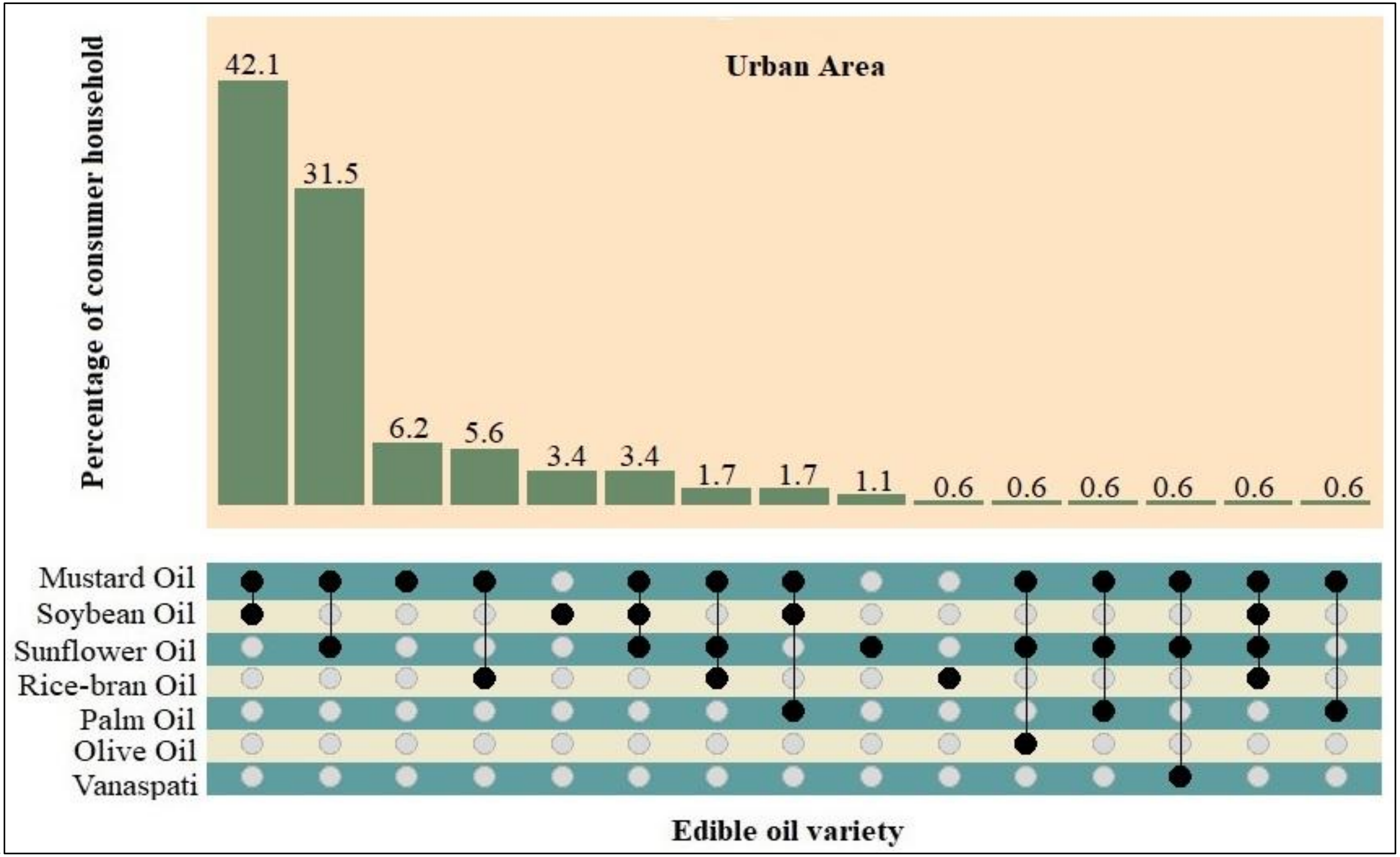

Figure 3.1.1.3c: Percentage of urban households consuming different combinations of edible oil

Data Source: Primary Survey

Along with the overall scenario as shown in Figure 3.1.1.3a, while considering the rural (Figure 3.1.1.3b) and urban (Figure 3.1.1.3c) scenarios, it is found that about 80 per cent of the households prefer three combinations of edible oil. These are as follows

Combination 1: Mustard and Soybean oil

Combination 2: Mustard and Sunflower oil

Combination 3: Only Mustard oil

However, the preferences for different combinations differ across rural and urban areas. It is evident from Figure 3.1.1.3a that most of the households prefer Combination 1, followed by Combination 3 and Combination 2. Moreover, in the case of rural areas, most of the households prefer Combination 3, followed by Combination 1 and Combination 2. Again, in the case of urban areas, most of the households prefer Combination 1, followed by Combination 2 and Combination 3. In a nutshell, there are differences across sample districts, as well as between rural and urban settings, in terms of the preferences for various types of edible oils and the combination of different types of edible oils utilised by the sample families.

3.1.2 Rural-urban consumption level of various edible oils

This section discusses the consumption levels of various edible oils in both rural and urban areas and across all sample districts. The annual per capita intake of various edible oils is taken into account, as was previously said, to comprehend the consumption levels of various edible oils. In this line, the following figure (Figure 3.1.2.1) illustrates the average yearly per

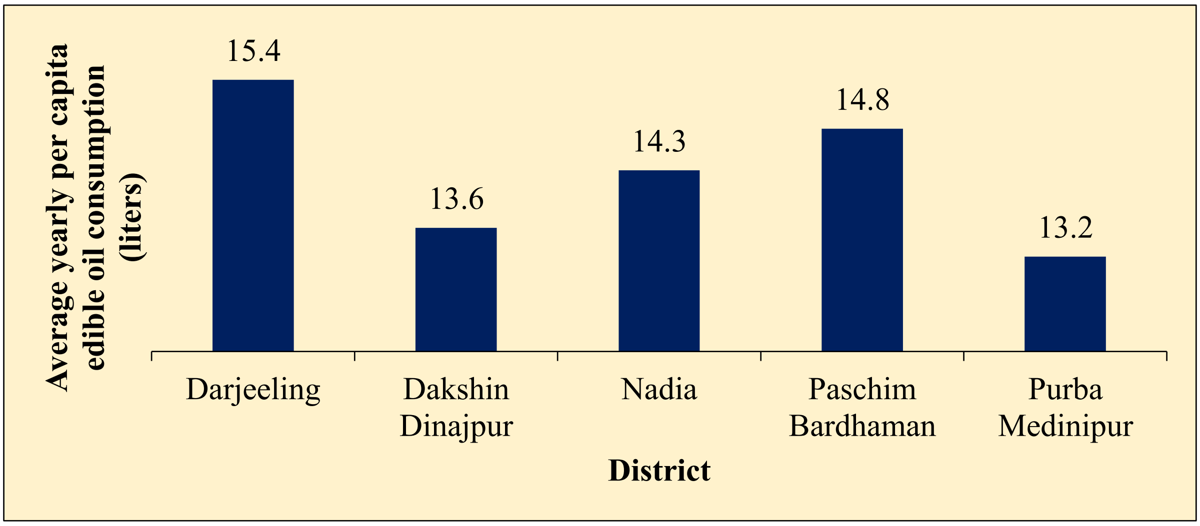

Figure 3.1.2.1: District-wise average yearly per capita consumption of edible oil

Data Source: Primary Survey

capita consumption of all types of edible oils together across five sample districts. As can be seen from the figure, with a yearly consumption of 15.4 litres per person, the Darjeeling district has the highest level of edible oil use. Paschim Bardhaman district comes in second, with a per capita annual consumption of 14.8 litres, followed by Nadia, Dakshin Dinajpur, and Purba Medinipur, with a per capita annual consumption of 14.3 litres, 13.6 litres, and 13.2 litres, respectively.

The yearly per capita consumption of edible oil in rural and urban areas of the sample districts is depicted in Figure 3.1.2.2. It can be seen that the level of edible oil consumption in

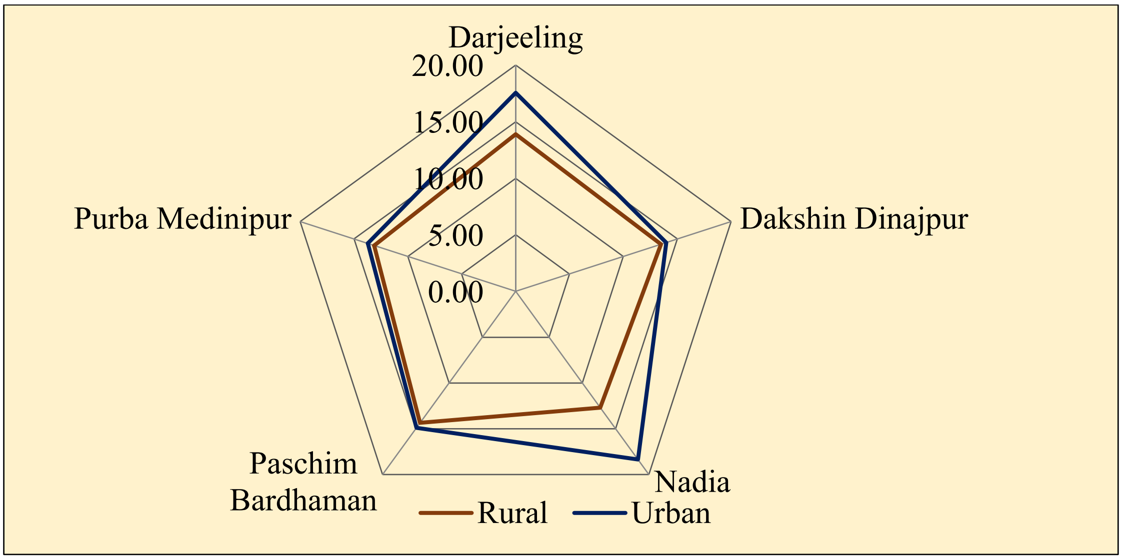

Figure 3.1.2.2: District-wise average yearly per capita rural-urban consumption of edible oil

Data Source: Primary Survey

urban areas are higher than those of rural areas. Despite having the greatest per capita consumption of edible oil, Darjeeling district comes in second place behind Nadia while considering the consumption level of urban households. Even while Darjeeling district falls behind Nadia in terms of urban consumption, the situation is the exact opposite when rural consumption is taken into account. In Dakshin Dinajpur, Paschim Bardhaman, and Purba Medinipur, the difference in the annual per capita use of edible oil in rural and urban areas is minimal, but it is significantly greater in the Nadia and Darjeeling districts.

The average yearly per capita consumption of different edible oils among the sample households is depicted in the following figure (Figure 3.1.2.3). The graph shows that, among all the edible oil types used by the sample households, mustard oil has the highest annual average consumption of 9.6 litres per person. It is interesting to note here that the most preferred edible oil variety has the highest consumption level.

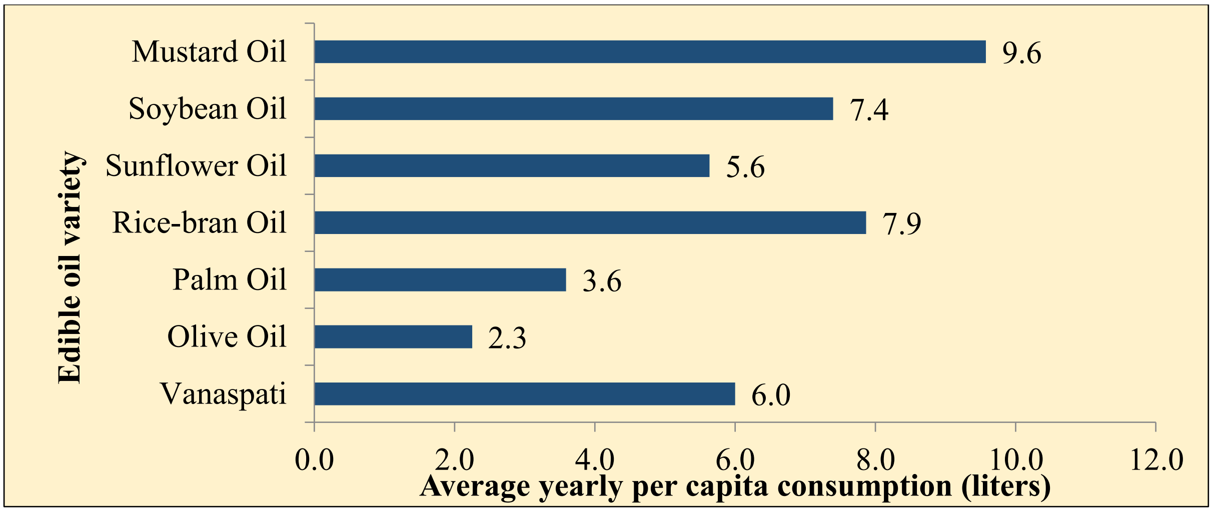

Figure 3.1.2.3: Average yearly per capita consumption of different edible oils (litres)

Data Source: Primary Survey

However, the fourth preferred rice-bran oil exhibits the second highest level of consumption, with an average of 7.9 litres per person annually, followed by soybean oil, with 7.4 litres per person annually. In a similar vein, the least preferred variety, vanaspati, has an average yearly per capita consumption of 6 litres, followed by sunflower oil, palm oil, and olive oil, with 5.6 litres, 3.6 litres, and 2.3 litres, respectively.

Table 3.1.2.1: Ranking of the edible oils according to the preference and consumption level

Edible oil variety	Preference-wise ranking	Consumption level-wise ranking
Mustard Oil	1	1
Soybean Oil	2	3
Sunflower Oil	3	5
Rice-bran Oil	4	2
Palm Oil	5	6
Olive Oil	6	7
Vanaspati	7	4

Data Source: Primary Survey

The ranking of the various edible oils according to the percentage of consumer households as well as the average per capita annual consumption is shown in Table 3.1.2.1. The data clearly shows that a higher percentage of households using a particular type of edible oil does not necessarily indicate a higher level of consumption.

The average yearly per capita consumption of different edible oils across rural and urban areas is shown in Figure 3.1.2.4. The consumption level of all types of edible oil, except mustard and sunflower oil, is higher for urban households. The highest yearly per capita consumption can be seen for mustard oil in rural areas, i.e., about 10 litres.

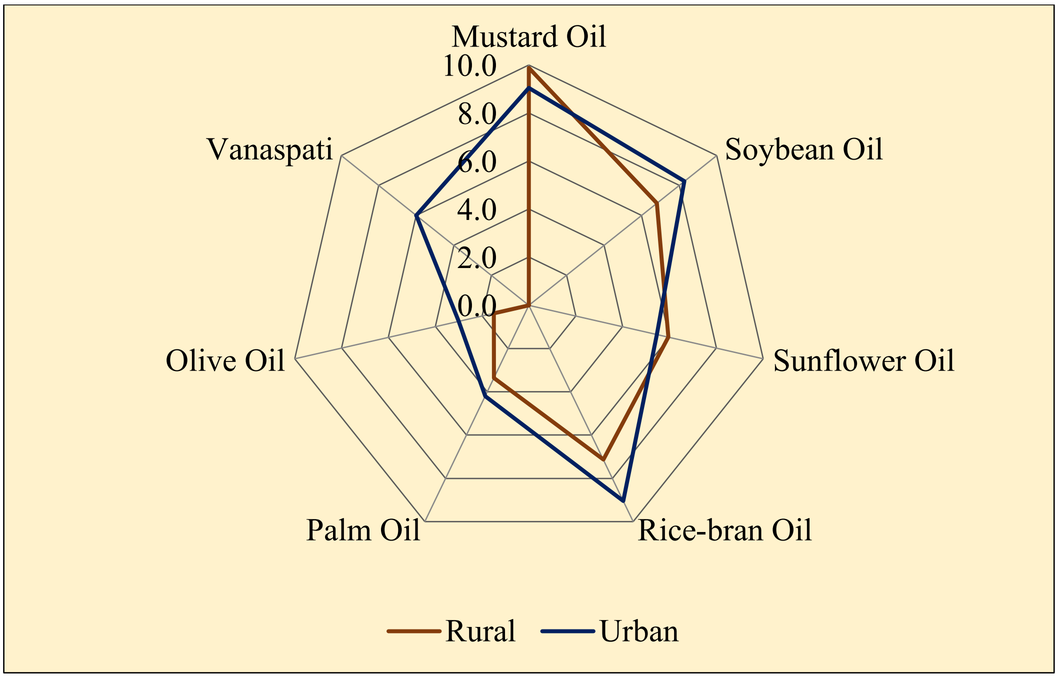

Figure 3.1.2.4: Area-wise average yearly per capita consumption of different edible oils (litres)
Data Source: Primary Survey

According to the consumption level of rural households, rice-bran oil is in the second position, with about 7 litres per person annual consumption, followed by soybean oil, sunflower oil, palm oil, and olive oil. On the other side, for urban households, the highest consumption level is observed for both mustard as well as rice-bran oil, i.e., yearly 9 litres per capita, followed by soybean oil, sunflower oil, palm oil, and olive oil. Although some urban households consume 6 litres of vanaspati per person annually, it is not often used in rural regions.

The consumption level of the four most preferred edible oils, i.e., mustard oil, soybean oil, sunflower oil, and rice-bran oil, across the sample districts as well as in their rural and urban portions is depicted in Figures 3.1.2.5a, 3.1.2.5b, and 3.1.2.5c, respectively. It is interesting to note that the difference in annual per capita consumption among the four major edible oils is least for the Darjeeling and Purba Medinipur districts. However, in Darjeeling, the yearly per capita consumption of all four major edible oils lies between 8 to 10 litres, where it lies in the

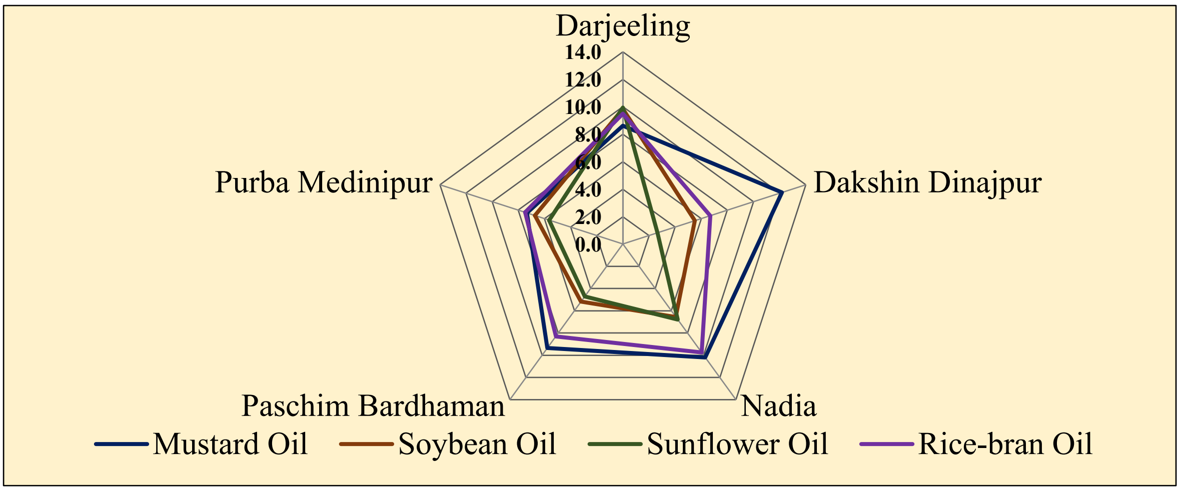

Figure 3.1.2.5a: District-wise average yearly per capita consumption of different edible oils (litres)

Data Source: Primary Survey

range of approximately 6 to 8 litres. In the case of Nadia and Paschim Bardhaman districts, the average annual per capita consumption of mustard and rice-bran oil lies between 8 to 10 litres, whereas it lies between 4 to 8 litres for soybean and sunflower oil. On the other hand, the difference in consumption level among the four major edible oils is highest for Dakshin Dinajpur. While the average annual per capita use of mustard oil in Dakshin Dinajpur is about 12 litres, it is roughly 6.5 litres, 5.5 litres, and 2.5 litres for rice-bran, soybean, and sunflower oil, respectively.

Figure 3.1.2.5b, which depicts the rural scenario, shows that Dakshin Dinajpur, Nadia, and Paschim Bardhaman have the highest consumption levels of mustard oil among all the major

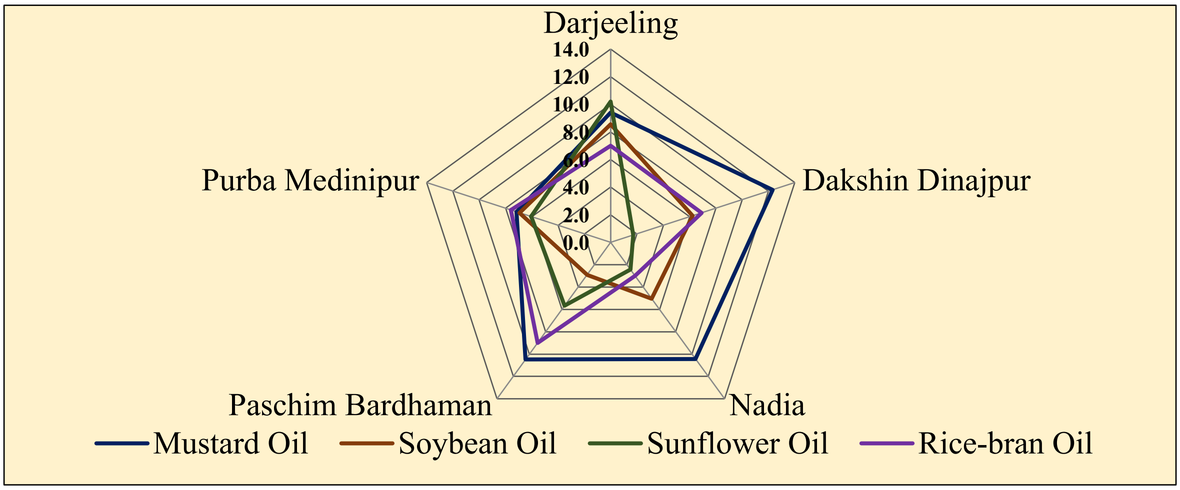

Figure 3.1.2.5b: District-wise average yearly per capita rural consumption of major edible oils (litres)

Data Source: Primary Survey

edible oil varieties, while Purba Medinipur and Darjeeling have the highest consumption levels of rice-bran oil and sunflower oil, respectively. The rural households of the Purba Medinipur district show the lowest variation in the average annual per capita consumption of major edible oils, ranging from 6 to 8 litres, followed by Darjeeling, with a range of 6 to 10 litres. On the other hand, for the rural regions of Dakshin Dinajpur, Nadia, and Paschim Bardhaman, the discrepancy between the annual per capita consumption of mustard oil and the remaining three of the most preferred edible oils is rather substantial.

On the other hand, the urban scenario depicted in Figure 3.1.2.5c shows that in Dakshin Dinajpur, Paschim Bardhaman, and Purba Medinipur, the annual per capita consumption of mustard oil is the highest among all the major edible oil varieties. However, the yearly per capita consumption of rice-bran oil is highest for Darjeeling and Nadia. Moreover, it can be

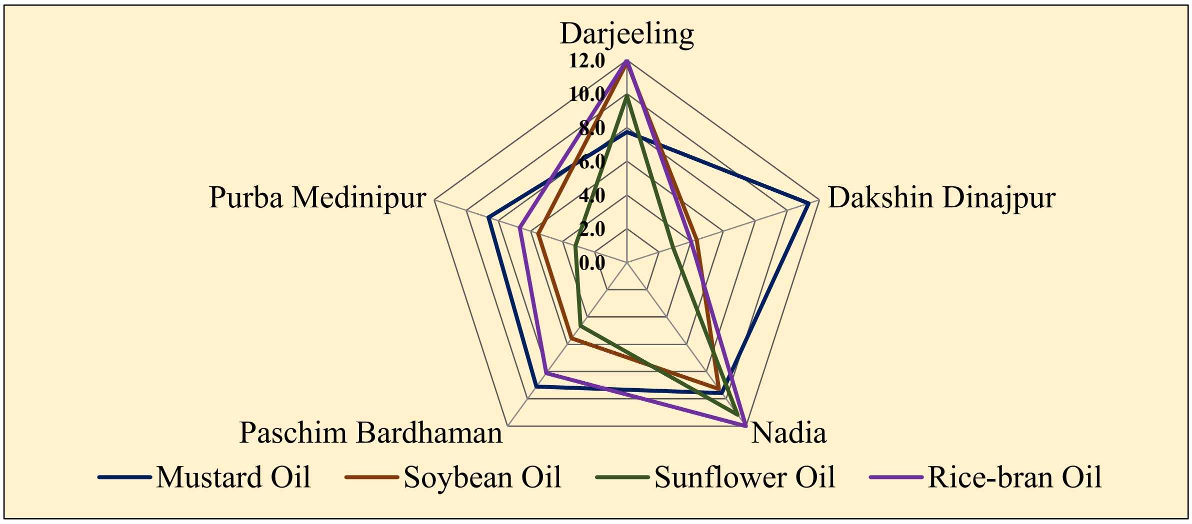

Figure 3.1.2.5c: District-wise average yearly per capita urban consumption of major edible oils (litres)
Data Source: Primary Survey

seen that the consumption rate of soybean oil is also high and almost equal to that of rice-bran oil in Darjeeling. The urban households of the Nadia district show the lowest variation in the average annual per capita consumption of major edible oils, ranging from 9 to 12 litres, followed by Darjeeling, with a range of 8 to 12 litres. In contrast, although the annual consumption of mustard oil is more than 11 litres per capita in Dakshin Dinajpur, the same is less than equal to 4 litres for the rest of the major edible oil varieties.

Table 3.1.2.2 provides the exact figures of the average annual per capita consumption of various edible oils in the sample districts and their rural and urban areas.

Table 3.1.2.2: District-wise rural-urban average yearly per capita consumption of different edible oils

(Values are in litres)

	Darjeeling			Dakshin Dinajpur			Nadia			Paschim Bardhaman			Purba Medinipur		
Edible oil variety	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
Mustard Oil	8.6	9.4	7.7	12.2	12.3	11.3	10.2	10.4	9.6	9.4	10.5	9.1	7.3	7.2	8.6
Soybean Oil	9.8	8.6	11.9	5.5	6.2	4.4	6.6	5.0	9.3	5.2	2.9	5.6	6.7	6.9	5.5
Sunflower Oil	9.9	10.2	9.9	2.6	1.7	2.9	6.8	2.4	11.2	4.7	5.7	4.6	5.6	6.1	3.2
Rice-bran Oil	9.5	7.0	12.0	6.7	6.9	4.0	9.8	3.0	12.0	8.3	9.0	8.1	7.5	7.6	6.7
Palm Oil	-	-	-	1.7	1.7	-	-	-	-	3.7	3.4	4.2	4.0	4.0	-
Olive Oil	-	-	-	-	-	-	1.5	1.5	-	3.0	-	3.0	-	-	-
Vanaspati	-	-	-	-	-	-	-	-	-	6.0	-	6.0	-	-	-

Data Source: Primary Survey

3.2 Preference and consumption level of various edible oils across socioeconomic status

This section presents the preferences and consumption levels of various edible oils of the sample households across their socio-economic status. The socio-economic status of the sample households has been proxied by the following four indicators.

- The number of the members in the family (family size)
- Age of the household head
- Educational qualification of the household head
- Monthly income of the household

This section is also divided into two subsections, 3.2.1 and 3.2.2, in which 3.2.1 addresses preferences for various edible oils, and 3.2.2 examines the consumption level of various edible oils of the sample households across their socioeconomic status.

3.2.1 Preferences of various edible oils across the socio-economic status

The preferences of the sample households for different edible oils based on their socioeconomic condition are explored here. As previously said, the percentage of consumer households for each type of edible oil is considered in order to understand the preferences for different edible oils. The following figure (3.2.1.1) shows the family size-wise percentage of

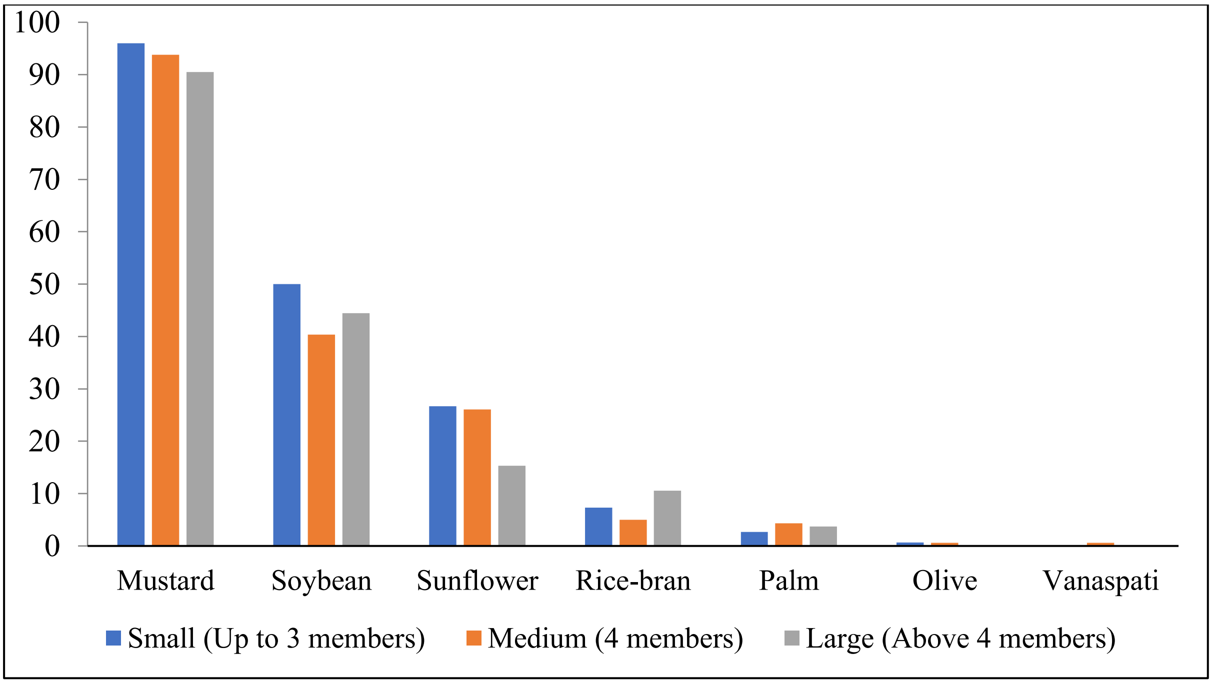

Figure 3.2.1.1: Family size-wise distribution of consumer households for various edible oils

Data Source: Primary Survey

the consumer households for various edible oil types. It provides insights into the edible oil preferences of households classified by small (up to 3 members), medium (4 members), and large (above 4 members) family sizes. It can be seen from the figure that mustard oil is the most preferred edible oil, indicating its widespread popularity and acceptance. However, the proportion of households consuming mustard oil decreases as the family size increases. A similar pattern can also be seen for the sunflower oil. Regarding rice-bran and soybean oil, the proportion of consumer households initially decreases with the increase in family size, but it rises for large families. Smaller families make up the majority of consumer households for mustard, soybean, and sunflower oil, whilst large and medium families make up the majority for rice-bran and palm oil, respectively.

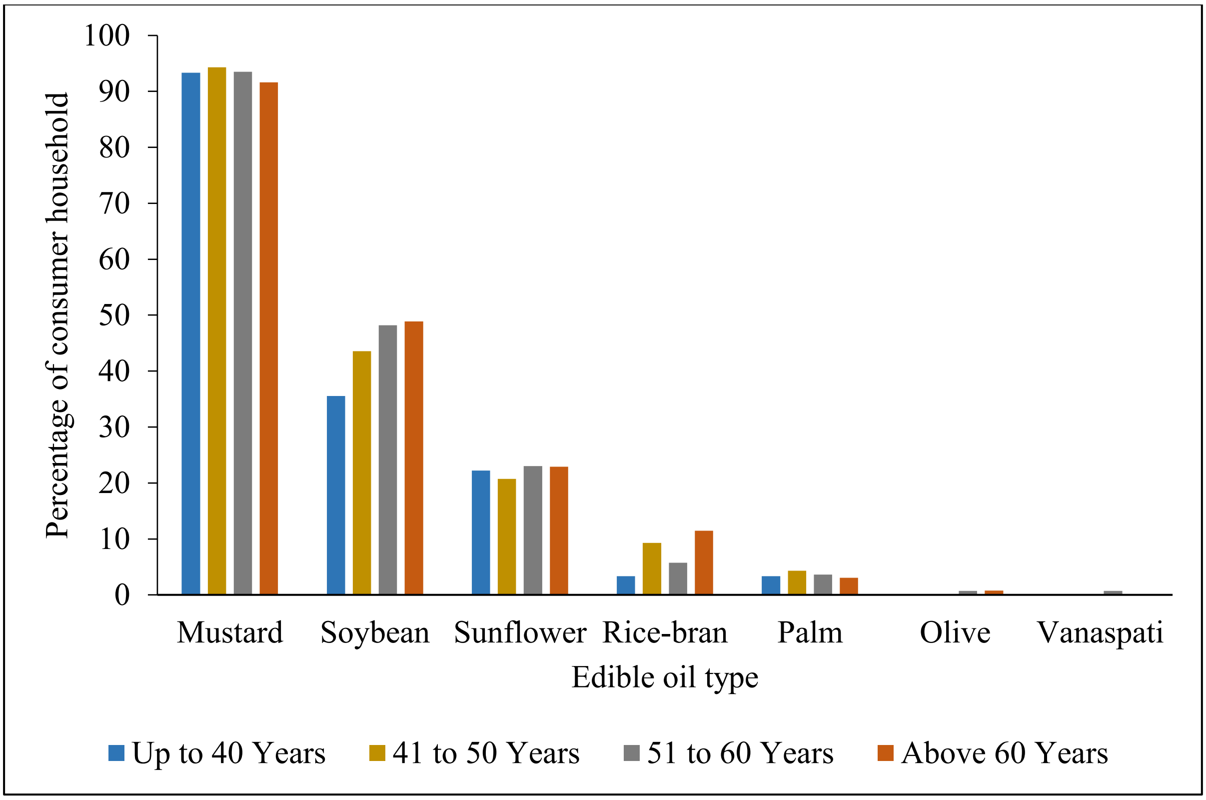

Figure 3.2.1.2: Age category of the household head-wise distribution of consumer households for various edible oils

Data Source: Primary Survey

The age category of the household head-wise distribution of consumer households for various edible oils is depicted in Figure 3.2.1.2. The preference for mustard oil is highest and almost similar for all the age groups. However, the preference for soybean oil increases with the increase in the age of household heads. In a similar vein, the preference for sunflower oil is also higher for households with a head aged more than fifty years. The households headed by those over sixty years old exhibit the greatest inclination towards rice-bran oil. However, in the case of palm oil, the preference is almost the same for all the age groups of the household head.

The educational status of the household head-wise distribution of consumer households for various edible oils is shown in Figure 3.2.1.3. It can be seen from the figure that the proportion of households consuming mustard and sunflower oil increases with the increase in the educational qualification of the household head. With the exception of households where the head has only up to a primary level of education, the percentage of households using soybean oil is about the same across all education categories. On the other hand, the percentage of households utilising rice-bran oil rises with the educational standing of the household head, with the exception of those where the head has a higher secondary level of education. It's interesting to note that the proportion of families consuming palm oil initially rises with the level of education obtained by the head of the family; however, this proportion falls for households with heads who have completed secondary school or above.

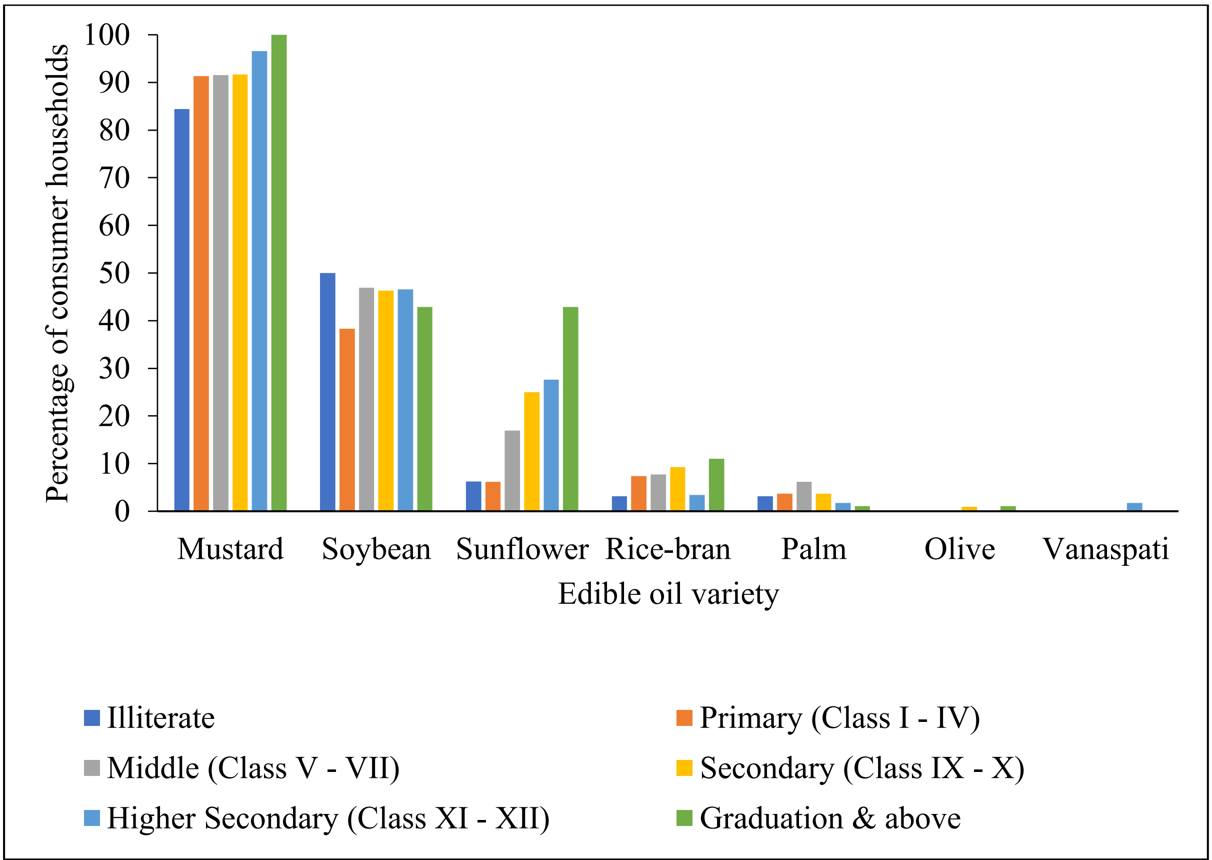

Figure 3.2.1.3: Educational status of the household head-wise distribution of consumer households for various edible oils

Data Source: Primary Survey

The preference for various types of edible oil across the monthly income of households is depicted in Figure 3.2.1.4. As stated before, the monthly income of the sample households is categorised into five categories. Except for the lowest income category, the percentage of sample households consuming mustard oil shows a positive relation with the monthly income of the households. In a similar line, households with higher monthly incomes tend to favour sunflower oil. Contrarily, households with higher monthly incomes have less of a preference for palm oil. Additionally, the result shows that households in the highest income category have the maximum demand for rice-bran oil. Compared to families in the top and lowest income levels, families belonging to the middle-income level show a larger preference for soybean oil.

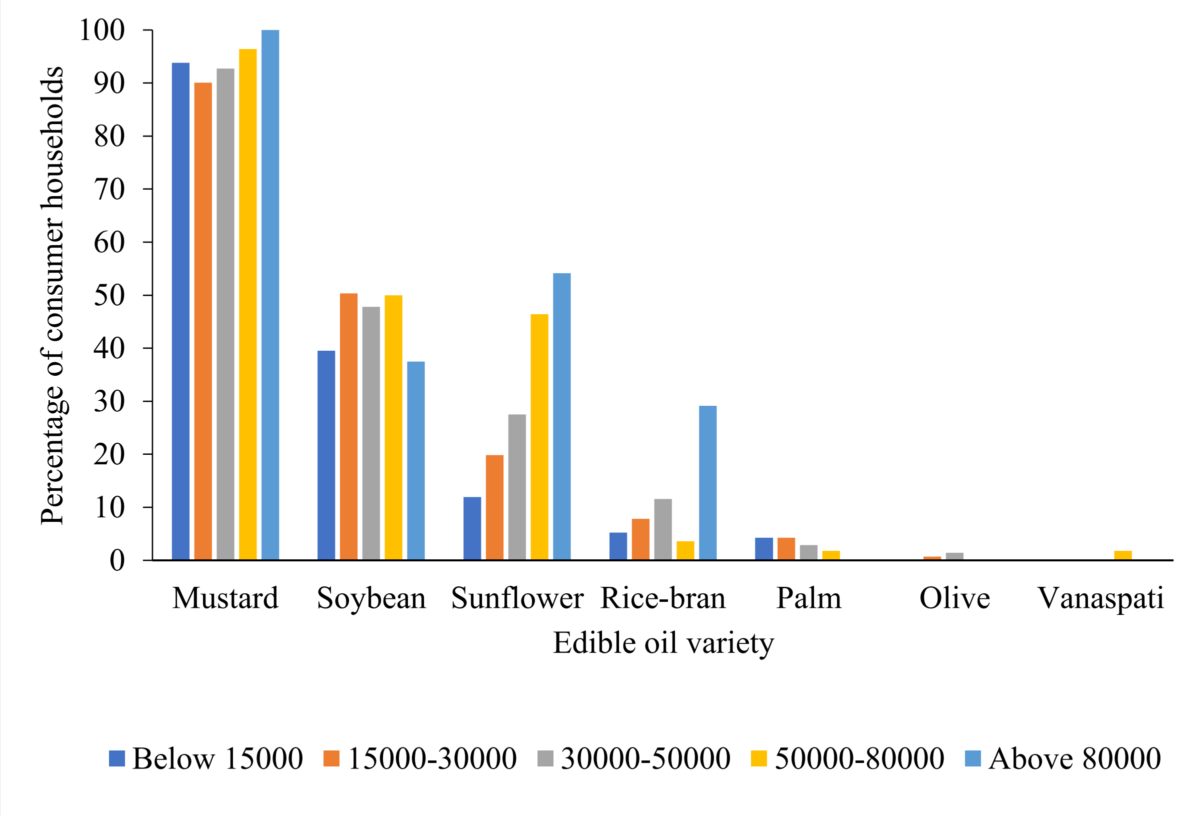

Figure 3.2.1.4: Households' monthly income category-wise distribution of consumers households for various edible oils

Data Source: Primary Survey

As can be observed in the aforementioned section, very few sample houses utilise olive oil and vanaspati; hence, they are not included in the above discussion. The exact percentage of consumer households for various types of edible oil across their socio-economic status is depicted in Table 3.2.1.1.

Table 3.2.1.1: Preference for various types of edible oil across the socio-economic indicators of the sample households

(Values are in percentage)

Socioeconomic indicator	Category	Mustard	Soybean	Sunflower	Rice-bran	Palm	Olive	Vanaspati
Family size	Small (Up to 3 members)	96.0	50.0	26.7	7.3	2.7	0.7	-
	Medium (4 members)	93.8	40.4	26.1	5.0	4.3	0.6	0.6
	Large (Above 4 members)	90.5	44.4	15.3	10.6	3.7	-	-
Age of the household head	Up to 40 Years	93.3	35.6	22.2	3.3	3.3	-	-
	41 to 50 Years	94.3	43.6	20.7	9.3	4.3	-	-
	51 to 60 Years	93.5	48.2	23.0	5.8	3.6	0.7	0.7
	Above 60 Years	91.6	48.9	22.9	11.5	3.1	0.8	-
Educational qualification of the household head	Illiterate	84.4	50.0	6.3	3.1	3.1	-	-
	Primary (Class I-IV)	91.4	38.3	6.2	7.4	3.7	-	-
	Middle (Class V-VII)	91.5	46.9	16.9	7.7	6.2	-	-
	Secondary (Class IX-X)	91.7	46.3	25.0	9.3	3.7	0.9	-
	Higher Secondary (Class XI-XII)	96.6	46.6	27.6	3.4	1.7	-	1.7
	Graduation & above	100.0	42.9	42.9	11.0	1.1	1.1	-
Monthly income of the household	Below 15000 Rs.	93.8	39.5	11.9	5.2	4.3	-	-
	15000-30000 Rs.	90.1	50.4	19.9	7.8	4.3	0.7	-
	30000-50000 Rs.	92.8	47.8	27.5	11.6	2.9	1.4	-
	50000-80000 Rs.	96.4	50.0	46.4	3.6	1.8	-	1.8
	Above 80000 Rs.	100.0	37.5	54.2	29.2	-	-	-

Data Source: Primary Survey

3.2.2 Consumption level of various edible oils across the socio-economic status

This section discusses the consumption levels of various edible oils across the socio-economic status of the consumer households. As previously mentioned, in order to figure out the consumption levels of various edible oils, the annual per capita consumption of those oils is taken into consideration. In this line, the following figure (Figure 3.2.2.1) illustrates the average yearly per capita consumption of different types of edible oils across the family size of sample households.

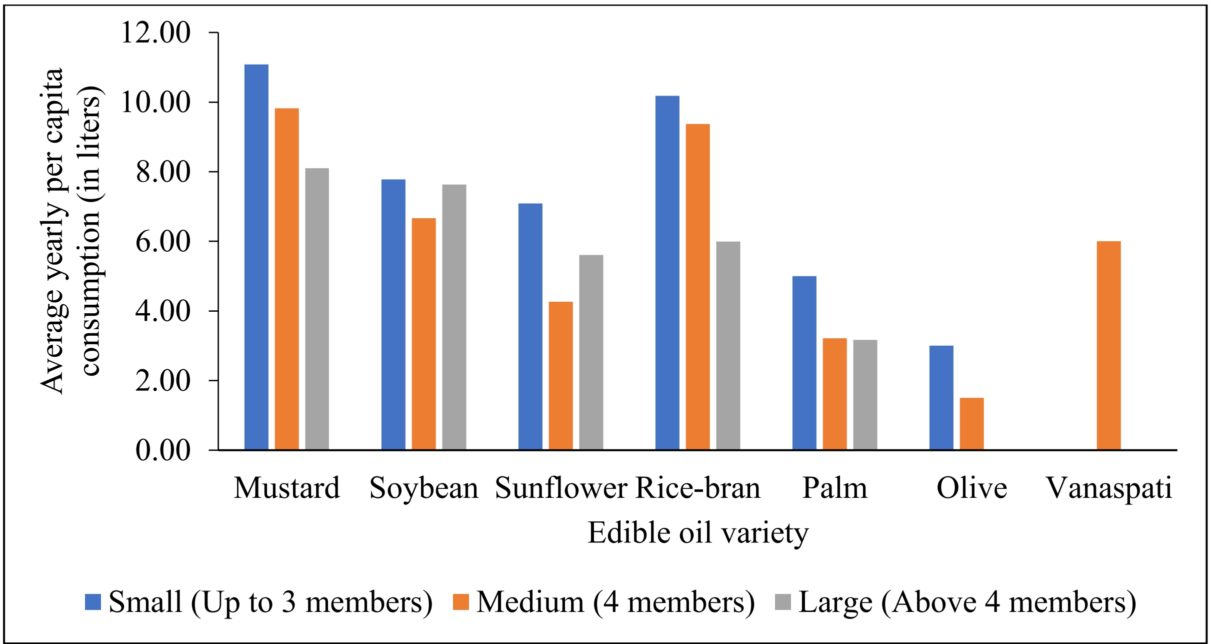

Figure 3.2.2.1: Family size-wise per capita consumption of different types of edible oil

Data Source: Primary Survey

The diagram above illustrates that the consumption level of small families is the highest for all types of edible oil except vanaspati. It is interesting to observe that on an annual basis, middle-sized households consume more mustard and rice-bran oil per person than large families. For soybean and sunflower oil, on the other hand, the situation is exactly the opposite; for palm oil, medium-sized and large-sized families consume almost the same amount.

The consumption level of various edible oils across the age category of the household head is represented in Figure 3.2.2.2. The average yearly intake of mustard oil per person is shown to decline as the age of the head of the family rises. Similar to this, annual per capita consumption of sunflower oil declines with increasing household head age; nevertheless, consumption levels rise for households with heads older than sixty years. Again, families with younger heads consume more soybean oil annually per person on average than families with older heads. In contrast, as the age of the family head increases, the average annual intake of palm oil per person is found to increase. Although the consumption level of rice-bran oil is also found to increase as the age of the family head increases, for households with heads older than sixty years, the average annual intake of rice-bran oil decreases.

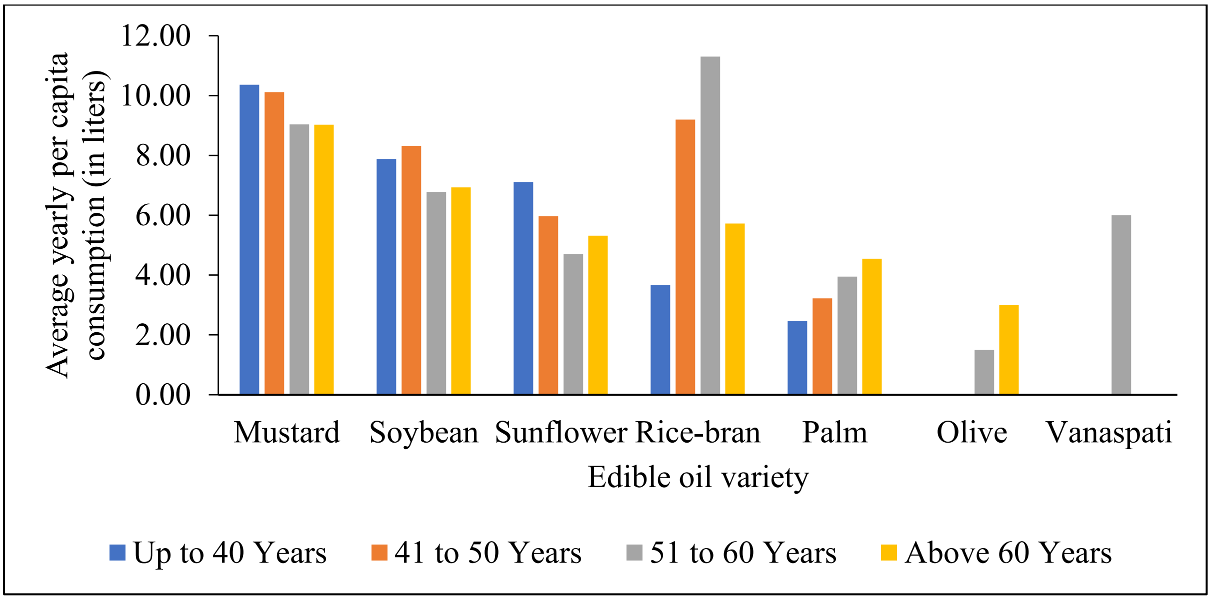

Figure 3.2.2.2: Household head's age category-wise consumption level of various edible oils

Data Source: Primary Survey

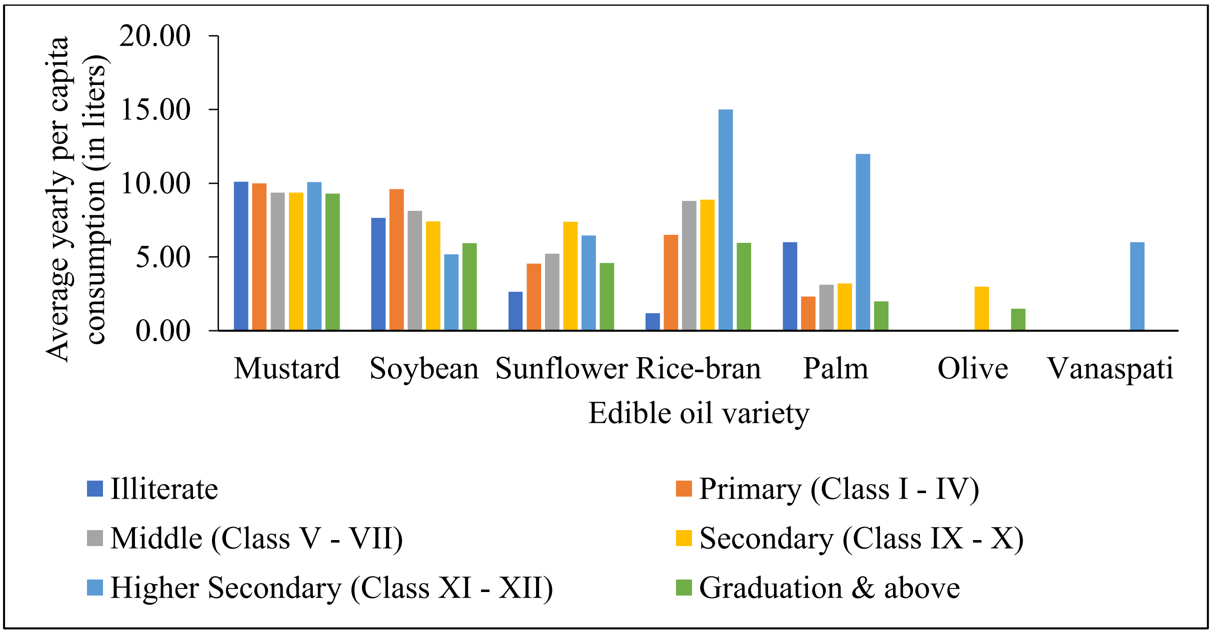

Figure 3.2.2.3: Household head's educational status-wise consumption level of various edible oil

Data Source: Primary Survey

The average annual per capita consumption of various edible oils across the educational status of the household head is represented in Figure 3.2.2.3. Regardless of the level of education of the head of the household, it has been noted that the average annual consumption of mustard oil per person is roughly identical. The relationship between the average yearly per capita intake of different edible oils and the educational attainment of the head of the household, however, does not appear to follow any discernible pattern. Nonetheless, a positively skewed graph for soybean oil and a negatively skewed graph for rice-bran and sunflower oils suggest that households headed by the person with lower levels of education consume more soybean oil, while higher levels of education consume more rice-bran and sunflower oils.

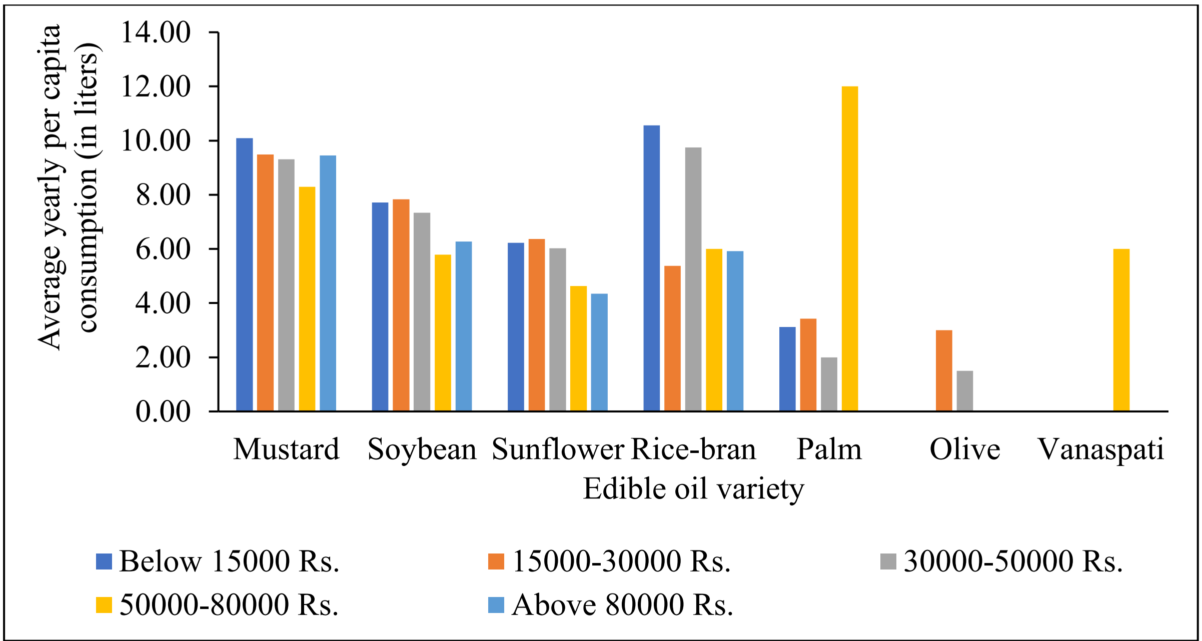

Figure 3.2.2.4: Households' monthly income category-wise consumption level of various edible oil

Data Source: Primary Survey

Figure 3.2.2.4 provides insights into the consumption level of various edible oils across the monthly income categories of households. It is evident from the figure that with the exception of the highest income group, the average annual per capita consumption of mustard oil is likely to decline as monthly household income rises. Also, for soybean and sunflower oil, the consumption levels of lower-income groups are relatively higher than those of higher-income groups. The exact amount of the average annual per capita consumption of various types of edible oil across the socio-economic status of the sample households is depicted in Table 3.2.2.1.

Table 3.2.2.1: Consumption level of various types of edible oil across the socio-economic indicators of the sample households

(Values are in litres)

Socioeconomic indicator	Category	Mustard	Soybean	Sunflower	Rice-bran	Palm	Olive	Vanaspati
Family size	Small (Up to 3 members)	11.1	7.8	7.1	10.2	5.0	3.0	-
	Medium (4 members)	9.8	6.7	4.3	9.4	3.2	1.5	6.0
	Large (Above 4 members)	8.1	7.6	5.6	6.0	3.2	-	-
Age of the household head	Up to 40 Years	10.4	7.9	7.1	3.7	2.5	-	-
	41 to 50 Years	10.1	8.3	6.0	9.2	3.2	-	-
	51 to 60 Years	9.0	6.8	4.7	11.3	4.0	1.5	6.0
	Above 60 Years	9.0	6.9	5.3	5.7	4.6	3.0	-
Educational qualification of the household head	Illiterate	10.1	7.7	2.6	1.2	6.0	-	-
	Primary (Class I-IV)	10.0	9.6	4.5	6.5	2.3	-	-
	Middle (Class V-VII)	9.4	8.1	5.2	8.8	3.1	-	-
	Secondary (Class IX-X)	9.4	7.4	7.4	8.9	3.2	3.0	-
	Higher Secondary (Class XI-XII)	10.1	5.2	6.5	15.0	12.0	-	6.0
	Graduation & above	9.3	5.9	4.6	6.0	2.0	1.5	-
Monthly income of the household	Below 15000 Rs.	10.1	7.7	6.2	10.6	3.1	-	-
	15000-30000 Rs.	9.5	7.8	6.4	5.4	3.4	3.0	-
	30000-50000 Rs.	9.3	7.3	6.0	9.8	2.0	1.5	-
	50000-80000 Rs.	8.3	5.8	4.6	6.0	12.0	-	6.0
	Above 80000 Rs.	9.5	6.3	4.3	5.9	-	-	-

Data Source: Primary Survey

3.3 Trends in the consumption pattern of different edible oils in West Bengal

This section explores the dynamic realm of edible oil consumption among sample households, drawing insights from recall data provided by respondents. The analysis of changes in the quantity of edible oil consumed not only sheds light on dietary preferences but also provides insights into broader economic landscapes, including market demand dynamics. In this line, the following figure (Figure 3.3.1) illustrates the percentage change in average yearly household consumption of edible oil across the sample districts over the last five years.

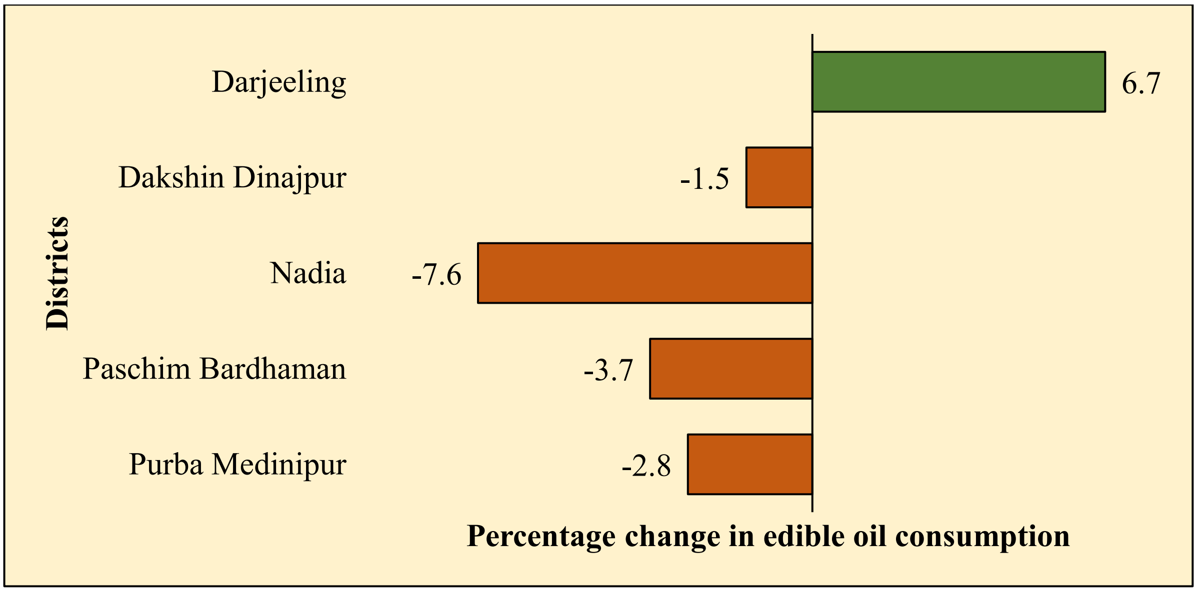

Figure 3.3.1: District-wise percentage change in average yearly household consumption of edible oil in 5 years

Data Source: Primary Survey

According to Figure 3.3.1, among the five districts, Darjeeling stands out as the only district where the average yearly household consumption of edible oil increased by 6.7 per cent over a period of 5 years. Conversely, Nadia experienced the highest decrease of 7.6 per cent in the average yearly household consumption of edible oil during the same period, followed by Paschim Bardhaman (3.7 per cent), Purba Medinipur (2.8 per cent), and Dakshin Dinajpur (1.5 per cent).

It is important to note that the percentage change in edible oil consumption over last five years across districts differed while considering the location of the households. The following figure (Figure 3.3.2) demonstrates the percentage change in the average annual household consumption of edible oil in rural and urban areas over a five-year period across the sample districts.

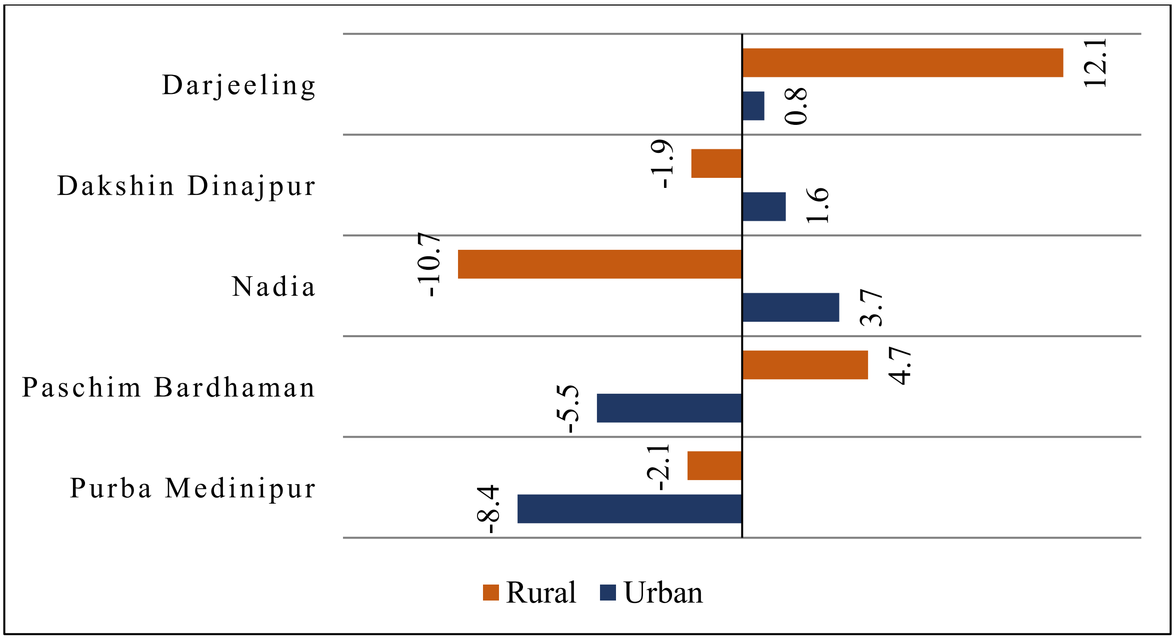

Figure 3.3.2: Percentage changes in the average annual household use of edible oil in rural and urban areas over a five-year period across the sample districts.

Data Source: Primary Survey

It can be seen from the above figure that in the Darjeeling district, there's a clear uptick in average household consumption of edible oil for both rural and urban areas. Remarkably, rural households exhibit a more substantial percentage increase (12.1 per cent) compared to urban ones (0.8 per cent). However, in Purba Medinipur district, the scenario flips entirely. Here, both rural and urban households experience a decline in average yearly consumption of edible oil, with urban households showing a higher percentage decrease (8.4 per cent) compared to rural ones (2.1 per cent).

On the other hand, in Nadia and Dakshin Dinajpur districts, there was a decline in edible oil consumption among rural households by 10.7 per cent and 1.9 per cent, respectively. However, urban households in these districts experienced an increase in consumption by 3.7 per cent and 1.6 per cent, respectively. In contrast, in Paschim Bardhaman district, while rural households saw a 4.7 per cent increase in edible oil consumption, urban households experienced a decrease of 5.5 per cent.

The change in average yearly household consumption not only varies across districts or rural-urban locations of households but also varies across different types of edible oils. The subsequent table (Table 3.3.1) illustrates the percentage change in average yearly household consumption of major edible oil types across districts and areas over the last five years.

Table 3.3.1: District & area-wise percentage change in average yearly household consumption of major types of edible oil in five years (Values are in per cent)

District	Area	Mustard Oil	Soybean Oil	Sunflower Oil	Rice-bran Oil
Darjeeling	Total	2.59	9.74	-5.77	-13.33
	Rural	**5.62**	18.53	14.29	-10.00
	Urban	-1.81	0.24	-11.54	**-30.00**
Dakshin Dinajpur	Total	-5.81	14.61	-10.00	-16.67
	Rural	-6.69	6.03	0.00	-12.50
	Urban	0.99	19.05	-12.50	*
Nadia	Total	-14.10	10.55	-10.34	-6.25
	Rural	-14.99	11.14	**-40.00**	*
	Urban	-9.59	10.08	**21.43**	12.50
Paschim Bardhaman	Total	-5.56	-17.78	-0.77	-13.04
	Rural	-0.77	0.00	9.09	-12.50
	Urban	-7.02	**-19.97**	-1.49	-17.11
Purba Medinipur	Total	-10.18	11.46	-14.34	3.78
	Rural	-8.21	8.53	-15.81	0.41
	Urban	**-23.46**	**45.71**	-8.33	**25.00**

* Some of the respondent households have recently started to consume rice-bran oil.

Data Source: Primary Survey

The table above illustrates that over the last five years the percentage change in average yearly household consumption of different edible oils varies not only across districts but also between rural and urban areas within those districts. Concerning Mustard oil, apart from the Darjeeling district, both rural and urban areas across all sampled districts exhibit a decline in consumption over the last five years. However, there's a slight positive change observed in the urban area of the Dakshin Dinajpur district. Despite overall increases in mustard oil consumption in the Darjeeling district and its rural areas, the urban region of this district experiences a negative change in average yearly consumption per household.

Regarding Soybean oil, all sampled districts' rural and urban areas exhibit a positive change in consumption except for Paschim Bardhaman. In this district, while the average soybean oil consumption has remained unchanged for rural households over the last five years, it has declined by nearly 20 per cent for urban households.

In the past five years, all districts have shown a decrease in sunflower oil consumption. Nonetheless, sunflower oil consumption has remained unchanged in the rural area of Dakshin Dinajpur district and has increased in the rural areas of Darjeeling and Paschim Bardhaman districts, as well as in the urban area of Nadia district. It is noteworthy that among all sampled districts, the highest negative and positive changes in sunflower oil consumption can be observed in the rural and urban areas of Nadia district, respectively.

Figure 3.1.1.1 reveals that only 7.8 per cent of the total sampled households are utilizing Rice-bran oil. Despite the current average annual per-household consumption being less than it was five years ago, this trend is prevalent across all sample districts except for Purba Medinipur. Notably, there is a positive trend in the urban areas of the Nadia district. Moreover, there is an emerging trend where some households in the urban area of Dakshin Dinajpur and the rural area of Nadia district have begun to adopt rice-bran oil consumption recently.

Understanding the consumption dynamics of edible oil in West Bengal provides valuable insights into the dietary habits and preferences of its population. However, to grasp the full picture of the region's edible oil landscape, it is essential to examine the production side as well. The cultivation of oilseeds within the state plays a pivotal role in shaping its edible oil market, influencing factors such as supply availability, pricing, and economic sustainability. Thus, the subsequent chapter will comprehensively discuss this facet, offering a more detailed insight into the region's edible oil landscape.

Chapter – IV

Oilseed Production in West Bengal

In this chapter, the empirical results obtained in relation to the fourth objective of the study are provided. This objective concerns the examination of the present scenario regarding the production of oilseed in West Bengal. Through the analysis of secondary data, insights have been gathered that shed light on various aspects of oilseed cultivation within the state. The examination encompasses factors such as the types of oilseeds predominantly cultivated, the geographical distribution of cultivation areas, yields achieved, and challenges encountered in the production process. These findings serve to enrich the understanding of the agricultural landscape in the region, providing valuable insights for policymakers, researchers, and stakeholders involved in the development and sustainability of the oilseed industry.

4.1 Status of the area, production, and yield rate of the oilseed in India and West Bengal

Understanding the landscape of the area, production, and yield rate of the oilseed in both India and West Bengal holds significant importance in grasping regional performance within the broader national framework. Analyzing these metrics allows for the assessment of West Bengal's progress in oilseed cultivation relative to nationwide trends. Figures 4.1, 4.2, and 4.3 play a pivotal role in this exploration, providing valuable insights through comparative analysis of the compound annual growth rate (CAGR) of area production and yield rate in comparison to the baseline year of 2010-11, both for India and West Bengal.

Figure 4.1 presents the compound annual growth rate of the combined oilseed area in India and West Bengal relative to the base year of 2010-11. The data illustrates varying trends over the years. In the fiscal year 2011-12, West Bengal saw marginal positive growth, while India experienced a negative trend. Subsequently, India showed sporadic positive shifts, while West Bengal consistently maintained positive growth. The CAGR of India's total oilseed area generally depicted a negative trend compared to 2010-11, with a few instances of positive movement, notably in 2013-14 and 2019-20. Conversely, West Bengal consistently exhibited positive growth in its oilseed area throughout the analyzed period. Consequently, it can be inferred that West Bengal surpassed India in terms of CAGR for the overall oilseed area.

The situation closely mirrors the overall oilseed production in both India and West Bengal, as illustrated in Figure 4.2. From 2011-12 to 2019-20, the CAGR of total oilseed production

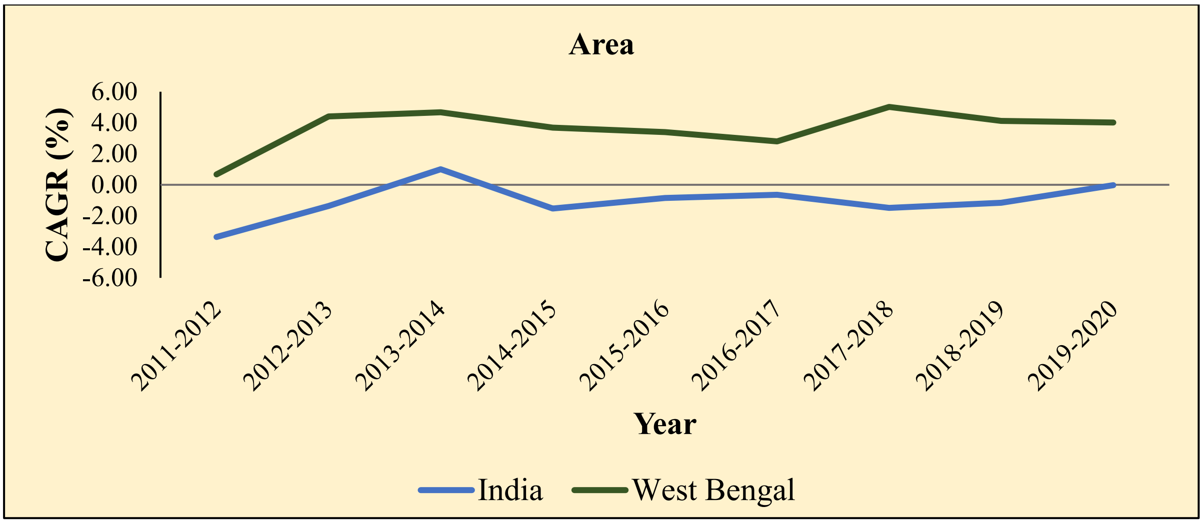

Figure 4.1: CAGR of the area of total oilseeds in India & West Bengal, compared to 2010-2011
Data Source: Handbook of Statistics on Indian States, RBI

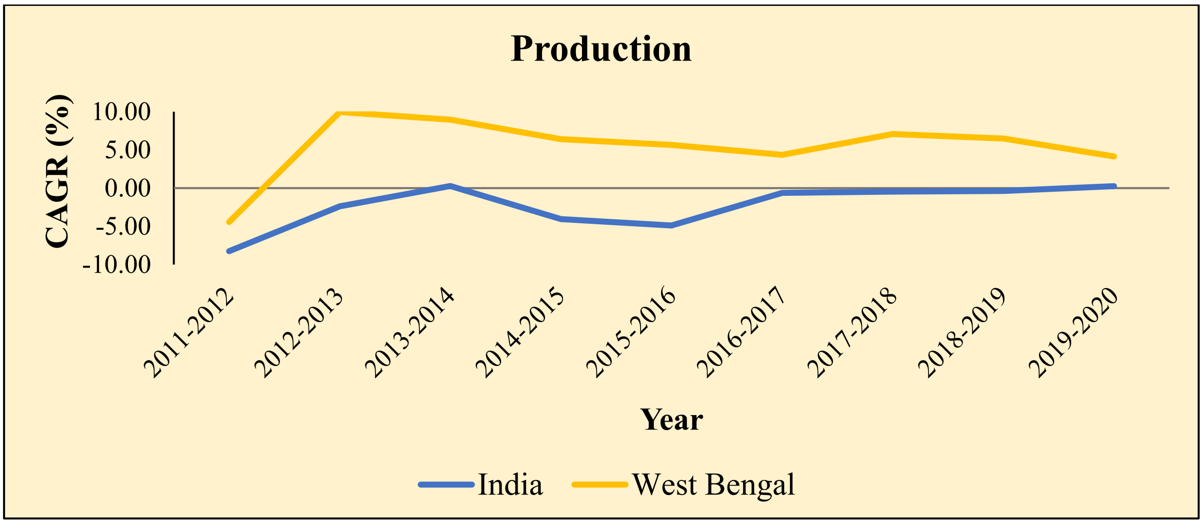

Figure 4.2: CAGR of the production of total oilseeds in India & West Bengal, compared to 2010-2011
Data Source: Handbook of Statistics on Indian States, RBI

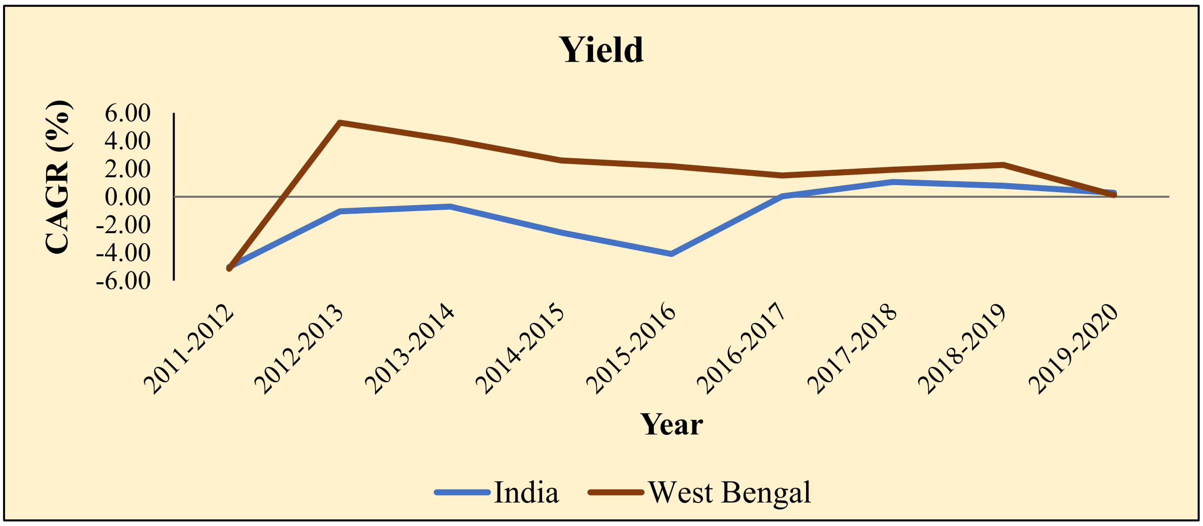

Figure 4.3: CAGR of the yield of total oilseeds in India & West Bengal, compared to 2010-2011
Data Source: Handbook of Statistics on Indian States, RBI

compared to the year 2010-11 in West Bengal, was higher than that of India. Despite the CAGR of total oilseed production in India and West Bengal being negative in 2011-12 compared to 2010-11, West Bengal unswervingly demonstrated positive growth thereafter. Conversely, India witnessed predominantly negative growth between 2012-13 and 2019-20.

Nevertheless, West Bengal faces a worrisome scenario regarding the yield rate of total oilseeds, as depicted in Figure 4.3. Both India and West Bengal witnessed a negative CAGR in the yield of total oilseeds for the year 2011-12 compared to 2010-11. Subsequently, West Bengal demonstrated a positive CAGR in the yield of total oilseeds, while India's CAGR remained consistently lower. From 2016-17 to 2019-20, India's yield exhibited a positive growth rate. However, for West Bengal, the CAGR of the yield rate of total oilseed consistently declined after 2012-13. Despite its evident dominance in preceding periods, by 2019-20, its CAGR aligned with India's.

While there have been improvements in the yield rate of total oilseed in India, West Bengal has struggled to keep pace. Despite India's strides in enhancing its yield rate, West Bengal has faced challenges in matching this progress. This discrepancy underscores the need for targeted interventions and strategies to address the specific constraints hindering West Bengal's agricultural productivity in the oilseed sector.

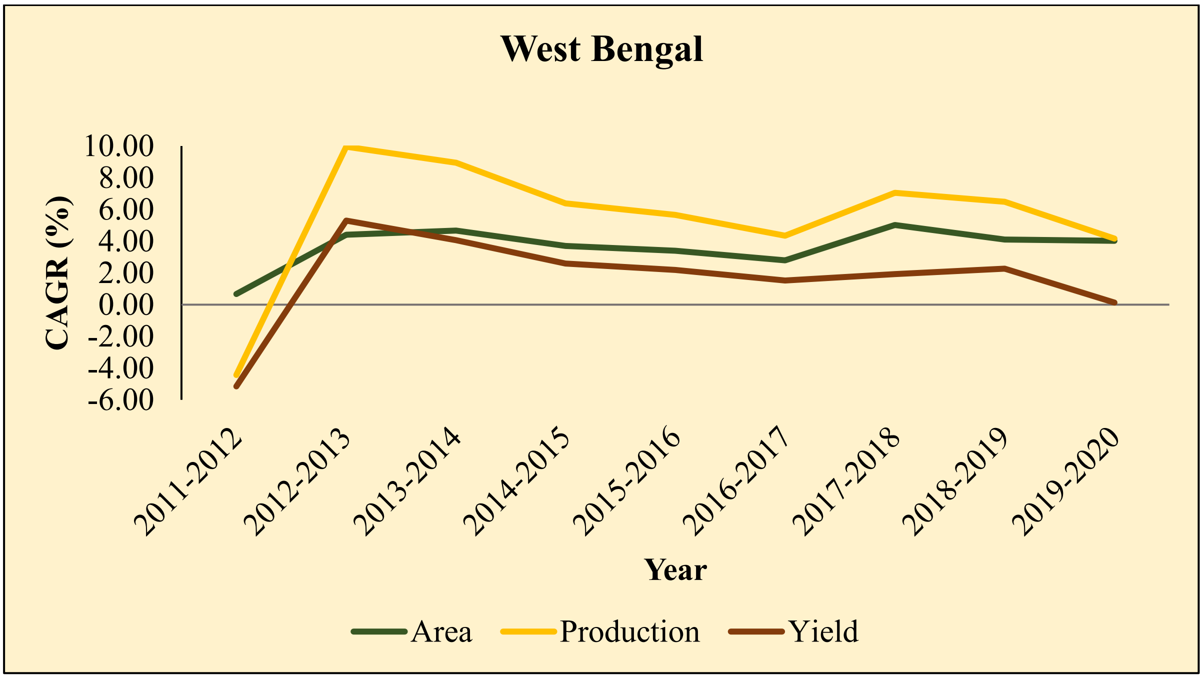

Figure 4.4: Year-wise CAGR of the area, production and yield of the total oilseed in West Bengal compared to 2010-2011

Data Source: Handbook of Statistics on Indian States, RBI

Figure 4.4 illustrates the year-wise CAGR of the area, production, and yield of total oilseeds in West Bengal relative to the base year of 2010-11. In 2011-12, a negative CAGR was observed for production and yield, contrasting with the positive growth in the area. Subsequently, production exhibited a growth rate surpassing that of yield and area, signalling a notable shift in West Bengal's oilseed cultivation dynamics. However, by 2019-20, the CAGR of both area and production closely aligned, indicating a comparable growth trajectory between the two factors, while the CAGR of yield approached zero, suggesting a plateau in yield improvement.

4.2 District-wise scenario of the area, production, and yield rate of the oilseed

In order to comprehensively grasp the intricate landscape of oilseed production in West Bengal, the examination of production dynamics at the district level is imperative. Hence, delving into oilseed production data of individual districts, along with various agroclimatic zones within West Bengal, can unveil variations across different geographic regions influenced by diverse factors such as climatic conditions, soil characteristics, agricultural practices, and socioeconomic factors. This comprehensive approach facilitates a holistic understanding of regional disparities, potentials, and opportunities in oilseed production, thereby enabling informed decision-making and strategic interventions to enhance the overall productivity and sustainability of the oilseed sector in the state.

Figure 4.5.1 illustrates the district-wise share of land dedicated to oilseed cultivation compared to the total oilseed cultivation area in West Bengal during the 2021-22 period. The data reveal a widespread distribution of oilseed production across all the districts of the state. Notably, Murshidabad emerges as the foremost district, boasting a significant share of 14.92 per cent in the total oilseed cultivation area of West Bengal. Following closely behind are Nadia, contributing 12.45 per cent, and Paschim Medinipur, with 9.71 per cent. In contrast, Alipurduar, Paschim Burdwan, Darjeeling and Kalimpong hold notably lower positions, each accounting for less than one per cent of the total oilseed production area within the state.

The scenario is almost the same when considering the district-wise share of West Bengal's total oilseed production in 2021-22. As depicted in Figure 4.5.2, Murshidabad emerges as the leading district, contributing 14.72 per cent to the state's total oilseed production, followed by Nadia with 10.41 per cent, Paschim Medinipur with 9.11 per cent, and Dakshin Dinajpur and Uttar Dinajpur with 8.44 and 8.37 per cent, respectively. Conversely, Alipurduar, Paschim

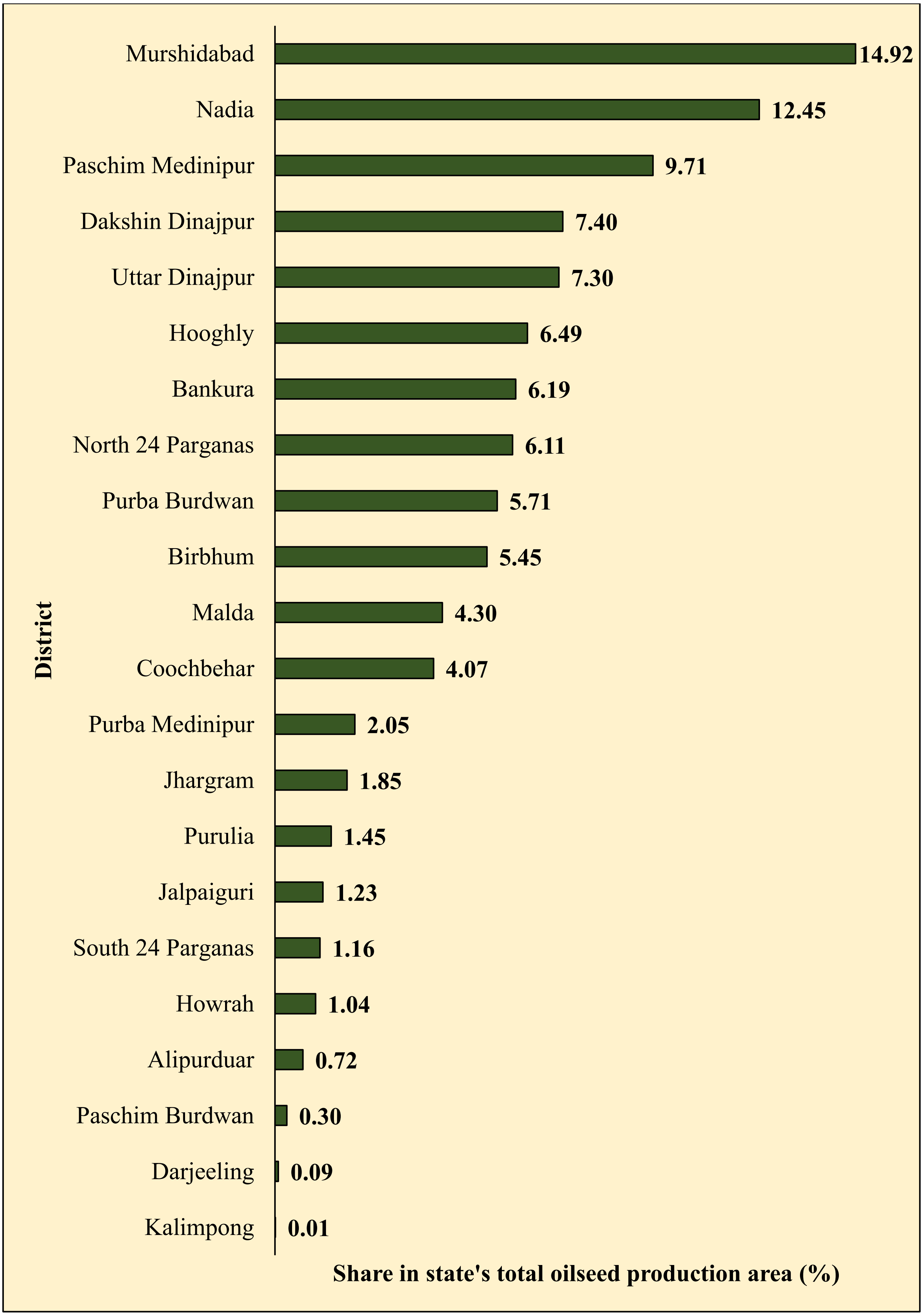

Figure 4.5.1: District-wise share of West Bengal's total oilseed production area in 2021-22

Data source: Directorate of Agriculture, Govt. of West Bengal

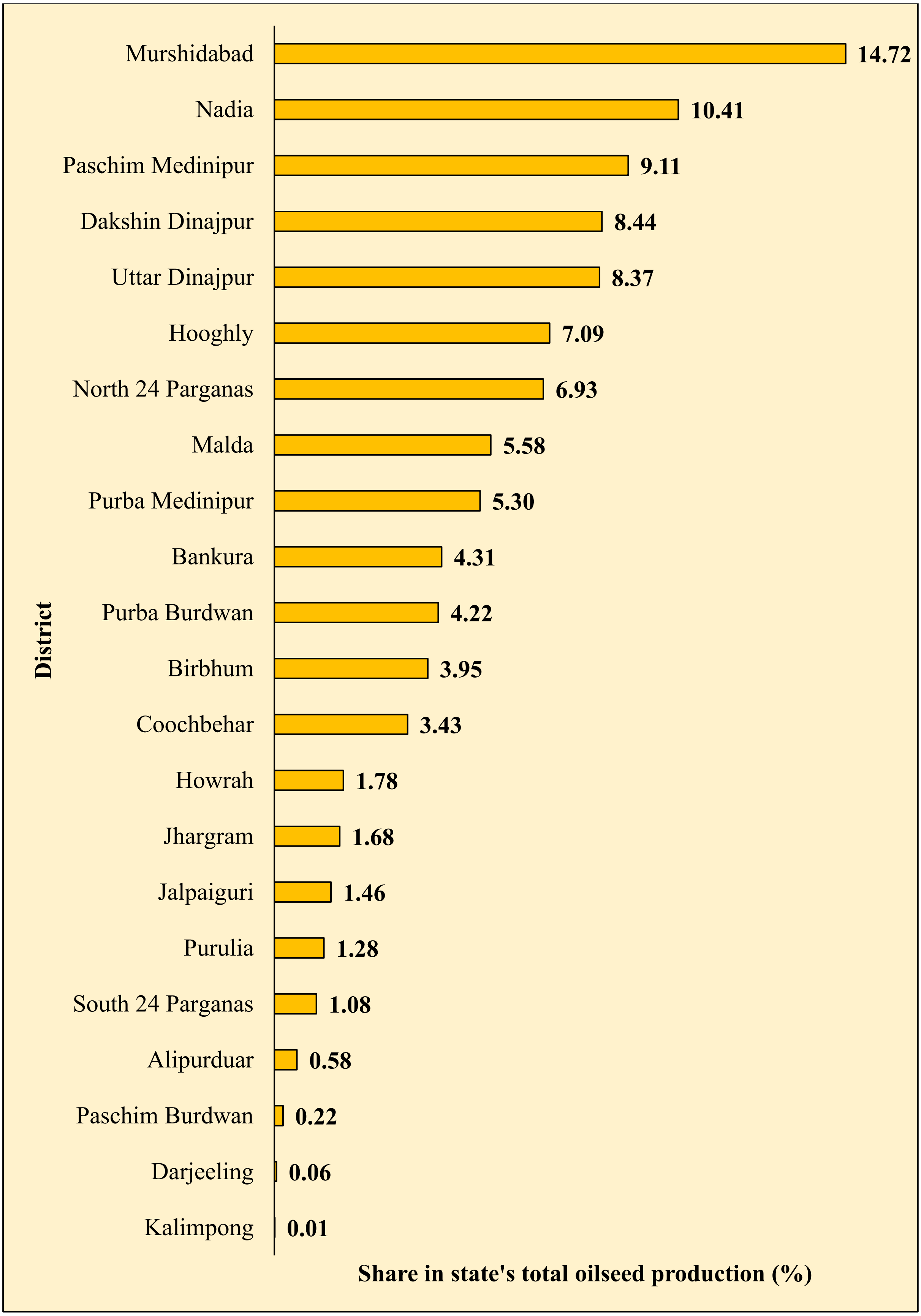

Figure 4.5.2: District-wise share of West Bengal's total oilseed production in 2021-22

Data source: Directorate of Agriculture, Govt. of West Bengal

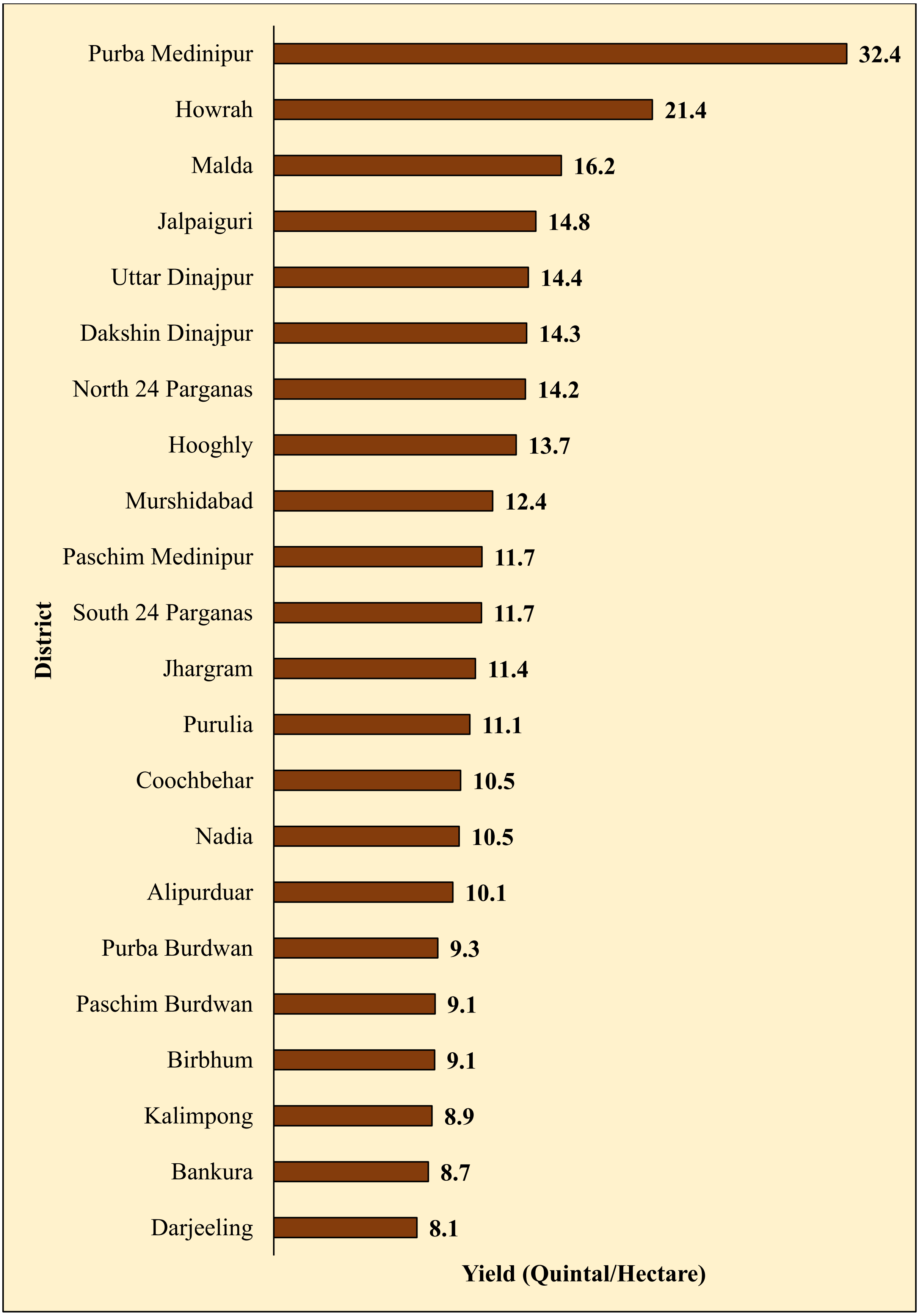

Figure 4.5.3: District-wise yield rate of total oilseed in 2021-22

Data source: Directorate of Agriculture, Govt. of West Bengal

Burdwan, Darjeeling, and Kalimpong occupy significantly lower positions, each accounting for less than one per cent of the state's total oilseed production.

With an astounding production of 32.4 quintals per hectare (q/ha), Purba Medinipur district stands out as the top producer in West Bengal with regard to oilseed yield rate. The Howrah district is in second position, with a noteworthy production of 21.4 q/ha. Jalpaiguri and Malda districts yield 14.8 and 16.2 q/ha, respectively, indicating good performance as well. These numbers demonstrate their major contributions to the oilseed production of the state and demonstrate their efficient farming methods and impressive yields. Darjeeling and Bankura districts, on the other hand, are at the bottom end of the yield range. At the bottom, Darjeeling yields 8.1 q/ha, while Bankura records 8.7 q/ha. These lower yields suggest that there may be problems with the local farming environment, resources available, or cultivation methods.

4.3 Agroclimatic zone-wise scenario of the area, production, and yield rate of the oilseed

Along with the district-wise scenario, examining oilseed cultivation in West Bengal through the lens of agroclimatic zones is crucial for a more detailed understanding of agricultural dynamics. West Bengal is divided into six agro-climatic zones, namely the Northern Hill Zone, Terai-Teesta Alluvial Zone, Vindhyan Alluvial Zone, Gangetic Alluvial Zone, Undulating Red and Laterite Zone, and Coastal Saline Zone, each characterized by distinct environmental conditions that influence agricultural practices. By focusing on these zones, policymakers can identify specific environmental factors that affect oilseed growth, such as rainfall patterns, temperature fluctuations, and soil types.

The following figure (Figure 4.6) provides an insightful look into the agroclimatic zone-wise yield rate of total oilseed production (quintals per hectare) and the respective share in the state's area and production of total oilseed (per cent) for the year 2021-2022. West Bengal, as outlined earlier, is divided into six unique agro-climatic zones, each with distinct characteristics affecting the area, production, and yield of oilseeds.

A notable observation arises when analyzing the Gangetic Alluvial Zone, renowned for its substantial agricultural potential. This zone encompasses the largest expanse of land dedicated to oilseed cultivation, accounting for 47 per cent of the state's total area for oilseeds and contributing the highest production at 45.4 per cent of the state's total oilseed output. Despite these impressive statistics, the yield rate in this zone is comparatively low, only 12.1 quintals per hectare.

A comparable situation is evident in the Undulating Red and Laterite Zone, which ranks second in terms of both the area and production of oilseeds, comprising 24.6 per cent and 20.3 per cent of the state's totals, respectively. However, the yield rate in this zone is merely 10.3 quintals per hectare, the second-lowest among all agro-climatic zones in West Bengal. This discrepancy underscores the imperative to investigate and address the underlying causes of the reduced yield rates in these high-potential zones.

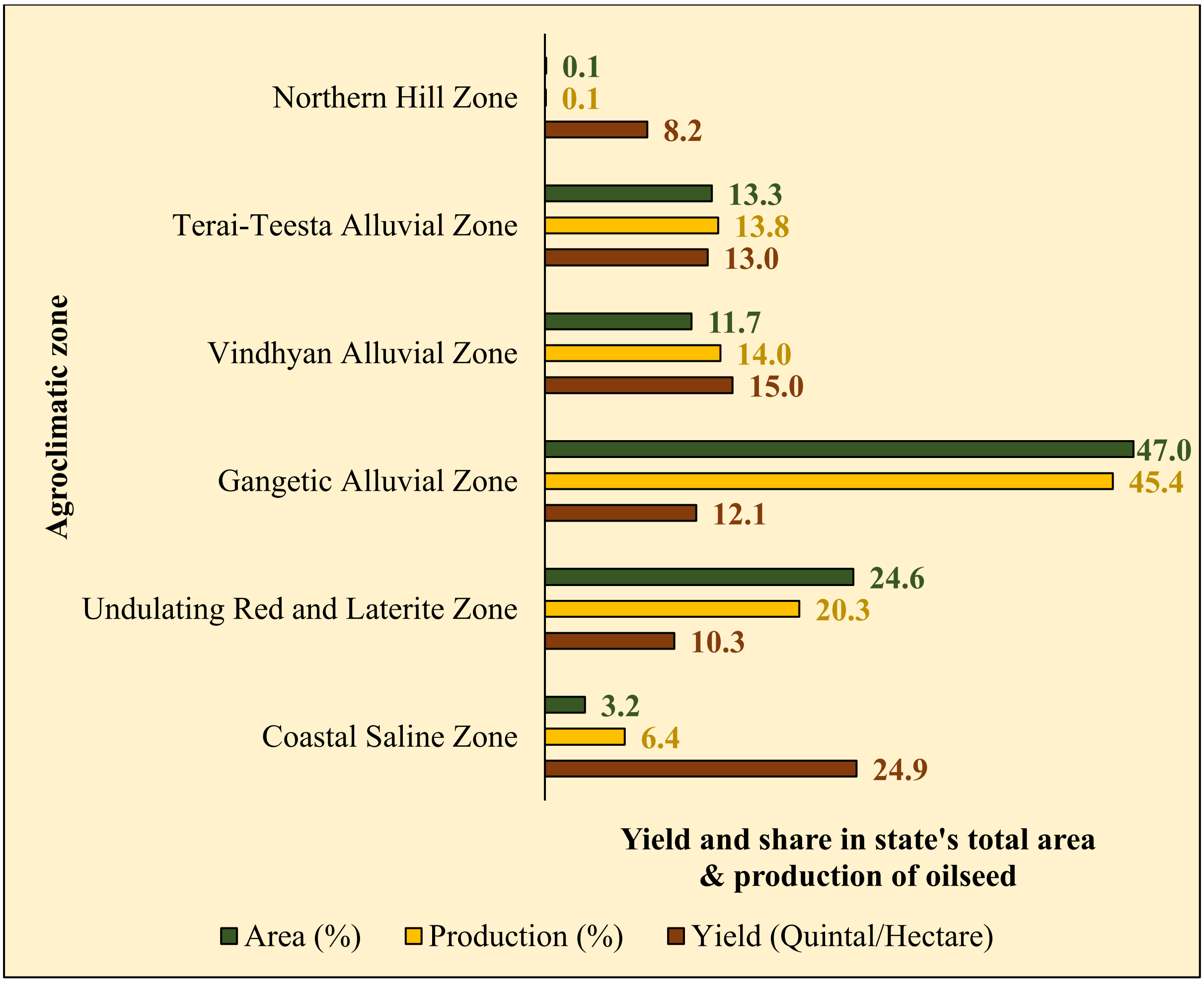

Figure 4.6: Agroclimatic zone-wise yield rate of total oilseed production (Quintal per hectare) and share in state's area & production of total oilseed (%) in 2021-2022

Data source: Directorate of Agriculture, Govt. of West Bengal

Shifting focus to the Coastal Saline Zone, we find a compelling contrast. Although this zone accounts for a modest 3.2 per cent of the area and 6.4 per cent of the production of the state's totals, respectively, it boasts the highest yield rate at 24.9 quintals per hectare. This impressive yield performance invites exploration into the agricultural practices and environmental conditions that enable such high productivity in a relatively smaller area. Learning from these practices could provide valuable insights and strategies for enhancing yield rates in other zones. Moreover, bringing more area under oilseed cultivation in this zone could potentially boost the state's overall oilseed production.

On the other end of the spectrum, the Terai-Teesta Alluvial Zone and the Vindhyan Alluvial Zone exhibit a moderate contribution to the state's total oilseed cultivation area and production. The Terai-Teesta Alluvial Zone accounts for 13.3 per cent of the area and 13.8 per cent of the production, while the Vindhyan Alluvial Zone covers 11.7 per cent of the area and contributes 14.0 per cent to production. Correspondingly, the yield rates in these zones are also moderate, with the Terai-Teesta Alluvial Zone producing 13 quintals per hectare and the Vindhyan Alluvial Zone yielding 15 quintals per hectare. These figures reflect a moderate performance in terms of both area and productivity compared to the other agroclimatic zones of West Bengal. However, the Northern Hill Zone presents a different scenario. With a yield rate of 8.2 quintals per hectare and negligible area and production shares of 0.1 per cent each, this zone's performance highlights the challenges faced in oilseed cultivation in this region.

These observations highlight the diversity and complexity of oilseed cultivation in West Bengal's agro-climatic zones. Understanding the specific constraints and opportunities within each zone can provide valuable insights for enhancing production and enabling targeted agricultural interventions for improved productivity and sustainability.

4.4 Status of the area, production, and yield rate of various oilseed crops across districts and agroclimatic zones

Exploring the types and extent of oilseed cultivation in West Bengal is crucial for understanding and optimizing the state's agricultural potential. The region's diverse agro-climatic zones support the cultivation of a variety of oilseeds, including Rapeseed & mustard, Til (Sesame), Groundnut, Sunflower, Soybean, Niger, Linseed, and Safflower. Each of these crops has unique growth requirements and makes distinct contributions to the state's economy. The following figure (Figure 4.7) illustrates the yield of these oilseed crops (measured in quintals per hectare) and their respective shares in the state's total oilseed area and production for the year 2021-2022.

As illustrated in Figure 4.7, Rapeseed & mustard is the most extensively cultivated oilseed in West Bengal, occupying 64.01 per cent of the total oilseed area and accounting for 62.27 per cent of the state's total oilseed production. Consequently, the yield rate for Rapeseed & mustard is 12.18 quintals per hectare. Til (Sesame) follows as the second most widely grown oilseed, covering 27.25 per cent of the total oilseed area and contributing 21.29 per cent to the state's oilseed production. The yield rate for Til stands at 9.79 quintals per hectare, which is lower than that of Rapeseed & mustard. Groundnut ranks as the third most extensively grown oilseed, with 7.79 per cent of the total oilseed area and 15.82 per cent of the total oilseed production. The yield rate for Groundnut is the highest among all oilseeds grown in the state, at 25.44 quintals per hectare.

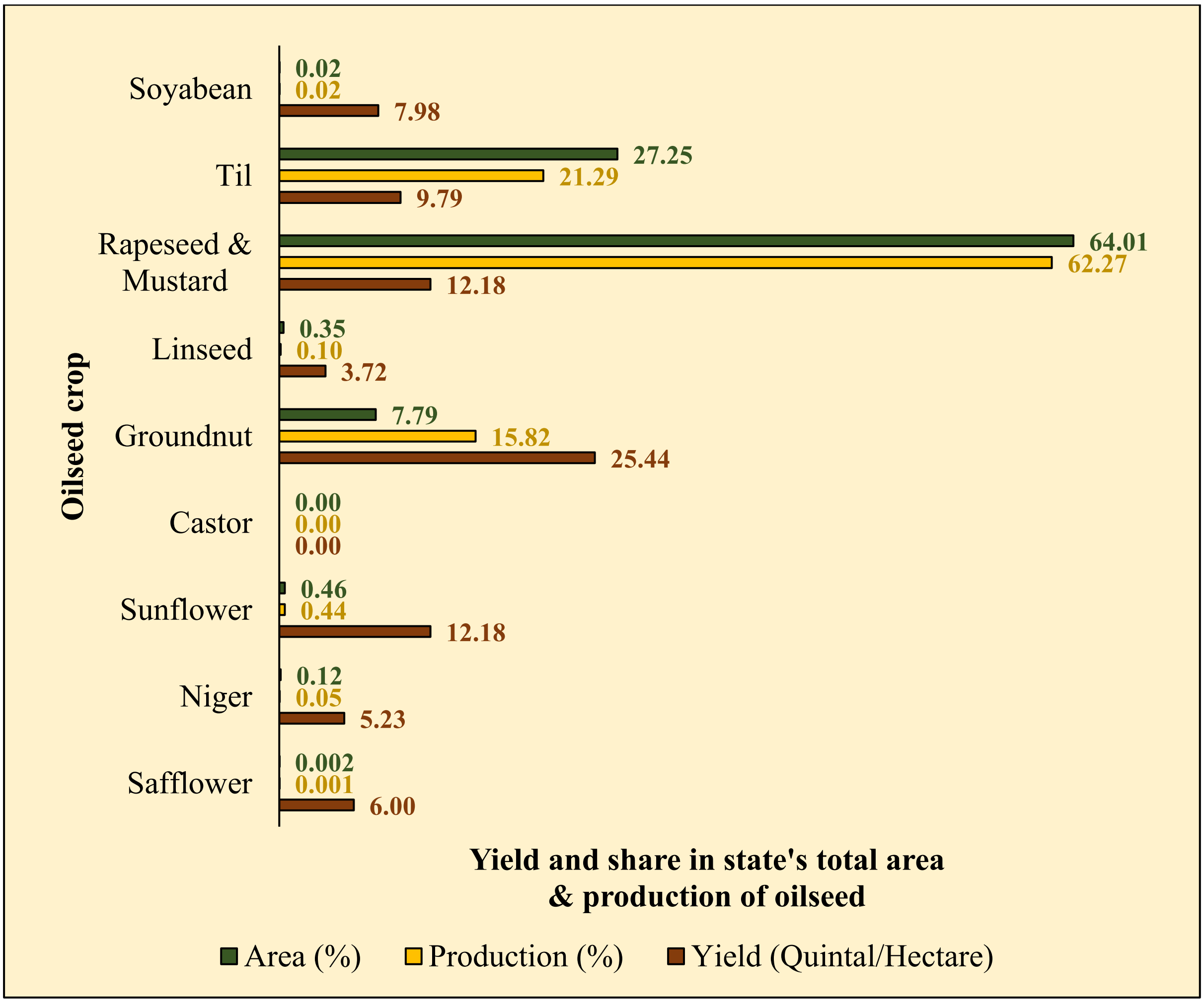

Figure 4.7: Oilseed crop-wise yield (Quintal per hectare) and share in the state's area & production of total oilseed (%) in 2021-2022

Data source: Directorate of Agriculture, Govt. of West Bengal

Sunflower, Soybean, Niger, Linseed, and Safflower are cultivated on less than 1% of the total oilseed area, each contributing less than one per cent to the state's total oilseed production. Nevertheless, with the exception of Sunflower, these oilseeds have yield rates ranging from 5 to 8 quintals per hectare. Sunflower, however, has a yield rate of 12.18 quintals per hectare, which is comparable to that of Rapeseed & mustard.

Understanding the distribution and productivity of these oilseeds across different districts and agro-climatic zones provides valuable insights into the region's agricultural practices and potential areas for improvement. Quantifying the extent of each oilseed's cultivation involves analyzing factors such as the total area dedicated to each crop, the yield per hectare, and the overall production volume. This data can reveal patterns of efficiency and identify zones with underutilized potential or those facing challenges. The following tables (Table 4.1.1, 4.1.2, 4.1.3, and 4.1.4) illustrate the district- and agroclimatic zone-wise area and production share of various oilseed crops in the state as a whole, along with their corresponding yield rates.

Table 4.1.1 depicts the district-wise distribution of various oilseed crops across the state during 2021-2022 in terms of area. Similarly, Table 4.1.2 provides a detailed breakdown of the district-wise production shares of these oilseed crops for the same timeframe. Furthermore, Table 4.1.3 outlines the district-wise yield rates of these oilseed crops for the year 2021-2022. Additionally, Table 4.1.4 delves into the agro-climatic zone-wise distribution of these oilseed crops within the state's total area and production, accompanied by their respective yield rates (measured in kg per hectare) for the same period.

Table 4.1.1 reveals that **rapeseed & mustard** are the only crops cultivated across all districts of West Bengal. Murshidabad district has the highest percentage share of the area under rapeseed & mustard cultivation, contributing 19.18 per cent to the total area under these crops in West Bengal. This indicates a significant concentration of rapeseed & mustard farming in Murshidabad compared to other districts. Nadia district follows with a notable 13.7 per cent share, indicating its substantial role in the state's overall rapeseed & mustard cultivation. Similarly, Dakshin Dinajpur and Uttar Dinajpur also contribute significantly, with shares of 11.51 per cent and 11.23 per cent, respectively.

In contrast, several districts, including Bankura, Birbhum, Cooch Behar, Malda, North 24 Parganas, Purba Burdwan, and South 24 Parganas, each contribute 1 to 8 per cent to the total area under rapeseed & mustard cultivation. This suggests a more dispersed and less intensive cultivation pattern in these regions. The remaining districts, which cover a wider geographical area within West Bengal, each account for less than 1 per cent of the total area under rapeseed & mustard cultivation. This distribution suggests that these districts have a minimal impact on

Table 4.1.1: District-wise distribution of the area under cultivation of various oilseed crops in West Bengal (2021-2022)

(Values are in per cent)

District	Soybean	Til	Rapeseed & Mustard	Linseed	Groundnut	Sunflower	Niger	Safflower
Alipurduar	-	0.21	0.82	12.94	0.64	-	**33.04**	-
Bankura	-	12.64	3.89	-	3.12	2.20	-	-
Birbhum	7.73	2.21	7.34	11.99	1.26	1.26	-	**100.00**
Coochbehar	-	0.34	5.99	11.51	1.13	1.38	9.82	-
Dakshin Dinajpur	-	0.05	11.51	1.28	0.13	-	-	-
Darjeeling	**92.27**	0.05	0.06	2.92	0.07	-	-	-
Hooghly	-	14.41	0.71	-	**27.11**	-	-	-
Howrah	-	1.35	0.26	0.77	6.47	0.34	-	-
Jalpaiguri	-	0.30	0.93	7.23	6.39	0.23	25.89	-
Jhargram	-	2.64	0.96	-	6.39	4.66	-	-
Kalimpong	-	-	0.02	-	-	-	-	-
Malda	-	0.16	6.57	1.22	0.63	-	-	-
Murshidabad	-	9.28	**19.18**	12.94	0.86	-	-	-
Nadia	-	12.22	13.70	3.36	4.28	0.90	-	-
North 24 Parganas	-	6.81	6.37	1.10	1.92	4.59	-	-
Paschim Burdwan	-	0.17	0.38	-	0.18	0.05	-	-
Paschim Medinipur	-	**26.66**	2.22	-	13.17	0.71	-	-
Purba Burdwan	-	8.85	5.00	2.23	1.09	1.38	-	-
Purba Medinipur	-	0.10	0.69	-	20.35	-	-	-
Purulia	-	0.18	1.46	**16.07**	4.71	0.57	31.25	-
South 24 Parganas	-	1.11	0.72	5.89	0.05	**81.64**	-	-
Uttar Dinajpur	-	0.27	11.23	8.54	0.06	0.09	-	-
West Bengal	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Data source: Directorate of Agriculture, Govt. of West Bengal

the overall cultivation of these crops in the state, thereby highlighting the dominance of a few key districts in rapeseed and mustard production.

Similar to rapeseed and mustard, **groundnut and til** are cultivated across nearly all districts of West Bengal, with the exception of Kalimpong district. This widespread cultivation indicates the importance and adaptability of these oilseed crops within the state's diverse agricultural landscape. Hooghly and Paschim Medinipur districts are particularly significant in the cultivation of these oilseed crops. Hooghly district contributes the largest area for groundnut cultivation, while Paschim Medinipur leads in til cultivation. Specifically, each of these districts accounts for more than one-fourth of the total area dedicated to the cultivation of these oilseeds in West Bengal. This substantial share underscores the critical role these districts play in the state's oilseed production.

Further, detailed data reveal that Purba Medinipur and Paschim Medinipur districts contribute 20.35 per cent and 13.17 per cent respectively, to the state's total area under groundnut cultivation. This highlights the concentrated nature of groundnut farming in these districts, reflecting favorable conditions and possibly well-established agricultural practices for groundnut cultivation. In contrast, the cultivation of til is more widely distributed among several districts. Bankura, Hooghly, Nadia, Murshidabad, and Purba Burdwan collectively account for over half of the total area under til cultivation in West Bengal. This collective contribution, amounting to more than 50 per cent indicates that til farming is somewhat more dispersed compared to groundnut cultivation yet still shows significant concentration in a few key districts.

Focusing on **linseed and sunflower** cultivation in West Bengal, it is observed that these crops are produced in 15 and 14 out of the state's 22 districts, respectively. However, there are notable differences in the distribution and concentration of these crops across the districts. Sunflower cultivation is predominantly concentrated in the South 24 Parganas district, which alone accounts for an overwhelming 81.64 per cent of the total area under sunflower cultivation in the state. This high concentration indicates that South 24 Parganas has particularly favorable conditions or established agricultural practices for sunflower cultivation, making it the primary hub for this crop in West Bengal.

In contrast, linseed cultivation is more widely dispersed across the state. The highest contribution comes from Purulia district, which accounts for 16.07 per cent of the total area under linseed cultivation in West Bengal. Additionally, Purulia district, combined with the contributions from Alipurduar, Birbhum, Coochbehar, and Murshidabad, collectively accounts for nearly 65 per cent of the state's total area dedicated to linseed cultivation. This distribution suggests a broader geographical spread of linseed farming compared to sunflower, reflecting a more diverse set of conditions suitable for linseed production across multiple districts.

Turning attention to **the cultivation of niger**, it is evident that the distribution of cultivation area is heavily concentrated in a few districts within West Bengal. Alipurduar district holds the highest share, accounting for approximately 33 per cent of the total area under niger cultivation in the state. This is closely followed by Purulia, which contributes 31.25 per cent and Jalpaiguri, with a share of 25.89 per cent Together, these three districts dominate niger cultivation in the region. While niger is also cultivated in Coochbehar, this district contributes a relatively modest share of approximately 10 per cent to the state's total niger cultivation area. This distribution highlights the regional specialization within the state, with Alipurduar, Purulia, and Jalpaiguri being the primary districts for niger production.

Lastly, among the diverse oilseed crops cultivated in West Bengal, **soybean and safflower** stand out for their concentrated cultivation patterns. Soybean cultivation is heavily centralized in the Darjeeling district, encompassing a substantial 92.27 per cent of the total cultivated area for this crop in the state. In contrast, Birbhum district contributes a relatively small 7.73 per cent to the total soybean cultivation area, highlighting Darjeeling's predominant role in soybean production within West Bengal.

Conversely, safflower is cultivated exclusively in Birbhum district, where it holds a unique position among oilseed crops in the state. This district-specific cultivation indicates specialized conditions or local agricultural practices that support safflower production in Birbhum. The exclusive presence of safflower in Birbhum further emphasizes the district's role as a focal point for this particular oilseed crop within West Bengal's agricultural landscape.

Along with analyzing the district-wise contribution of the area under various oilseed crops to the state’s total, it is equally important to examine the district-wise contribution to the production of these crops. Typically, a larger area devoted to a particular crop correlates with higher production levels. Therefore, as evident from the table, for crops such as soybean, til, rapeseed & mustard, sunflower, and niger, districts with a higher share of the cultivated area also show a higher share of production. It is important to note that since Birbhum district encompasses the entire area under safflower cultivation in the state, it consequently accounts for 100 per cent of safflower production in West Bengal.

Table 4.1.2: District-wise production distribution of various oilseed crops in West Bengal (2021-2022)

(Values are in per cent)

District	Soybean	Til	Rapeseed & Mustard	Linseed	Groundnut	Sunflower	Niger	Safflower
Alipurduar	-	0.17	0.71	12.47	0.46	-	**36.01**	-
Bankura	-	10.60	2.71	-	2.25	1.73	-	-
Birbhum	18.82	1.63	5.57	11.51	0.73	0.72	-	**100.00**
Coochbehar	-	0.28	5.20	11.11	0.71	1.36	11.09	-
Dakshin Dinajpur	-	0.04	13.50	1.36	0.13	-	-	-
Darjeeling	**81.18**	0.04	0.04	2.80	0.06	-	-	-
Hooghly	-	13.76	0.57	-	24.06	-	-	-
Howrah	-	1.50	0.16	0.72	8.58	0.28	-	-
Jalpaiguri	-	0.27	0.74	6.95	5.82	0.19	28.67	-
Jhargram	-	2.35	0.63	-	4.80	6.05	-	-
Kalimpong	-	-	0.01	-	-	-	-	-
Malda	-	0.14	8.74	2.08	0.63	-	-	-
Murshidabad	-	8.65	**20.45**	**17.83**	0.77	-	-	-
Nadia	-	12.70	11.56	3.20	3.13	1.30	-	-
North 24 Parganas	-	9.54	7.42	1.04	1.60	5.60	-	-
Paschim Burdwan	-	0.16	0.28	-	0.08	0.06	-	-
Paschim Medinipur	-	**29.28**	1.66	-	11.63	0.62	-	-
Purba Burdwan	-	7.16	4.09	2.16	0.90	1.36	-	-
Purba Medinipur	-	0.11	0.56	-	**31.12**	-	-	-
Purulia	-	0.15	1.34	12.07	2.46	0.57	24.23	-
South 24 Parganas	-	1.27	0.72	5.68	0.03	**80.12**	-	-
Uttar Dinajpur	-	0.20	13.35	9.03	0.04	0.06	-	-
West Bengal	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Data source: Directorate of Agriculture, Govt. of West Bengal

However, the data also indicate that variations in yield rates can lead to discrepancies between the percentage share of area and production. For instance, in the case of linseed, although Purulia has the highest share of the area under cultivation, accounting for a significant portion of the state's total area under linseed cultivation, it is Murshidabad that contributes the most to the state's total production. Similarly, for groundnut, while Hooghly district has the largest area under cultivation, Purba Medinipur leads in total production. This discrepancy suggests that Murshidabad and Purba Medinipur may have higher productivity, potentially due to better soil conditions, agricultural practices, or access to resources compared to those in Purulia and Hooghly, respectively.

These observations underscore that merely considering the cultivated area is inadequate for understanding the production potential of the districts; the productivity of crops in these areas is equally important. Therefore, Table 4.1.3 presents the district-wise yield rates of various oilseed crops, considering the necessity of taking both the cultivation area and yield rates into account to achieve a comprehensive understanding of the production scenario. A cursory glance at the table reveals the following facts

- Birbhum district excels in soybean production with the highest yield of 1,944 kg per hectare, surpassing the state average of 798 kg per hectare.
- North 24 Parganas district leads in til production, achieving a notable yield of 1,371 kg per hectare compared to the state’s yield of 979 kg per hectare.
- Malda district is the frontrunner in rapeseed & mustard production, with a yield of 1,622 kg per hectare, exceeding the state average of 1,218 kg per hectare. Malda also stands out in linseed production with a yield of 634 kg per hectare, surpassing the state’s 372 kg per hectare.
- Purba Medinipur district boasts the highest yield of groundnuts at 3,891 kg per hectare, well above the state’s average of 2,544 kg per hectare.
- Nadia district leads in sunflower production with a yield of 1,769 kg per hectare, compared to the state’s 1,218 kg per hectare.
- Coochbehar district shows exceptional production of niger seeds with a yield of 591 kg per hectare, exceeding the state’s yield of 523 kg per hectare.
- Birbhum district is the sole producer of safflower, with a yield of 600 kg per hectare, aligning with the state’s average for safflower.

Table 4.1.3: District-wise yield rate of various oilseed crops in West Bengal (2021-2022)

(Values are in kg per hectare)

District	Soybean	Til	Rapeseed & Mustard	Linseed	Groundnut	Sunflower	Niger	Safflower
Alipurduar	-	799	1045	359	1846	-	570	-
Bankura	-	821	848	-	1838	958	-	-
Birbhum	**1944**	723	925	357	1479	691	-	**600**
Coochbehar	-	803	1057	359	1607	1200	**591**	-
Dakshin Dinajpur	-	796	1429	395	2515	-	-	-
Darjeeling	702	847	780	357	2170	-	-	-
Hooghly	-	935	977	-	2257	-	-	-
Howrah	-	1087	750	346	3375	1000	-	-
Jalpaiguri	-	872	960	358	2316	1000	579	-
Jhargram	-	873	806	-	1912	1581	-	-
Kalimpong	-	-	894	-	-	-	-	-
Malda	-	840	**1622**	**634**	2516	-	-	-
Murshidabad	-	912	1299	513	2279	-	-	-
Nadia	-	1017	1028	354	1858	**1769**	-	-
North 24 Parganas	-	**1371**	1418	351	2121	1485	-	-
Paschim Burdwan	-	934	895	-	1100	1500	-	-
Paschim Medinipur	-	1075	913	-	2246	1065	-	-
Purba Burdwan	-	792	997	360	2102	1200	-	-
Purba Medinipur	-	1063	1001	-	**3891**	-	-	-
Purulia	-	806	1113	280	1328	1200	406	-
South 24 Parganas	-	1114	1223	359	1886	1195	-	-
Uttar Dinajpur	-	710	1448	394	1976	750	-	-
West Bengal	**798**	**979**	**1218**	**372**	**2544**	**1218**	**523**	**600**

Data source: Directorate of Agriculture, Govt. of West Bengal

Upon a detailed examination of the data presented in the table and cross-referencing with Table 4.1.1, which delineates the district-wise contributions of the area under various oilseed cultivations to the state, the following insights can be determined:

- Darjeeling district accounts for more than 90 per cent of the state's total area under soybean cultivation, while Birbhum district's share is less than 10 per cent. Nevertheless, the per-hectare production of soybeans in Birbhum is more than 2.5 times higher than in Darjeeling.
- Paschim Medinipur district contributes over 25 per cent of the state's total area under til cultivation, while North 24 Parganas accounts for approximately 7 per cent. However, the per hectare production of til in North 24 Parganas surpasses that of Paschim Medinipur by about 3 quintals. Additionally, Howrah and South 24 Parganas show higher per-hectare production than Paschim Medinipur, despite each having around a 1 per cent share in the state's total area under til cultivation.
- Murshidabad district encompasses nearly one-fifth of the state's total area under rapeseed and mustard cultivation, while Malda district contributes around 6.5%. The per-hectare production in Malda surpasses that in Murshidabad by approximately 3 quintals. Moreover, Murshidabad's yield rate, despite having the highest area share, is lower than that of Dakshin Dinajpur, North 24 Parganas, and Uttar Dinajpur.
- Purulia district holds the largest share, nearly 16 per cent, of the state’s total area under linseed cultivation, whereas Malda district’s share is about 1 per cent. However, the per-hectare production of linseed in Malda is more than double that of Purulia. Unfortunately, Purulia has the lowest per-hectare production among all linseed-producing districts in West Bengal.
- Hooghly district accounts for the largest share, more than one-fourth of the state's total area under groundnut cultivation, while Purba Medinipur's share is around 20 per cent. Nevertheless, the per-hectare production of groundnut in Purba Medinipur is about 70 per cent higher than in Hooghly. Unfortunately, the productivity of groundnut in the Hooghly district is below the state’s average.
- South 24 Parganas district dominates with over 80 per cent of the state’s total area under sunflower cultivation, while Nadia district’s share is less than 1 per cent. However, the per-hectare production of sunflowers in Nadia is 1769 kg, roughly 50 per cent higher than in South 24 Parganas. Unfortunately, South 24 Parganas’ per-hectare production of sunflower is below the average yield rate of the state.

- Among the four niger-producing districts of West Bengal, Alipurduar district holds the largest share at 33 per cent of the state's total area under niger cultivation, followed by Purulia with 31.25 per cent, Jalpaiguri with 25.89 per cent, and Cooch Behar with 9.82 per cent. Nonetheless, Cooch Behar demonstrates the highest niger productivity at 591 kg per hectare, followed by Jalpaiguri with 579 kg/ha, Alipurduar with 570 kg/ha, and Purulia with 406 kg/ha. It is notable that despite Cooch Behar's highest productivity, its share in the state's total area under niger cultivation is the lowest.

The analysis of district-wise contributions to oilseed cultivation in West Bengal reveals significant variations in both the area under cultivation and per-hectare productivity across different regions. Key findings indicate that while some districts have a large share of the state's total cultivated area for specific oilseeds, their productivity per hectare often lags behind districts with smaller cultivation areas. This pattern underscores the importance of not only expanding the cultivation area but also enhancing agricultural practices and technologies to boost productivity.

In addition to the district-wise scenario, it is crucial to examine the status of various oilseed productions across different agroclimatic zones in West Bengal, as depicted in Figure 4.1.4. This figure illustrates the following facts:

- Til, rapeseed & mustard, linseed, and groundnut are cultivated across all agroclimatic zones of West Bengal. Meanwhile, soybean is cultivated in the Northern Hill Zone and the Undulating Red & Laterite Zone. Sunflower is grown in the Terai-Teesta Alluvial Zone, Gangetic Alluvial Zone, and Undulating Red & Laterite Zone. Niger is cultivated in the Terai-Teesta Alluvial Zone and Undulating Red & Laterite Zone, while safflower is exclusively grown in the Undulating Red & Laterite Zone. It is noteworthy that the Undulating Red & Laterite Zone is unique in supporting the cultivation of all oilseed crops found in West Bengal.
- The Northern Hill Zone has the highest contribution to the total area of West Bengal under soybean cultivation at 92.27 per cent. The Gangetic Alluvial Zone leads in the cultivation of til at 53.08 per cent, rapeseed & mustard at 45.60 per cent, and groundnut at 41.91 per cent. Linseed cultivation is most significant in the Terai-Teesta Alluvial Zone at 53.08 per cent. Sunflower cultivation is predominant in the Coastal Saline Zone at 81.64 per cent, and niger is primarily grown in the Terai-Teesta Alluvial Zone at 68.75 per cent. Safflower is exclusively cultivated in the Undulating Red & Laterite

Table 4.1.4: Agroclimatic zone-wise share of area and production in the state's total area and production of various oilseed crops and yield rate

Agroclimatic zone	Particular	Soybean	Til	Rapeseed & Mustard	Linseed	Groundnut	Sunflower	Niger	Safflower
Northern Hill Zone	Area (%)	**92.27**	0.05	0.07	2.92	0.07	-	-	-
	Production (%)	**81.18**	0.04	0.05	2.80	0.06	-	-	-
	Yield (Kg/Ha)	702	847	808	357	2170	-	-	-
Terai-Teesta Alluvial Zone	Area (%)	-	1.13	18.98	**40.23**	8.22	1.70	**68.75**	-
	Production (%)	-	0.92	19.99	**39.57**	7.04	1.60	**75.77**	-
	Yield (Kg/Ha)	-	799	1283	366	2180	1149	**577**	-
Vindhyan Alluvial Zone	Area (%)	-	0.21	18.08	2.50	0.76	-	-	-
	Production (%)	-	0.18	22.25	3.44	0.76	-	-	-
	Yield (Kg/Ha)	-	829	**1499**	**512**	2516	-	-	-
Gangetic Alluvial Zone	Area (%)	-	**53.08**	**45.60**	20.41	**41.91**	7.25	-	-
	Production (%)	-	**53.47**	**44.52**	24.94	**39.12**	8.59	-	-
	Yield (Kg/Ha)	-	986	1190	455	2374	**1443**	-	-
Undulating Red and Laterite Zone	Area (%)	7.73	44.32	15.86	28.06	28.64	9.41	31.25	**100.00**
	Production (%)	18.82	44.02	11.91	23.58	21.87	9.69	24.23	**100.00**
	Yield (Kg/Ha)	**1944**	972	915	313	1942	1254	406	**600**
Coastal Saline Zone	Area (%)	-	1.21	1.40	5.89	20.39	**81.64**	-	-
	Production (%)	-	1.37	1.28	5.68	31.16	**80.12**	-	-
	Yield (Kg/Ha)	-	**1110**	1114	359	**3886**	1195	-	-
West Bengal	Area (%)	100	100	100	100	100	100	100	100
	Production (%)	100	100	100	100	100	100	100	100
	Yield (Kg/Ha)	798	979	1218	372	2544	1218	523	600

Data source: Directorate of Agriculture, Govt. of West Bengal

Zone. Correspondingly, the share of production to the state for various oilseeds is highest in the agroclimatic zones that have the largest contribution to the state's total area under cultivation for each specific oilseed crop.

- The table clearly shows that, with the exception of niger and safflower, agroclimatic zones with higher productivity for specific oilseed crops allocate significantly less area to cultivating those crops compared to zones that contribute the highest area but exhibit lower productivity. This trend highlights a disparity where regions with optimal growing conditions and higher yields are not the primary contributors to the cultivated area for these crops. Consequently, it suggests that there may be potential for increasing overall production by reassessing and possibly redistributing cultivation efforts towards more productive zones.

4.5 District and agroclimatic zone-wise instability in the area, production, and yield rate of various oilseed crops

Instability analysis in agriculture involves studying the fluctuations and variations in agricultural area, production and yield over time. This variability can be attributed to a range of factors, including weather conditions, pests, diseases, market dynamics, etc. The impact of instability in agriculture can be substantial, affecting farmers' overall economic stability. By understanding and addressing these fluctuations, stakeholders can develop strategies to mitigate risks, enhance resilience, and promote sustainable agricultural practices. In certain districts of West Bengal, the cultivation area and productivity of oilseed crops experience highly volatile fluctuations over time, which is mirrored in production as well.

The district and agroclimatic zone-wise instability in the area, productivity, and output of several oilseed crops from 2017–2018 to 2021–2022 is shown in the following tables (Tables 4.2.1, 4.2.2, 4.2.3, and 4.2.4). The district-level volatility in the area of individual oilseed crops and the overall oilseed area from 2017–2018 to 2021–2022 is shown in Table 4.2.1. A detailed scenario of the district-level fluctuations in the production of several oilseed crops, as well as the overall oilseed output throughout this time, can be seen in Table 4.2.2. The district-level volatility in the yield rates of these oilseed crops over the same period is shown in Table 4.2.3. Furthermore, for the aforementioned five years, Table 4.2.4 illustrates the instability in the area, productivity, and production of these oilseed crops across the agroclimatic zones of West Bengal.

It is seen from Table 4.2.1 that the area under **soybean** cultivation in West Bengal shows notable variations, ranging from 0.0 in the Darjeeling district to 136.95 in the Kalimpong district. These differences highlight the diverse nature of soybean cultivation across the region, with Kalimpong experiencing the highest fluctuations while Darjeeling remains relatively stable. Overall, West Bengal's soybean cultivation area has an instability index of 29.47. In contrast, regarding **til** cultivation, West Bengal presents a more favourable situation compared to soybean, with an overall instability index of 4.01. Hooghly exhibits the lowest instability at 3.43, indicating steady devotion of area under til cultivation, whereas Purulia shows the most volatility. On the other hand, in the case of **rapeseed and mustard**, West Bengal demonstrates remarkable stability, with an overall instability index of just 1.48, making it the most stable oilseed crop in the region. Nadia stands out for its higher stability, while Paschim Burdwan exhibits the highest instability.

For **linseed** cultivation, West Bengal has an instability index of 14.45. Alipurduar displays relatively low instability, indicating consistent cultivation, while Howrah shows the highest instability, signifying significant fluctuations. **Groundnut** cultivation in West Bengal has an instability index of 3.99, with variations from 3.48 in Howrah to 115.72 in Paschim Burdwan. Howrah is the most stable district, whereas Paschim Burdwan experiences the highest instability. **Sunflower** cultivation area in West Bengal exhibits significant variations, ranging from 10.17 in Jhargram to 223.61 in Dakshin Dinajpur, Darjeeling, Kalimpong, and Murshidabad. These disparities highlight the diverse nature of sunflower cultivation, with Jhargram being relatively stable. The overall instability for sunflower cultivation stands at 22.40.

The **niger** crop cultivation area in West Bengal shows a relatively high level of instability compared to other oilseed crops except safflower, with variations ranging from 4.56 in Jalpaiguri to 223.61 in Darjeeling, Jhargram, and Malda. **Safflower** cultivation in West Bengal demonstrates the highest level of instability among the oilseed crops, with an instability index of 150.58. Variations range from 92.11 in Birbhum to 223.61 in Jalpaiguri and Purulia, with Birbhum being relatively more stable.

Finally, focusing on the **total oilseed** cultivation area, West Bengal shows remarkable stability with an overall instability index of only 1.35. Nadia is notably stable, with an instability index of 1.91, while Kalimpong shows the highest instability at 44.55. This comprehensive assessment underscores the importance of tailored agricultural strategies to address the specific

Table 4.2.1: District-wise instability in the area under various oilseed crops (2017-2018 to 2021-2022)

District	Soybean	Til	Rapeseed & Mustard	Linseed	Groundnut	Sunflower	Niger	Safflower	Total oilseed
Alipurduar	-	18.22	4.89	12.97	7.40	135.14	17.97	-	5.12
Bankura	-	12.95	24.38	91.57	34.49	62.77	-	-	16.73
Birbhum	38.12	4.36	11.39	21.67	96.57	25.64	-	92.11	10.47
Coochbehar	-	33.44	5.94	51.35	50.45	68.59	172.72	-	6.43
Dakshin Dinajpur	-	48.04	12.15	36.63	49.21	223.61	-	-	11.97
Darjeeling	0.00	25.55	11.14	24.06	45.20	223.61	223.61	-	6.39
Hooghly	-	3.43	30.81	-	14.22	143.89	-	-	3.23
Howrah	-	19.45	23.80	114.66	3.48	96.66	-	-	10.83
Jalpaiguri	-	18.80	8.61	21.25	13.48	86.08	4.56	223.61	5.88
Jhargram	-	8.80	6.76	-	11.51	10.17	223.61	-	4.70
Kalimpong	136.95	-	8.87	-		223.61	-	-	44.55
Malda	-	28.00	7.89	71.90	50.33	-	223.61	-	7.45
Murshidabad	-	5.02	6.68	35.99	74.89	223.61	-	-	5.42
Nadia	-	5.35	2.26	35.70	32.51	116.31	-	-	1.91
North 24 Parganas	-	17.04	3.47	109.75	19.15	13.18	-	-	6.26
Paschim Burdwan	-	33.57	45.99	-	115.72	127.41	-	-	42.91
Paschim Medinipur	-	5.93	13.46	62.56	27.64	149.89	-	-	4.62
Purba Burdwan	-	9.91	5.22	41.59	58.33	51.90	-	139.24	2.53
Purba Medinipur	-	16.29	26.59	-	8.12	215.76	-	-	7.95
Purulia	-	57.23	39.01	24.30	36.66	53.56	12.41	223.61	25.60
South 24 Parganas	-	4.37	25.99	47.25	57.90	22.46	-	-	12.26
Uttar Dinajpur	-	29.65	3.98	40.02	60.10	81.11	125.08	-	4.27
West Bengal	**29.47**	**4.01**	**1.48**	**14.45**	**3.99**	**22.40**	**62.74**	**150.58**	**1.35**

Data source: Directorate of Agriculture, Govt. of West Bengal

needs and challenges of each district, ensuring sustainable and stable oilseed production across West Bengal.

In addition to analyzing the instability in the area under various oilseed cultivation, it's also crucial to understand the instability in oilseed production, as depicted in Table 4.2.2. In West Bengal, **soybean** production shows considerable variation in instability, ranging from 11.57 in Darjeeling to 164.76 in Kalimpong. These differences highlight the diverse nature of soybean production, with Kalimpong experiencing the highest fluctuations and Darjeeling showing stable production. The overall instability index for soybean production in West Bengal is 34.65, suggesting a moderate level of variability.

Til production in West Bengal presents a more favourable scenario compared to soybean, with a state-wide instability index of 22.82. Jhargram stands out with the lowest instability index at 11.37, indicating relatively steady til production in this region. Conversely, Dakshin Dinajpur exhibits the highest instability index at 58.65, closely followed by Purulia with 57.18, pointing to significant fluctuations in til production.

Rapeseed and mustard production are notably stable across West Bengal, with an overall instability index of only 1.70, making them the most stable oilseed crops in the region. Nadia district exemplifies this stability with a modest index of 5.91, while Purulia, with an instability index of 52.01, shows the most variation. This high degree of stability in rapeseed and mustard production suggests that these crops are well-suited to the regional agricultural conditions and that their cultivation could be expanded to improve overall oilseed production stability in West Bengal.

Linseed production in West Bengal demonstrates an instability index of 34.34, with Purulia exhibiting relatively low instability at 37.07, closely followed by Uttar Dinajpur with 37.32, and Murshidabad with 37.79, indicating more consistent production. In contrast, Howrah shows the highest instability at 97.95, signifying significant fluctuations in linseed production.

Groundnut production in West Bengal is relatively stable, with an instability index of 8.35, ranging from 7.49 in Alipurduar to 110.19 in Paschim Burdwan. Alipurduar emerges as the most stable district, experiencing relatively minor fluctuations in groundnut production, while Paschim Burdwan displays the highest instability, indicating significant variations.

Sunflower production in West Bengal shows significant variations in the instability index, ranging from 7.83 in Jhargram to 223.61 in Dakshin Dinajpur, Darjeeling, Kalimpong, and

Table 4.2.2: District-wise instability in the production of various oilseed crops (2017-2018 to 2021-2022)

District	Soybean	Til	Rapeseed & Mustard	Linseed	Groundnut	Sunflower	Niger	Safflower	Total oilseed
Alipurduar	-	15.64	28.46	47.96	7.49	127.07	20.99	-	20.76
Bankura	-	22.48	25.35	96.16	32.06	66.04	-	-	16.84
Birbhum	55.47	20.89	13.43	51.01	96.25	11.89	-	92.04	11.17
Coochbehar	-	38.48	21.81	38.42	44.68	68.63	176.50	-	19.84
Dakshin Dinajpur	-	58.65	11.22	63.10	51.95	223.61	-	-	11.18
Darjeeling	11.57	27.23	45.97	55.14	46.14	223.61	223.61	-	16.09
Hooghly	-	35.40	31.09	-	13.13	151.00	-	-	16.05
Howrah	-	53.31	26.20	97.95	37.49	128.09	-	-	32.11
Jalpaiguri	-	14.40	8.35	40.63	16.77	88.12	4.92	223.61	11.46
Jhargram	-	11.37	12.21	-	13.32	7.83	223.61	-	7.57
Kalimpong	164.76	-	21.28	-	-	223.61	-	-	59.58
Malda	-	30.76	11.18	87.64	43.07	-	223.61	-	10.92
Murshidabad	-	30.39	8.04	37.79	72.83	223.61	-	-	9.82
Nadia	-	17.75	5.91	63.78	36.81	105.82	-	-	8.35
North 24 Parganas	-	49.03	7.81	67.10	35.22	12.52	-	-	12.94
Paschim Burdwan	-	40.06	45.77	-	110.19	117.42	-	-	43.19
Paschim Medinipur	-	22.32	18.31	58.63	19.51	147.31	-	-	15.85
Purba Burdwan	-	20.76	8.39	83.59	66.51	48.26	-	141.42	5.69
Purba Medinipur	-	35.87	27.61	-	10.33	212.03	-	-	9.11
Purulia	-	57.18	52.01	37.07	38.15	38.57	17.43	223.61	37.62
South 24 Parganas	-	52.49	45.25	72.05	73.98	21.92	-	-	11.34
Uttar Dinajpur	-	28.68	7.44	37.32	60.30	81.42	119.32	-	7.38
West Bengal	**34.65**	**22.82**	**1.70**	**34.34**	**8.35**	**20.56**	**75.24**	**171.71**	**6.38**

Data source: Directorate of Agriculture, Govt. of West Bengal

Murshidabad. These disparities highlight the diverse nature of sunflower production across the region, with Jhargram demonstrating relatively stable production. The overall instability index for sunflower production stands at 20.56, reflecting considerable variability that could be addressed through region-specific agricultural interventions.

Niger production in West Bengal exhibits relatively high instability compared to other oilseed crops except safflower, with an overall instability index of 75.24. The instability ranges from 4.92 in Jalpaiguri to 223.61 in Darjeeling, Jhargram, and Malda. This high level of instability indicates significant room for improvement in stabilizing niger crop production, particularly in the more volatile districts.

Safflower production has the highest instability among oilseed crops in West Bengal, with an index of 171.71. The variations range from 92.04 in Birbhum to 223.61 in Jalpaiguri and Purulia. Birbhum emerges as the most stable district for safflower production, showcasing relatively lower fluctuations, while Jalpaiguri and Purulia display the highest instability. These findings suggest a need for targeted strategies to reduce instability in safflower production, particularly in the most affected districts.

Overall, West Bengal's **total oilseed** production displays remarkable stability, with an instability index of only 6.38. Among the districts, Purba Burdwan stands out as relatively stable, exhibiting a modest index of 5.69, while Kalimpong demonstrates the highest instability, reaching 59.58. This overall stability indicates that while there are significant variations in specific crops and districts, West Bengal's oilseed production as a whole is relatively stable.

It is noteworthy that the productivity of a certain crop and the amount of land allocated to it both have a substantial impact on agricultural production. Understanding productivity fluctuations facilitates better planning, enhancing agricultural resilience and sustainability by ensuring more stable agricultural output. Therefore, conducting a thorough investigation of the volatility in crop productivity, as shown in Table 4.2.3, is imperative.

Considering both Table 4.2.1 and 4.2.3, it can be seen that in West Bengal, the instability is higher in the yield rate of total oilseed than in the area devoted to it. The situation is also similar for til, rapeseed & mustard, linseed, and groundnut. However, the situation is the opposite for soybean, sunflower, niger, and safflower, where the instability is higher in the area devoted to these crops than in the yield rate.

Table 4.2.3: District-wise instability in the yield rate of various oilseed crops (2017-2018 to 2021-2022)

District	Soybean	Til	Rapeseed & Mustard	Linseed	Groundnut	Sunflower	Niger	Safflower	Total oilseed
Alipurduar	-	3.42	29.28	44.25	7.60	93.81	7.25	-	20.28
Bankura	-	21.08	4.35	94.31	10.55	9.31	-	-	10.36
Birbhum	37.27	16.84	7.43	44.16	20.78	39.30	-	94.17	6.11
Coochbehar	-	7.28	15.77	44.09	42.97	55.90	4.32	-	14.54
Dakshin Dinajpur	-	24.55	11.68	32.33	13.75	223.61	-	-	11.64
Darjeeling	11.58	4.84	51.79	44.05	9.97	223.61	223.61	-	20.84
Hooghly	-	32.63	1.92	-	14.69	138.59	-	-	17.67
Howrah	-	56.42	8.82	100.50	36.95	26.17	-	-	36.07
Jalpaiguri	-	9.86	5.44	44.36	9.29	4.61	2.85	223.61	6.17
Jhargram	-	11.19	7.82	-	9.39	3.27	223.61	-	8.44
Kalimpong	165.80	-	16.89	-	-	223.61	-	-	26.77
Malda	-	29.41	10.37	36.36	13.80	-	223.61	-	10.39
Murshidabad	-	29.41	4.48	41.15	12.21	223.61	-	-	5.92
Nadia	-	20.78	4.84	44.04	6.82	13.82	-	-	8.24
North 24 Parganas	-	44.83	5.58	44.08	24.04	5.58	-	-	11.57
Paschim Burdwan	-	10.13	7.13	-	36.28	61.43	-	-	3.94
Paschim Medinipur	-	26.79	7.13	58.94	11.41	8.02	-	-	18.49
Purba Burdwan	-	22.85	5.53	44.01	10.66	12.80	-	137.32	7.72
Purba Medinipur	-	24.68	6.85	-	14.87	141.49	-	-	15.67
Purulia	-	3.64	12.40	18.10	11.20	18.97	6.61	223.61	10.70
South 24 Parganas	-	48.67	27.17	43.83	24.62	12.58	-	-	14.27
Uttar Dinajpur	-	24.54	7.61	31.45	0.46	7.89	95.37	-	7.73
West Bengal	**8.47**	**24.65**	**2.51**	**34.92**	**10.09**	**10.12**	**8.77**	**61.93**	**6.91**

Data source: Directorate of Agriculture, Govt. of West Bengal

In West Bengal, instability in the yield of **soybeans** ranges from 11.58 in the Darjeeling district to 165.80 in the Kalimpong district, where Kalimpong experiences the highest fluctuations, while Darjeeling maintains relatively consistent and stable yields. Overall, the instability index for soybean yields in West Bengal stands at 8.47.

When evaluating the yield of **til** in West Bengal, it appears less favorable compared to soybean. The overall instability of til yield for the state is 24.65. Notably, Alipurduar displays a relatively steady til yield among the districts, with the lowest instability index of 3.42, closely followed by Purulia, which has an index of 3.64 despite experiencing the highest instability in the area under til cultivation. In contrast, Howrah emerges as the district with the most instability in til productivity, exhibiting an instability index of 56.42. Additionally, while Paschim Medinipur, which contributes the largest area share under til cultivation in the state, shows high stability in the allocation of land for til cultivation, it faces higher instability in productivity compared to the state.

The productivity of **rapeseed and mustard** in West Bengal is notably stable, with an impressively low instability index of 2.51, distinguishing it as the most stable oilseed crop in terms of productivity in the state. Among the districts, Hooghly demonstrates particularly high stability in yield, boasting a minimum instability index of 1.92. Conversely, Darjeeling experiences the greatest instability, with an index of 51.79. Overall, rapeseed and mustard exhibit the highest stability among all oilseeds produced in West Bengal, both in terms of area under cultivation and productivity.

Regarding **linseed** yield, West Bengal exhibits an instability index of 34.92, making it the second most unstable oilseed crop in the state. Among the districts, Purulia stands out with a relatively low instability index of 18.10. Conversely, Howrah experiences the highest instability at 100.50, indicating significant fluctuations in linseed yield. Except for Purulia, all other districts have an instability index exceeding 30, highlighting widespread variability in linseed productivity across the state.

Groundnut yield in West Bengal exhibits an instability index of 10.09, with values ranging from a low of 0.46 in Uttar Dinajpur to a high of 42.97 in Coochbehar district. Uttar Dinajpur stands out as the most stable district, experiencing minimal fluctuations in groundnut yield, though it shows higher variability in the area under production. Conversely, Coochbehar displays higher instability in both the area under production and productivity, indicating significant variations in overall linseed production in this region. Similarly, the state-level instability index for **sunflower** yield is almost equivalent to that of groundnut, with an index of 10.12. However, at the district level, the scenario is less favorable, with instability indices ranging from 3.27 in Jhargram to 223.61 in Dakshin Dinajpur, Darjeeling, Kalimpong, and Murshidabad.

The yield of **niger** in West Bengal exhibits fluctuations similar to those of soybean, with an instability index of 8.77. At the district level, this index varies significantly, ranging from a low of 2.85 in Jalpaiguri to a high of 223.61 in Darjeeling, Jhargram, and Malda. However, it is noteworthy that the districts which produced niger in 2021-2022 have shown better stability than the state.

Safflower yield in West Bengal shows the highest level of instability among the oilseed crops, with an index of 61.93, which is less volatile than the fluctuations in the area under cultivation. The instability ranges from 94.17 in Birbhum to 223.61 in Jalpaiguri, Purba Burdwan, and Purulia. Notably, in 2021-2022, safflower cultivation was confined to the Birbhum district, where both the production area and productivity exhibited significant instability.

When considering the yield of **total oilseeds**, West Bengal demonstrates remarkable stability, with an overall instability index of 6.91. This indicates that the state's oilseed production is relatively consistent and less prone to fluctuations. Among the districts, Paschim Burdwan stands out for its stability, showing a modest variability in yield with an instability index of 5.92. On the other hand, Howrah exhibits the highest level of instability in oilseed yield, with an index of 36.07. This significant variability indicates that oilseed production in Howrah is subject to considerable fluctuations, which could be due to a variety of factors such as climatic variations, soil fertility issues, pest and disease pressures, or variations in agricultural practices.

Similarly, Table 4.2.4 provides a detailed examination of the agroclimatic zone-wise instability in the area, production, and yield rate of various oilseeds cultivated within the state, including the aggregate total of all oilseeds. The table reveals that in the **Northern Hill Zone**, the area allocated to rapeseed and mustard cultivation exhibits remarkable consistency, with an instability index of 6.71 over the five-year period from 2017-2018 to 2021-2022. However, this consistency does not extend to the yield rate of rapeseed and mustard, which shows considerable variability, reflected in a high instability index of 40.78. In contrast, the yield rate of til (sesame) in this zone is the most stable among all oilseeds, with a notably low instability index of 4.84.

Furthermore, the total production of til in the Northern Hill Zone also stands out for its relative

Table 4.2.4: Agroclimatic zone-wise instability in the area, production, and yield rate of various oilseed crops (2017-2018 to 2021-2022)

Agroclimatic zone	Particular	Soybean	Til	Rapeseed & Mustard	Linseed	Groundnut	Sunflower	Niger	Safflower	Total oilseed
Northern Hill Zone	Area	29.10	25.55	6.71	24.06	45.20	223.61	223.61	-	12.40
	Production	46.30	27.23	36.98	55.14	46.14	223.61	223.61	-	11.63
	Yield	21.69	4.84	40.78	44.05	9.97	223.61	223.61	-	18.11
Terai-Teesta Alluvial Zone	Area	-	7.99	2.55	26.74	11.25	47.71	81.27	223.61	2.62
	Production	-	7.47	10.36	35.39	14.05	48.93	89.83	223.61	9.83
	Yield	-	5.46	8.76	37.60	6.17	7.64	6.39	223.61	8.38
Vindhyan Alluvial Zone	Area	-	26.42	9.78	59.31	40.96	223.61	223.61	-	9.47
	Production	-	31.25	7.75	81.03	32.70	223.61	223.61	-	7.54
	Yield	-	28.30	8.16	34.76	13.79	223.61	223.61	-	8.11
Gangetic Alluvial Zone	Area	-	4.56	3.01	24.99	5.24	34.94	-	139.24	0.73
	Production	-	26.85	2.84	34.22	16.74	28.74	-	141.42	8.63
	Yield	-	28.23	2.40	39.40	15.08	5.85	-	137.32	8.82
Undulating Red and Laterite Zone	Area	38.12	5.02	14.78	15.60	8.58	39.61	10.10	113.01	7.55
	Production	55.47	19.28	16.35	27.16	7.63	37.66	15.67	126.69	10.34
	Yield	37.27	22.33	3.64	21.61	6.69	2.21	6.62	93.55	9.80
Coastal Saline Zone	Area	-	5.14	24.79	47.25	8.01	21.49	-	-	8.84
	Production	-	51.03	36.11	72.05	10.38	21.68	-	-	6.34
	Yield	-	46.48	17.08	43.83	14.81	12.89	-	-	13.56

Data source: Directorate of Agriculture, Govt. of West Bengal

stability, with an instability index of 27.23, the lowest among all types of oilseeds grown in this zone. Despite the high stability in the yield rate of til across all agroclimatic zones in West Bengal, it is important to note that the instability in the area under til cultivation within the Northern Hill Zone contributes to greater inconsistency in its total production.

A similar scenario is observed in the **Terai-Teesta Alluvial Zone**, where the area allocated to rapeseed & mustard cultivation demonstrates exceptional consistency. With an instability index of 2.55, this zone achieves the highest stability in the area devoted to rapeseed & mustard among all types of oilseeds grown within the zone. It is noteworthy that this zone has the highest stability in the area devoted to rapeseed & mustard cultivation in comparison to other agroclimatic zones of the state. Nevertheless, when considering the yield rate and total production, til (sesame) emerges as the most stable oilseed crop in this zone. The yield rate of til exhibits an instability index of 5.46, and its total production has an instability index of 7.47. Notably, this level of stability in the total production of til surpasses that of all other agroclimatic zones in the state.

Examining the **Vindhyan Alluvial Zone** reveals that among all the oilseed crops produced in this area, rapeseed and mustard exhibit the highest consistency in terms of cultivation area, production, and yield rate. The instability indices for these parameters are 9.78, 7.75, and 8.16, respectively, indicating a relatively stable performance for rapeseed and mustard in this zone. Similarly, the **Gangetic Alluvial Zone** stands out for its low instability in the area, production, and yield rate of rapeseed and mustard, with instability indices of 3.01, 2.84, and 2.40, respectively. This zone demonstrates the highest stability in the cultivation of rapeseed and mustard compared to all other varieties of oilseed crops produced within the zone. Furthermore, when considering all agroclimatic zones across the state, the Gangetic Alluvial Zone exhibits the greatest stability in terms of the area dedicated to rapeseed and mustard cultivation, as well as its total production and yield rate. These observations underscore the robustness and reliability of rapeseed and mustard cultivation in both the Vindhyan and Gangetic Alluvial Zones, highlighting their significant contributions to the overall production of rapeseed & mustard to the state.

The scenario is quite distinct for the **Undulating Red and Laterite Zone** and the **Coastal Saline Zone**. Unlike the other agroclimatic zones in the state, where the area devoted to rapeseed and mustard cultivation exhibits the highest consistency, these two zones show the highest stability in the area devoted to til (sesame) cultivation among all types of oilseeds grown there, with instability indices of 5.02 and 5.14, respectively. However, in terms of total production, groundnut demonstrates the greatest stability among all oilseeds in these zones, with instability indices of 7.63 in the Undulating Red and Laterite Zone and 10.38 in the Coastal Saline Zone. Moreover, when examining yield rates, the sunflower stands out for its stability, with instability indices of 2.21 in the Undulating Red and Laterite Zone and 12.89 in the Coastal Saline Zone. These results emphasize the unique agricultural dynamics within the Undulating Red and Laterite Zone and the Coastal Saline Zone, where til cultivation is the most stable in terms of area, groundnut in terms of total production, and sunflower in terms of yield rate.

Focusing on the area under total oilseed production across all the agroclimatic zones of West Bengal, it is evident that the Gangetic Alluvial Zone stands out as the most stable region, boasting an impressively low instability index of 0.73. This zone is followed by the Terai-Teesta Alluvial Zone, which also exhibits a relatively stable condition with an instability index of 2.62. In contrast, the Northern Hill Zone displays the highest inconsistency with an instability index of 12.40.

Regarding the production of total oilseed, the Coastal Saline Zone emerges as the most stable among the six agroclimatic zones, with an instability index of 6.34. It is closely followed by the Vindhyan Alluvial Zone, which has an instability index of 7.54. Conversely, the Northern Hill Zone remains the most unstable in terms of total oilseed production, with an instability index of 11.63, followed closely by the Undulating Red and Laterite Zone, which has an instability index of 10.34.

In terms of the productivity of total oilseed, the Vindhyan Alluvial Zone leads as the most stable zone, with an instability index of 8.11. The Terai-Teesta Alluvial Zone and the Gangetic Alluvial Zone follow closely, with instability indices of 8.38 and 8.82, respectively. However, the Northern Hill Zone once again exhibits the highest inconsistency in yield, with an instability index of 18.11.

These findings underscore the unique agricultural dynamics within the different agroclimatic zones of West Bengal. The varying stability and instability indices across zones highlight the necessity of tailoring agricultural practices and policies to the specific conditions and strengths of each agroclimatic zone. By doing so, it is possible to optimize oilseed production and enhance overall agricultural stability in the region. This targeted approach can help address the

Table 4.3.1: District-wise decomposition of oilseed crop production (2017-2018 to 2021-2022)

District	Til			Rapeseed & Mustard			Linseed		
	Yield Effect	Area Effect	Interaction Effect	Yield Effect	Area Effect	Interaction Effect	Yield Effect	Area Effect	Interaction Effect
Alipurduar	-3.3	**104.5**	-0.7	**96.2**	1.7	2.1	**57.7**	25.6	16.8
Bankura	-13.8	**116.8**	-2.9	1.1	**98.0**	0.8	-	-	-
Birbhum	**90.1**	14.0	-4.3	-16.7	**123.0**	-6.1	**106.3**	-4.0	-2.6
Coochbehar	14.9	**76.2**	8.8	**73.0**	20.1	7.0	**-164.8**	161.1	104.2
Dakshin Dinajpur	-0.7	**105.5**	-4.7	20.0	**83.9**	-4.0	**534.5**	-202.4	-232.1
Darjeeling	9.0	**94.7**	-3.8	**118.7**	-8.4	-10.3	30.0	**42.3**	27.6
Hooghly	**78.2**	26.5	-4.8	-2.8	**101.3**	1.6	-	-	-
Howrah	-43.0	**153.4**	-10.3	**55.6**	**54.8**	-10.2	-	-	-
Jalpaiguri	**77.8**	25.4	-3.3	**55.3**	42.3	2.4	**152.4**	-31.7	-20.6
Jhargram	**353.5**	-294.3	40.9	**57.2**	40.1	2.6	-	-	-
Kalimpong	-	-	-	**99.9**	0.0	0.0	-	-	-
Malda	0.5	**99.2**	0.2	**269.5**	-132.5	-37.0	**652.8**	-162.1	-390.4
Murshidabad	**53.3**	43.3	2.6	-3.4	**103.2**	0.3	**215.8**	-40.2	-75.7
Nadia	19.4	**78.5**	1.5	47.8	**54.5**	-2.3	**-2524.5**	1620.6	999.0
North 24 Parganas	7.1	**90.0**	3.0	**52.1**	43.9	4.4	-91.7	**120.1**	71.5
Paschim Burdwan	18.4	**62.6**	19.1	-6.3	**120.5**	-14.2	-	-	-
Paschim Medinipur	**134.2**	-28.9	-5.6	-8.5	**111.3**	-2.7	-	-	-
Purba Burdwan	-81.8	**204.0**	-22.0	**64.6**	38.6	-2.8	**785.4**	-419.9	-264.1
Purba Medinipur	-72.7	**159.1**	14.4	-13.5	**121.1**	-7.6	-	-	-
Purulia	-9.3	**103.8**	5.6	18.4	**64.7**	16.8	33.1	**52.7**	14.7
South 24 Parganas	**87.9**	15.8	-3.6	22.8	**56.6**	20.6	10.1	**55.7**	34.4
Uttar Dinajpur	-86.3	**143.1**	43.3	**100.8**	-0.6	0.0	**-348.5**	214.9	233.1
West Bengal	6.7	**93.5**	0.4	**251.1**	-149.9	-2.6	**345.2**	-137.8	-108.7

Data source: Directorate of Agriculture, Govt. of West Bengal

Table 4.3.1: District-wise decomposition of oilseed crop production (2017-2018 to 2021-2022) [continued…]

District	Groundnut			Sunflower			Total Oilseed		
	Yield Effect	Area Effect	Interaction Effect	Yield Effect	Area Effect	Interaction Effect	Yield Effect	Area Effect	Interaction Effect
Alipurduar	-1780.2	**2139.1**	-262.3	-	-	-	**87.4**	7.5	5.2
Bankura	-4.0	**107.3**	-3.3	14.8	**97.8**	-12.7	-1.2	**101.5**	-0.5
Birbhum	-4.7	**148.7**	-44.0	290.0	**-383.4**	193.3	-32.9	**143.1**	-10.4
Coochbehar	-190.1	**650.1**	-359.9	-	-	-	**87.7**	9.3	3.3
Dakshin Dinajpur	-10.1	**128.7**	-18.6	-	-	-	20.4	**83.9**	-4.1
Darjeeling	-0.4	**101.0**	-0.6	-	-	-	**165.3**	-51.5	-13.6
Hooghly	-49.6	**169.9**	-20.3	-	-	-	**59.8**	41.9	-1.9
Howrah	**80.4**	13.3	6.3	32.5	**95.3**	-27.8	**79.1**	16.1	4.8
Jalpaiguri	34.5	**56.3**	9.2	13.4	**97.5**	-11.0	**59.6**	34.5	5.7
Jhargram	**388.7**	-337.7	49.3	-82.5	**170.1**	12.7	**1202.7**	**-1203.3**	108.7
Kalimpong	-	-	-	-	-	-	16.8	**92.6**	-9.5
Malda	-8.5	**127.0**	-18.5	-	-	-	**239.3**	-108.8	-30.5
Murshidabad	-1.3	**109.6**	-8.3	-	-	-	-13.0	**112.4**	0.9
Nadia	-3.3	**102.4**	0.9	-2.6	**110.2**	-7.6	**55.9**	46.5	-1.5
North 24 Parganas	12.8	**91.5**	-4.3	17.2	**84.7**	-1.8	29.1	**66.7**	4.2
Paschim Burdwan	-6.5	**205.8**	-99.2	-	-	-	-2.4	**107.6**	-5.1
Paschim Medinipur	-67.0	**147.2**	19.6	2.4	**99.6**	-1.9	**171.4**	-63.6	-7.0
Purba Burdwan	30.3	**88.7**	-18.9	37.4	**73.3**	-10.7	**132.3**	-37.6	5.2
Purba Medinipur	**107.1**	-8.8	1.6	-	-	-	**129.3**	-36.5	7.3
Purulia	2.1	**92.8**	5.2	16.0	**63.6**	20.4	20.9	**61.6**	17.5
South 24 Parganas	25.6	**88.5**	-14.1	-7.6	**105.4**	2.3	-42.3	**143.6**	-2.3
Uttar Dinajpur	-0.3	**100.0**	0.2	-9.7	**100.8**	8.8	**141.4**	-37.7	-3.2
West Bengal	-1286.6	**1506.8**	-121.4	1.8	**99.0**	-0.7	42.2	**55.5**	0.3

Data source: Directorate of Agriculture, Govt. of West Bengal

specific challenges and leverage the strengths of each zone, leading to more efficient and sustainable agricultural outcomes.

4.6 District and agroclimatic zone-wise decomposition analysis of various oilseed crops

The decomposition analysis is invaluable in identifying the primary sources of variability in agricultural output. By breaking down total production into its constituent areas and yield components, it becomes possible to determine whether fluctuations in production are primarily due to changes in the area under cultivation or variations in yield rates. This analysis is particularly relevant for understanding the dynamics of oilseed crops in West Bengal.

From the previous discussion, it is clear that five major oilseed crops—til (sesame), rapeseed & mustard, linseed, groundnut, and sunflower—are cultivated across most districts of West Bengal. To gain deeper insights, a comprehensive decomposition analysis for the period 2017-2018 to 2021-2022 has been conducted both district-wise and agroclimatic zone-wise for these five key oilseed crops, as well as for the total oilseed.

Table 4.3.1 presents the district-wise decomposition of total production into its area and yield components, providing a detailed view of how the oilseed cultivation in each district is affected by these components. Similarly, Table 4.3.2 offers an agroclimatic zone-wise decomposition, which helps in understanding the production dynamics across different environmental conditions within the state.

A thorough examination of the variables affecting the shift in production of the major oilseed crops across different districts is given in Table 4.3.1. It specifically emphasizes, the relative contribution of yield, area, and simultaneously their joint contribution to the change in total production. When a component's value in the table is positive, it means that it has a positive impact on overall production. On the other hand, a negative value means that the component has impacted the overall production negatively. Furthermore, a larger magnitude denotes a greater impact on output and vice-versa.

The data presented in the table reveals that for West Bengal, the change in production for most major oilseed crops—specifically til, groundnut, and sunflower, as well as the overall total oilseed production—is predominantly driven by the area under cultivation. However, for rapeseed & mustard, and linseed, the primary factor influencing the change in production is the increase in yield. Additionally, the total oilseed production is influenced by a combination of both the increase in yield rate and the expansion of the cultivation area, highlighting the significant impact of these two factors working in tandem, though their interaction effect does not show any significant contribution.

The decomposition analysis of oilseed production in West Bengal provides a detailed view of the varied approaches employed by districts to drive growth across different oilseed crops, highlighting the dual influence of area expansion and yield improvements. While it is evident that many districts prioritize increasing the area under cultivation to boost production, others demonstrate remarkable success in enhancing productivity per unit area, emphasizing the adaptability of districts to their specific agronomic and economic contexts.

For Til (sesame) cultivation, the analysis indicates that the production dynamics are largely driven by area expansion in the majority of districts. In 14 out of 21 Til-producing districts, the dominant area effect underscores the reliance on land allocation as the primary strategy for growth. However, in 7 districts, a positive yield effect emerges as a key driver, reflecting advancements in agricultural practices such as the adoption of high-yielding varieties (HYVs), efficient irrigation, and improved pest and disease management. This dual pattern suggests that while some districts capitalize on land availability, others focus on intensifying productivity to meet production goals.

A similar reliance on the area effect is observed in the production of groundnut and sunflower, where land expansion is the predominant growth driver. In 18 out of 21 groundnut-producing districts and 11 out of 12 sunflower-producing districts, a positive area effect has been identified. This trend may point to the suitability of these crops for marginal or newly cultivated lands, allowing districts to quickly expand production without requiring significant yield-focused investments. However, in districts such as Howrah, Jhargram, and Purba Medinipur, a positive yield effect has driven groundnut production, highlighting the potential for targeted technological and agronomic interventions. Conversely, Birbhum district stands out with a negative area effect for sunflower production, possibly indicating challenges such as declining land availability or shifts in cropping patterns.

The scenario shifts noticeably for rapeseed & mustard and linseed production, where productivity improvements play a more substantial role in driving growth. A positive yield effect dominates in 11 out of 22 rapeseed & mustard-producing districts and 7 out of 14 linseed-producing districts. This indicates that these districts have successfully harnessed yield-

Table 4.3.2: Agroclimatic zone-wise decomposition of oilseed crop production (2017-2018 to 2021-2022)

Agroclimatic Zone	Til			Rapeseed & Mustard			Linseed		
	Yield Effect	Area Effect	Interaction Effect	Yield Effect	Area Effect	Interaction Effect	Yield Effect	Area Effect	Interaction Effect
Northern Hill Zone	9.0	**94.7**	-3.8	**115.4**	-8.0	-7.7	30.0	**42.3**	27.6
Terai-Teesta Alluvial Zone	-711.9	**733.6**	72.7	79.7	**17.8**	2.5	**-1252.6**	770.3	585.1
Vindhyan Alluvial Zone	-1.1	**102.1**	-1.0	-40.9	**133.6**	7.3	**582.1**	-173.9	-307.4
Gangetic Alluvial Zone	-132.1	**244.8**	-12.5	1.3	**97.6**	-0.1	**377.3**	-119.5	-158.0
Undulating Red and Laterite Zone	**77.8**	20.6	1.7	-0.2	**100.6**	-0.1	**90.4**	7.3	2.9
Coastal Saline Zone	**82.3**	22.4	-4.6	13.5	**76.7**	9.7	10.1	**55.7**	34.4

Agroclimatic Zone	Groundnut			Sunflower			Total Oilseed		
	Yield Effect	Area Effect	Interaction Effect	Yield Effect	Area Effect	Interaction Effect	Yield Effect	Area Effect	Interaction Effect
Northern Hill Zone	-0.4	**101.0**	-0.6	-	-	-	-176.5	**243.7**	33.5
Terai-Teesta Alluvial Zone	10.8	**86.0**	3.3	-341.1	**359.6**	80.9	**93.6**	5.7	0.9
Vindhyan Alluvial Zone	-8.7	**127.3**	-18.5	-	-	-	-44.0	**136.4**	7.7
Gangetic Alluvial Zone	-3.1	**103.4**	-0.4	-1.1	**100.8**	0.4	48.7	**50.9**	-0.5
Undulating Red and Laterite Zone	-175.2	**280.7**	-7.5	-9.5	**103.4**	6.0	10.8	**87.2**	1.7
Coastal Saline Zone	**105.7**	-6.9	1.2	5.9	**96.2**	-2.2	**136.4**	-43.7	7.6

Data source: Directorate of Agriculture, Govt. of West Bengal

enhancing technologies and practices, which may include better seed varieties, advanced nutrient management, and timely sowing. However, certain districts, such as Coochbehar, Nadia, and Uttar Dinajpur, exhibit a negative yield effect for linseed production, potentially reflecting issues like pest infestations, unfavourable weather, or suboptimal farming techniques. On the other hand, the area effect remains influential for rapeseed & mustard, with 12 out of 22 districts showing a positive area effect and Howrah district presenting a balanced impact of both area and yield effects.

At the state level, total oilseed production predominantly relies on an increase in cultivated area. This trend is reflective of the overarching strategy employed across West Bengal to meet growing demand by bringing more land under oilseed cultivation. However, a closer analysis reveals that 13 out of 22 districts show a positive yield effect as the dominant factor, while 9 districts rely on a positive area effect. This duality highlights the importance of striking a balance between land expansion and productivity improvements. Notably, Jhargram district shows a negative impact overall, indicating challenges that require immediate attention to reverse declining trends and restore production growth.

In conclusion, while area expansion has been the predominant driver of oilseed production growth in West Bengal, the role of yield improvements cannot be overlooked. The findings suggest that a dual approach—one that emphasizes sustainable land use while simultaneously fostering productivity enhancements—is essential for ensuring long-term growth. By aligning agricultural policies with region-specific needs and supporting both land expansion and yield optimization, West Bengal can further strengthen its oilseed production and contribute to the economic well-being of its farming communities.

In addition to analyzing the district-level scenario, it is crucial to delve into the production dynamics of major oilseed crops across various environmental conditions within the state, as presented in Table 4.3.2. This comprehensive examination provides valuable insights into the factors influencing oilseed production across different agroclimatic zones.

The data in the table reveal that, with the exception of linseed, the production of crops such as til, rapeseed & mustard, groundnut, sunflower, and total oilseeds is predominantly driven by the expansion of the area under cultivation in most agroclimatic zones. This suggests that increasing the cultivation area has been a significant determinant of production growth for these crops.

However, notable variations are observed when analyzing the yield effect across specific zones and crops. For til, the production benefits significantly from a dominant and positive yield effect in the Undulating Red and Laterite Zone as well as the Coastal Saline Zone. Similarly, rapeseed & mustard production experiences a dominant and positive yield effect exclusively in the Northern Hill Zone. Groundnut production stands out in the Coastal Saline Zone, where the yield effect plays a crucial role. Furthermore, the total oilseed production shows a pronounced positive yield effect in both the Terai-Teesta Alluvial Zone and the Coastal Saline Zone.

In the case of linseed, the production dynamics exhibit a nuanced pattern. While the area effect is dominant in the Northern Hill Zone and Coastal Saline Zone, a contrasting trend is observed in the Vindhyan Alluvial Zone, Gangetic Alluvial Zone, and Undulating Red and Laterite Zone, where the yield rate positively influences production. Interestingly, in the Terai-Teesta Alluvial Zone, the dominant yield rate impacts linseed production negatively, highlighting a unique regional challenge. These findings emphasize the importance of adopting region-specific strategies to enhance oilseed production, considering the varying impacts of area expansion and yield improvements across agroclimatic zones.

Chapter – V

Major Findings and Policy Suggestions

Edible oils are a major source of dietary fat and are used extensively in Indian cuisine. In addition to being the world's second-largest consumer of vegetable oil, India is one of the leading producers of oilseeds. However, the insufficient production of oilseed within the economy in order to meet the domestic demand for edible oil causes significant importation of edible oil. Policymakers are concerned about moving India closer to self-sufficiency in edible oils, given the anticipated increase in demand for edible oils on the domestic market.

Regarding the net value added (NVA) by agriculture to the Indian economy over the last two decades, West Bengal has consistently ranked among the top five contributing states. Among the five states that have consistently contributed the highest NVA to the Indian economy through agriculture over the past five years, West Bengal has the highest compound annual growth rate (from 2010-2011 to 2019-2020) for the area under cultivation as well as production for oilseeds. However, West Bengal has a relatively poor compound annual growth rate of oilseed yield over the same time period.

This study takes both primary and secondary data into account in order to comprehend the current edible oil consumption as well as the oilseed production scenario in West Bengal. The consumption patterns of different edible oils are assessed using primary data from 500 households that were collected between May and July 2022 in five districts of West Bengal, namely, Darjeeling, Dakshin Dinajpur, Nadia, Paschim Bardhaman, and Purba Medinipur. Along with the assessment of consumption, the state of oilseed production has also been investigated, using secondary data made available by the Directorate of Agriculture, Government of West Bengal.

This chapter delves into the significant findings concerning the consumption patterns of edible oil in West Bengal, offering insights into the preferences and trends observed among consumers. It also examines the production scenario of various oilseed crops in the region, highlighting the current status, challenges, and opportunities within this sector. Furthermore, the chapter explores suitable policies aimed at addressing issues related to edible oil consumption and enhancing the production of oilseed crops, with a focus on fostering sustainable practices and meeting the growing demand effectively.

5.1 Key insights on edible oil consumption

- The sample households utilize a variety of edible oils to meet their culinary needs; these include mustard oil, soybean oil, sunflower oil, rice bran oil, palm oil, olive oil, and vanaspati.
- Mustard oil is the most popular cooking oil among the sample households, being used by 93.2 per cent of the sample households. Despite being the second most popular edible oil, soybean oil is only utilized by 44.8 per cent of households, representing less than half of the percentage of those who opt for mustard oil. Sunflower oil is the third most popular edible oil, being used by 22.2 per cent of the sample households; however, this figure is less than half of the percentage of soybean oil-using households. Only a small percentage, i.e., 7.8 per cent of the sample households, use rice-bran oil, followed by palm oil at 3.6 per cent. On the other hand, olive oil and vanaspati are consumed by a very small portion of households, indicating their comparatively lower preference.
- Edible oil preferences vary significantly across districts. Except for Darjeeling, nearly all sample households in the other four districts use mustard oil, while over 20 per cent of households in Darjeeling do not. Darjeeling has the highest percentage of soybean oil consumers, followed by Nadia, Purba Medinipur, Paschim Bardhaman, and Dakshin Dinajpur. While soybean oil is generally more popular than sunflower or rice-bran oil, Paschim Bardhaman shows a preference for sunflower oil over soybean oil. Rice-bran oil, though fourth in overall preference, is favoured over sunflower oil in Dakshin Dinajpur.
- The scenario for edible oil preferences varies between rural and urban areas. In rural regions, mustard oil remains the most popular, except in Darjeeling, where soybean oil is more prevalent. Paschim Bardhaman has a higher preference for sunflower oil overall, but in its rural areas, soybean oil is more commonly used. In the rural areas of Dakshin Dinajpur, rice-bran oil is favoured over soybean and sunflower oils. In urban areas, mustard oil is the most preferred in all districts except Paschim Bardhaman, where sunflower oil is the second choice after mustard oil, rather than soybean oil.
- Households often use more than one type of edible oil, revealing diverse culinary preferences. Mustard oil is the most preferred, with more than one-third of households combining it with soybean oil, one-fourth using only mustard oil, and one-fifth combining it with sunflower oil. Additionally, 5.6 per cent prefer mustard and rice-bran oil, and 5.4 per cent use only soybean oil. In rural areas, over one-third use only mustard oil, and another third combine it with soybean oil. Urban households mostly use a

combination of mustard and soybean oils (42.1 per cent) or mustard and sunflower oils (31.5 per cent), with only 6.2 per cent using only mustard oil. Overall, about 80 per cent of households prefer three combinations: mustard and soybean oil, mustard and sunflower oil, or only mustard oil.

- Darjeeling district has the highest annual per capita consumption of edible oil at 15.4 litres, followed by Paschim Bardhaman (14.8 litres), Nadia (14.3 litres), Dakshin Dinajpur (13.6 litres), and Purba Medinipur (13.2 litres). Urban areas generally consume more edible oil than rural areas. Despite Darjeeling's overall highest consumption, Nadia leads in urban consumption, while Darjeeling surpasses Nadia in rural consumption. The rural-urban consumption gap is notably significant in the Nadia and Darjeeling districts, but minimal in Dakshin Dinajpur, Paschim Bardhaman, and Purba Medinipur.
- Mustard oil is the most consumed edible oil among sample households, with an annual average of 9.6 litres per person. Despite being the fourth most preferred, rice-bran oil has the second highest consumption at 7.9 litres per person annually. Soybean oil follows with 7.4 litres per person annually. Vanaspati, the least preferred, is consumed at 6 litres per person annually, followed by sunflower oil (5.6 litres), palm oil (3.6 litres), and olive oil (2.3 litres).
- Consumption patterns vary between urban and rural areas. Urban households generally consume more of all edible oils, except for mustard and sunflower oil, which are more consumed in rural areas. In rural areas, mustard oil has the highest consumption (about 10 litres annually), followed by rice-bran oil (7 litres), soybean oil, sunflower oil, palm oil, and olive oil. Urban households consume the most mustard and rice-bran oils (9 litres annually), followed by other oils in similar quantities, though vanaspati is more consumed in urban than rural areas.
- The variation in consumption of the four major oils (mustard, soybean, sunflower, and rice-bran) is least in Darjeeling and Purba Medinipur districts but highest in Dakshin Dinajpur. Notably, in Dakshin Dinajpur, mustard oil consumption is around 12 litres annually, while other oils are consumed notably less. In urban areas, mustard oil consumption is highest in Dakshin Dinajpur, Paschim Bardhaman, and Purba Medinipur, while rice-bran oil consumption is highest in Darjeeling and Nadia. The variation in oil consumption is lowest in urban Nadia and highest in rural Dakshin Dinajpur.

- The preferences and consumption levels for different edible oils among households are influenced by several socioeconomic factors:

  Preferences

  - Family size:
    - Mustard oil is the most preferred, but its consumption decreases as family size increases. This pattern is also observed with sunflower oil.
    - Smaller families (up to 3 members) primarily consume mustard, soybean, and sunflower oils.
    - Larger families (more than 4 members) predominantly consume rice-bran and palm oils.
  - Age of the household head:
    - The preference for mustard oil remains high and consistent across all age groups.
    - Preference for soybean oil increases with the age of the household head.
    - Households with heads over 50 years old show a higher preference for sunflower oil.
    - Those with heads over 60 years old exhibit the greatest inclination towards rice-bran oil.
    - Preference for palm oil is relatively uniform across all age groups.
  - Educational status of the household head:
    - Households with higher educational qualifications of the head tend to consume more mustard and sunflower oils.
    - Soybean oil consumption is consistent across all educational levels except for those with only primary education.
    - Rice-bran oil is more favored by households where the head has a higher educational status, excluding those with higher secondary education.
    - Initial increase in palm oil consumption with education level, but it drops for those with secondary school education or above.
  - Monthly household income:
    - Except for the lowest income category, higher income households show a positive relationship with the consumption of mustard oil.
    - Higher income households also tend to favor sunflower oil.
    - Higher income households show less preference for palm oil.

- Households in the highest income category have the maximum demand for rice-bran oil.
- Middle-income households have a greater preference for soybean oil compared to the highest and lowest income levels.

Consumption levels

- **Family Size**:
  - Small families (up to 3 members) have the highest consumption levels for all edible oils except vanaspati.
  - Middle-sized households (4 members) consume more mustard and rice-bran oil per person annually than large families (more than 4 members).
  - For soybean and sunflower oils, large families consume more than medium-sized households.
- **Age of Household Head**:
  - The average yearly intake of mustard oil per person decreases as the age of the household head increases.
  - Sunflower oil consumption also declines with the age of the head, but rises for heads over 60 years old.
  - Younger heads of households consume more soybean oil annually per person than older heads.
  - Palm oil consumption increases with the age of the household head.
  - Rice-bran oil consumption increases with age, but decreases for heads older than 60 years.
- **Educational Status of Household Head**:
  - Mustard oil consumption remains roughly the same regardless of the educational level of the household head.
  - The relationship between the annual per capita intake of different oils and the educational attainment of the head does not follow a clear pattern.
  - Households with heads having lower levels of education consume more soybean oil; however, higher levels of education are associated with higher consumption of rice-bran and sunflower oils.
- **Monthly Income**:
  - Except for the highest income group, the average annual per capita consumption of mustard oil declines as monthly household income rises.

    - Lower-income groups consume more soybean and sunflower oils compared to higher-income groups.
- Among the five districts, Darjeeling is the only one where the average yearly household consumption of edible oil increased by 6.7 per cent over five years. Nadia had the highest decrease at 7.6 per cent, followed by Paschim Bardhaman (3.7 per cent), Purba Medinipur (2.8 per cent), and Dakshin Dinajpur (1.5 per cent).
- The changes in edible oil consumption also differed between rural and urban areas. In Darjeeling, rural households saw a 12.1 per cent increase, whereas urban households saw a 0.8 per cent increase. In Purba Medinipur, both rural and urban households experienced declines, with urban households seeing an 8.4 per cent decrease and rural ones a 2.1 per cent decrease.
- In Nadia and Dakshin Dinajpur, rural households experienced declines of 10.7 per cent and 1.9 per cent, respectively, while urban households saw increases of 3.7 per cent and 1.6 per cent. Paschim Bardhaman showed a 4.7 per cent increase in rural areas and a 5.5 per cent decrease in urban areas.
- The changes also varied across different types of edible oils. Mustard oil consumption generally declined across all districts, except for slight increases in Darjeeling and the urban area of Dakshin Dinajpur. Soybean oil consumption increased in all districts except for the urban areas of Paschim Bardhaman. Sunflower oil consumption decreased overall but increased in specific rural and urban areas. Rice-bran oil usage declined overall but showed a positive trend in some urban areas.
- The dynamics of edible oil consumption provide insights into dietary habits and preferences in West Bengal. The subsequent chapter will discuss the production side, including oilseed cultivation, which influences the edible oil market in the region.

5.2 Key insights on oilseed production

- West Bengal demonstrated consistent positive growth in the oilseed area from 2010-11 to 2019-20, outperforming India's overall negative trend during the same period. Similarly, the state achieved higher growth rates in oilseed production compared to the national average. From 2011-12 onwards, West Bengal maintained positive growth in oilseed production, whereas India experienced predominantly negative growth.
- West Bengal faced challenges in improving its yield rates. After an initial phase of positive growth, the compound annual growth rate (CAGR) for yield in the state

steadily declined post-2012-13, even as India showed signs of improvement in later years. By 2019-20, both the area and production growth rates in West Bengal reached a point of alignment, while yield growth remained stagnant. These trends underscore the importance of implementing targeted interventions to address the specific constraints in West Bengal's oilseed sector. While the state has made commendable progress in expanding the area and production of oilseeds relative to the national scenario, enhancing yield rates remains a critical area for improvement.

- In 2021-2022, Murshidabad leads with 14.92 per cent of the total oilseed cultivation area of the state, followed by Nadia (12.45 per cent) and Paschim Medinipur (9.71 per cent). Alipurduar, Paschim Burdwan, Darjeeling, and Kalimpong account for less than 1 per cent. Murshidabad again leads with 14.72 per cent of the total oilseed production of the state, followed by Nadia (10.41 per cent), Paschim Medinipur (9.11 per cent), Dakshin Dinajpur (8.44 per cent), Uttar Dinajpur (8.37 per cent) and the same four districts at the bottom hold less than 1 per cent each. Purba Medinipur has the highest yield at 32.4 quintals per hectare (q/ha), followed by Howrah (21.4 q/ha), Jalpaiguri (16.2 q/ha), and Malda (14.8 q/ha). The lowest yields are in Darjeeling (8.1 q/ha) and Bankura (8.7 q/ha). In a nutshell, Murshidabad, Nadia, and Paschim Medinipur are prominent in both land share and production, while Purba Medinipur excels in yield rate, whereas Darjeeling and Bankura face challenges with lower yields.
- The Gangetic Alluvial Zone has the largest share of oilseed cultivation area (47 per cent) and production (45.4 per cent) but a low yield rate (12.1 quintals per hectare). The Undulating Red and Laterite Zone ranks second in area (24.6 per cent) and production (20.3 per cent) but also has a low yield rate (10.3 quintals per hectare). In contrast, the Coastal Saline Zone has a small area share (3.2 per cent) and production (6.4 per cent) but the highest yield rate (24.9 quintals per hectare).
- The Terai-Teesta Alluvial Zone and the Vindhyan Alluvial Zone have moderate contributions to area and production, with yield rates of 13 and 15 quintals per hectare, respectively. The Northern Hill Zone struggles with the lowest yield rate (8.2 quintals per hectare) and minimal area and production shares (0.1 per cent each).
- Rapeseed & Mustard is the most extensively cultivated oilseed in West Bengal, occupying 64.01 per cent of the total oilseed area and contributing 62.27 per cent to the state’s oilseed production in 2021-2022, with a yield rate of 12.18 quintals per hectare. Til (Sesame) follows as the second most cultivated oilseed, covering 27.25 per cent of

the area and accounting for 21.29 per cent of production, with a yield rate of 9.79 quintals per hectare. Groundnut ranks third, comprising 7.79 per cent of the cultivated area and 15.82 per cent of production, and it achieves the highest yield rate at 25.44 quintals per hectare. Other oilseeds, including Sunflower, Soybean, Niger, Linseed, and Safflower, collectively occupy less than one per cent of the total oilseed area and contribute less than 1 per cent to the state's production. Their yield rates generally range from 5 to 8 quintals per hectare, except for Sunflower, which has a yield rate of 12.18 quintals per hectare, comparable to that of Rapeseed & Mustard.

- Rapeseed & mustard are the only oilseed crops cultivated across all districts of West Bengal, with Murshidabad leading at 19.18 per cent of the total cultivation area of the state in 2021-2022, followed by Nadia, Dakshin Dinajpur, and Uttar Dinajpur. Groundnut and til are also widely grown, except in Kalimpong, with Hooghly and Paschim Medinipur leading their respective cultivation. While til farming is more dispersed across districts such as Bankura, Hooghly, and Murshidabad, groundnut cultivation is concentrated in Purba and Paschim Medinipur. Linseed and sunflower are cultivated in fewer districts, with sunflower predominantly grown in South 24 Parganas (81.64 per cent) and linseed in Purulia. Niger cultivation is largely concentrated in Alipurduar, Purulia, and Jalpaiguri, while soybean is primarily grown in Darjeeling (92.27 per cent). Safflower, in contrast, is exclusively cultivated in Birbhum, reflecting the unique agricultural conditions and practices of these districts.
- In general, a larger cultivated area tends to result in higher production levels, as observed with crops like soybean, til, rapeseed & mustard, sunflower, and niger, where districts with greater land allocation also achieve higher production. However, differences in yield rates can lead to disparities between the share of cultivated area and production. For instance, while Purulia has the highest share of linseed cultivation, Murshidabad surpasses it in total production. Similarly, although Hooghly allocates the largest area for groundnut cultivation, Purba Medinipur leads in production.
- Birbhum district excels in soybean production with the highest yield of 1,944 kg per hectare, significantly above the state average of 798 kg per hectare. North 24 Parganas leads in til production with a yield of 1,371 kg per hectare, compared to the state's 979 kg per hectare. Malda is the frontrunner in rapeseed & mustard production, achieving 1,622 kg per hectare, and also excels in linseed production with a yield of 634 kg per hectare, surpassing the state's averages. Purba Medinipur boasts the highest yield of

groundnuts at 3,891 kg per hectare, far above the state's average of 2,544 kg per hectare. Nadia leads in sunflower production with a yield of 1,769 kg per hectare, while Coochbehar shows exceptional niger seed production with a yield of 591 kg per hectare, both exceeding state averages. Lastly, Birbhum is the sole producer of safflower, with a yield of 600 kg per hectare, aligning with the state's average yield. These figures illustrate the critical role of specific districts in enhancing overall productivity through higher yields.

- Examining the status of oilseed production across different agroclimatic zones in West Bengal reveals a diverse cultivation pattern. Til, rapeseed & mustard, linseed, and groundnut are grown across all zones, while other crops have more specific zones. The Undulating Red & Laterite Zone uniquely supports all oilseed crops found in West Bengal. The Northern Hill Zone leads in soybean cultivation, while the Gangetic Alluvial Zone excels in til, rapeseed & mustard, and groundnut cultivation. The Terai-Teesta Alluvial Zone is significant for linseed, and the Coastal Saline Zone predominates in sunflower cultivation. The data indicate that zones with higher productivity for specific crops often allocate less area to these crops compared to zones with lower productivity.
- An analysis of instability in the area of oilseed cultivation across West Bengal from 2017-2018 to 2021-2022 reveals varying trends. Soybean cultivation shows significant fluctuations, with Kalimpong being the most unstable and Darjeeling the most stable. Til cultivation is relatively stable, with Hooghly showing the lowest instability and Purulia the highest. Rapeseed & mustard emerge as the most stable oilseed crops, while linseed displays variability, with Alipurduar being stable and Howrah experiencing notable fluctuations. Groundnut cultivation is largely stable, particularly in Howrah, though Paschim Burdwan shows high instability. Sunflower cultivation varies significantly, with stability observed in Jhargram. Niger and safflower exhibit the highest instability levels, with safflower being the most volatile. Overall, oilseed cultivation in West Bengal demonstrates remarkable stability, with Nadia being the most stable district and Kalimpong the least.
- Oilseed production in West Bengal shows varied stability across crops and districts. Rapeseed & mustard demonstrate notable stability, reflecting their suitability to local conditions. Soybean and til production vary widely, with Kalimpong and Dakshin Dinajpur experiencing significant fluctuations, while Darjeeling and Jhargram show

stability. Groundnut production is relatively stable, with Alipurduar being the most consistent. Sunflower, niger, and safflower display higher instability, indicating potential for improvement. Overall, the state's total oilseed production remains stable, highlighting the need for tailored strategies to address district-specific challenges and promote sustainable production.

- Instability analysis in West Bengal reveals greater fluctuations in yield rates than in cultivation areas for total oilseeds, til, rapeseed & mustard, linseed, and groundnut. In contrast, soybean, sunflower, niger, and safflower show higher instability in area than in yield. Soybean yield is particularly volatile in Kalimpong, while til and linseed yields are unstable, especially in Howrah. Rapeseed & mustard yields remain stable, and groundnut yields are generally consistent, with some variability in Coochbehar. Sunflower, niger, and safflower exhibit regional disparities in yield. Overall, while total oilseed yields are stable, district-specific variations suggest the need for targeted strategies to improve productivity and stability.
- The agroclimatic zone-wise instability analysis of oilseed cultivation in West Bengal reveals notable differences in stability across regions. The Northern Hill Zone exhibits consistency in the area under rapeseed & mustard cultivation but variability in yield, while til shows the most stable yield. The Terai-Teesta Alluvial Zone demonstrates the highest stability in rapeseed & mustard area and til production. The Vindhyan Alluvial Zone shows stable rapeseed & mustard across area, production, and yield, while the Gangetic Alluvial Zone excels in rapeseed & mustard stability, especially in area and yield. The Undulating Red and Laterite Zone and Coastal Saline Zone stand out for til area stability, groundnut production stability, and sunflower yield consistency. Overall, the Gangetic Alluvial Zone leads in oilseed area stability, while the Coastal Saline Zone excels in production stability. The Northern Hill Zone, however, shows the highest instability in all parameters.
- The decomposition analysis reveals that the change in production for key oilseed crops such as til, groundnut, and sunflower is predominantly driven by the expansion of the cultivation area, with many districts focusing on increasing land allocation to enhance production. In contrast, crops like rapeseed & mustard and linseed show more significant changes due to yield improvements. Overall, total oilseed production benefits from both an increase in yield rates and expanded cultivation area, although the combined effect of these factors is not substantial.

- At the state level, the focus on expanding the cultivation area reflects West Bengal's strategy to meet rising demand by increasing the land dedicated to oilseed production. However, different districts adopt a dual approach, with some focusing on improving productivity through advanced agricultural practices, while others prioritize land expansion. This flexibility underscores the effectiveness of both strategies, depending on local conditions. The agroclimatic zone-wise decomposition further highlights how varying environmental conditions impact production, with most zones primarily relying on area expansion, though certain zones, such as the Coastal Saline and Northern Hill Zones, benefit from yield improvements for specific crops like groundnut and rapeseed & mustard.

5.3 Policy recommendations

The recommendations put forth suggest a holistic strategy to tackle the challenges identified in the discussion. The policy recommendation derived from this discussion advocates for an integrated approach that encompasses enhancing agricultural productivity, addressing consumption inequalities, optimizing production and supply chains, promoting sustainable agricultural practices, and implementing institutional reforms. Together, these measures strive to establish an equitable and sustainable edible oil sector in West Bengal.

1. Addressing Consumption Inequalities

- Addressing consumption inequalities requires a strategic approach that begins with educational campaigns. Launching public awareness programs to highlight the health benefits of diverse oils can encourage consumers to incorporate a variety of oils into their diets. Collaborating with NGOs and community groups to spread knowledge about balanced diets ensures that this information reaches a wider audience, particularly those in underserved communities. These efforts can help shift dietary habits towards healthier and more diverse choices.
- Improving rural access to nutritious oils is another critical step. Enhancing rural distribution networks for less popular but nutritious oils ensures that these options are available to all. Introducing mobile retail units can bridge the gap in remote areas, providing affordable oil options to communities that might otherwise have limited access. This approach not only promotes healthier eating habits but also supports local economies by creating new market opportunities for producers.

- Subsidized pricing for low-income groups is essential to make premium oils more accessible. Reducing costs for oils like rice-bran and olive oil encourages their adoption among consumers who might otherwise find them too expensive. Implementing ration card schemes to distribute subsidized oils in rural areas ensures that even the most economically disadvantaged populations can benefit from these healthier options. By addressing both education and access, these measures work together to reduce consumption inequalities and promote better nutrition for all.

2. Strengthening Agricultural Productivity

- Enhancing agricultural productivity in West Bengal necessitates a strategic, multi-pronged approach. It begins with advancing crop research and development, focusing on high-yield, drought-resistant, and pest-resistant oilseed varieties suited to the region's diverse agro-climatic conditions. Expanding research into less commonly cultivated crops, such as sunflower and soybean, can diversify production, bolster food security, and unlock new market opportunities.
- Empowering farmers through capacity-building initiatives is equally critical. Training in modern agricultural practices, including integrated pest management and precision irrigation techniques, equips farmers with tools to improve yields sustainably. Demonstration farms in high-potential zones, such as the Coastal Saline Zone, can serve as hubs for disseminating best practices and innovations.
- Financial incentives, such as subsidies for eco-friendly fertilizers and high-quality seeds, alongside robust crop insurance schemes, are essential to mitigate risks associated with climate variability and market fluctuations. These initiatives collectively ensure agricultural resilience and productivity growth.

3. Optimizing Production and Supply Chains

- Optimizing production and supply chains in the agricultural sector requires infrastructure development. Establishing oilseed processing units in high-production districts can significantly reduce post-harvest losses, ensuring that a larger portion of the harvest reaches the market. Building better storage facilities is equally important, as it minimizes spoilage and helps maintain a steady supply of oilseeds throughout the year. These improvements not only enhance efficiency but also contribute to the overall stability of the supply chain.

- Market integration is another crucial aspect. Facilitating direct market linkages for farmers ensures they receive better prices by reducing reliance on intermediaries. This direct connection to the market empowers farmers, giving them more control over their earnings. Additionally, creating export hubs for high-value oils like groundnut and sesame can boost farmer incomes by tapping into international markets. These hubs can serve as centralized points for quality control and export logistics, further enhancing the value of the produce.
- Technology adoption plays a pivotal role in modernizing the agricultural supply chain. Digitizing supply chains improves transparency and efficiency, allowing for better tracking of produce from farm to market. Promoting the use of AI and satellite data for real-time monitoring of crop health and yield predictions can help farmers make informed decisions, leading to higher productivity and reduced risks. These technological advancements not only streamline operations but also provide valuable insights that can drive sustainable growth in the agricultural sector.

4. Sustainable Agricultural Practices

- Sustainable agricultural practices are essential for ensuring long-term productivity and environmental health. Promoting crop rotation and intercropping with legumes helps maintain soil fertility by replenishing essential nutrients and reducing pest and disease cycles. Encouraging organic farming practices reduces dependency on chemical fertilizers and pesticides, leading to healthier soil and ecosystems. These practices not only enhance soil health but also contribute to the overall sustainability of agricultural systems.
- Building climate resilience is crucial in the face of changing weather patterns. Developing climate-resistant farming systems with efficient irrigation and rainwater harvesting techniques ensures that crops can withstand droughts and erratic rainfall. Agroforestry practices, which integrate trees and shrubs into agricultural landscapes, protect oilseed crops from extreme weather conditions and provide additional benefits such as carbon sequestration and biodiversity enhancement. These measures help farmers adapt to climate change while maintaining productivity.
- Expanding agricultural activities in high-yield zones, such as the Coastal Saline Zone, leverages the potential of underutilized areas. By increasing cultivated areas in these regions, farmers can tap into new resources and improve overall production. This

expansion should be done sustainably, ensuring that soil health and ecosystem balance are maintained. By focusing on sustainable practices and climate resilience, the agricultural sector can achieve higher productivity while preserving the environment for future generations.

5. Institutional Reforms

- Institutional reforms are crucial for creating a robust agricultural sector. Collaborative models that foster partnerships between government bodies, research institutions, and private enterprises can lead to innovative solutions that address various challenges. Strengthening cooperatives empowers small-scale farmers by providing them with better access to resources, knowledge, and markets. These partnerships and cooperatives can drive sustainable growth and ensure that the benefits of agricultural advancements reach all stakeholders.
- Regulatory measures play a vital role in stabilizing the agricultural market. Implementing minimum support price (MSP) mechanisms helps stabilize market prices, ensuring that farmers receive fair compensation for their produce. Monitoring and controlling imports protect domestic oilseed farmers from global market volatility, providing them with a more predictable and secure environment. These measures help create a balanced market that supports both producers and consumers.

By addressing disparities in consumption and production, the proposed measures aim to achieve a balanced, equitable, and sustainable edible oil sector in West Bengal. The recommendations focus on empowering rural communities, enhancing agricultural efficiency, and ensuring economic and nutritional security for all. These interventions will not only bridge current gaps but also position the state as a leader in India’s edible oil landscape.

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Annexure 1

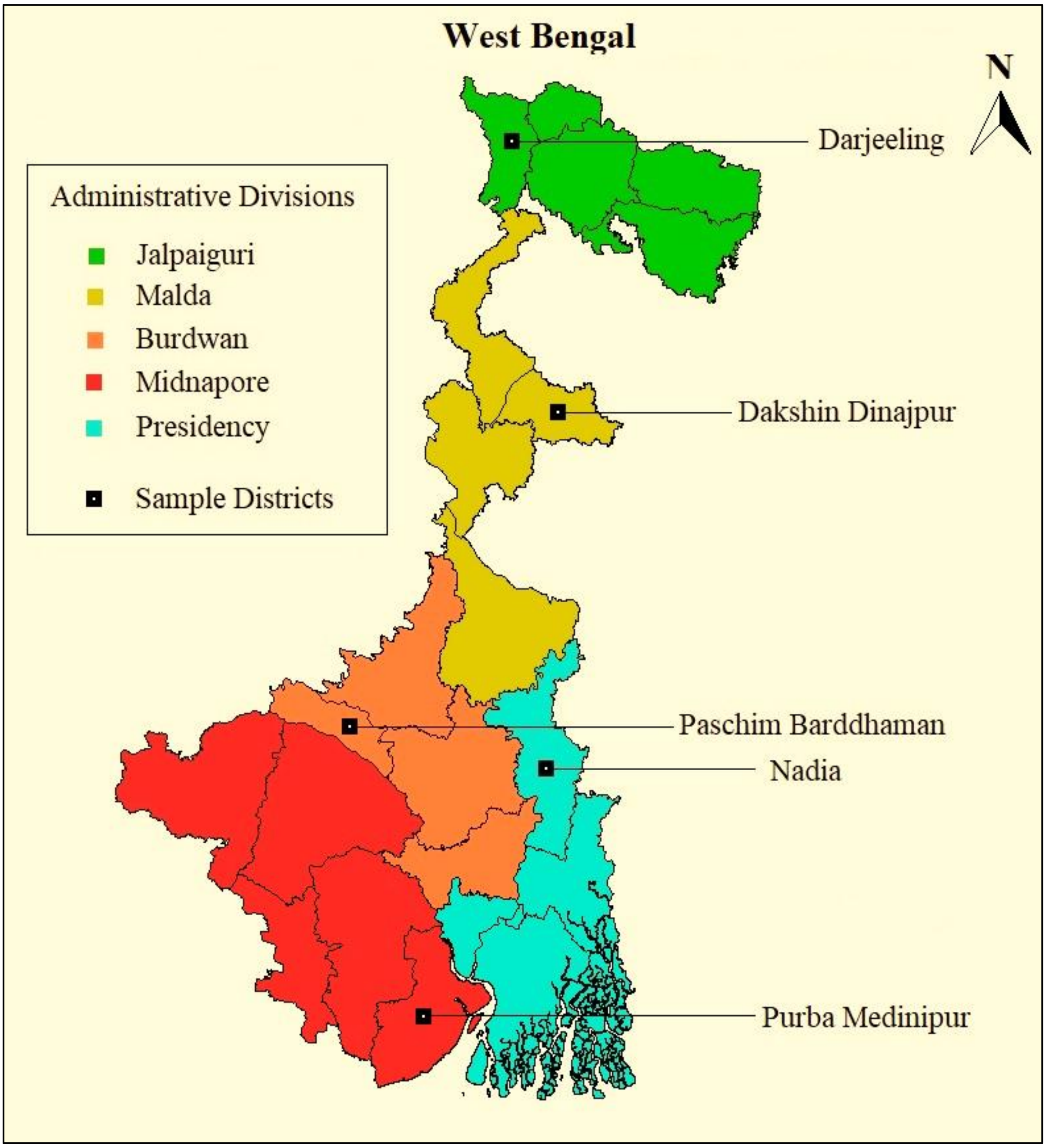

Figure A1.1: Administrative divisions of West Bengal and the sample districts

Table A1.1: Trends in Area, Production, and Yield of Oilseeds

	State/Union Territory	2010-2011	2019-2020	CAGR (2010-11 to 2019-20)
Area ('000 hectares)	ALL INDIA	27224	27139	-0.03
	Gujarat	2893	2868	-0.10
	Madhya Pradesh	7030	7470	0.68
	Maharashtra	3615	4526	2.53
	Uttar Pradesh	1105	1262	1.49
	West Bengal	672	958	4.03
Production ('000 tonnes)	ALL INDIA	32479	33219	0.25
	Gujarat	4896	6653	3.47
	Madhya Pradesh	8035	6452	-2.41
	Maharashtra	5040	5177	0.30
	Uttar Pradesh	919	1146	2.48
	West Bengal	704	1016	4.16
Yield (Quintal per Hectare)	ALL INDIA	1193	1224	0.29
	Gujarat	1692	2320	3.57
	Madhya Pradesh	1143	864	-3.06
	Maharashtra	1394	1144	-2.17
	Uttar Pradesh	832	908	0.98
	West Bengal	1048	1060	0.13

Data source: Handbook of Statistics on Indian States, RBI

Annexure 2

Reviewer's Comments on the Draft Report

1. **Title of the Report** : Consumption Patterns of Different Edible Oils in West Bengal

2. **Date of receipt of the Draft report** : 17.04.2025

3. **Date of dispatch of the comments** : 09.05.2025

4. **Comments on the objectives of the study** **:** Objectives of the study have been duly covered.

5. **Comments on the methodology** : Methodology has been properly followed.

6. **Comments on analysis, organization, presentation** **:** Detailed analysis is undertaken and organized properly.

7. Following suggestions are made:

- In Table 3.1.2.2, (page-39), unit is missing and only 4 districts are shown in the table, whereas it should for 5 sample districts.
- In Table 3.2.2.1, (page-48), units of various edible oils consumed by the respondents are missing.
- Data source should be written in details particularly in Chapter –IV, for example in figures 4.1 to 4.4 only RBI is written. It is vague.

8. **General Remarks** : The study is of much significance and so the given suggestions should be more specific (in points) in place of detailed description.

9. **Overall View on Acceptability of the Report** **:** The report is acceptable after attending the comments, as suggested above.

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Action Taken Report

Response to Comments:

Chapter III, Table 3.1.2.2 (Page 39):

The unit of measurement has been specified, and data for all five sample districts have been appropriately presented within the table.

Chapter III, Table 3.2.2.1 (Page 48):

The units corresponding to various edible oils consumed by respondents have been explicitly indicated in the table.

Chapter IV:

The detailed source of the data has been duly referenced to ensure clarity and transparency.

All comments have been thoroughly reviewed, and the necessary revisions have been incorporated into the report.