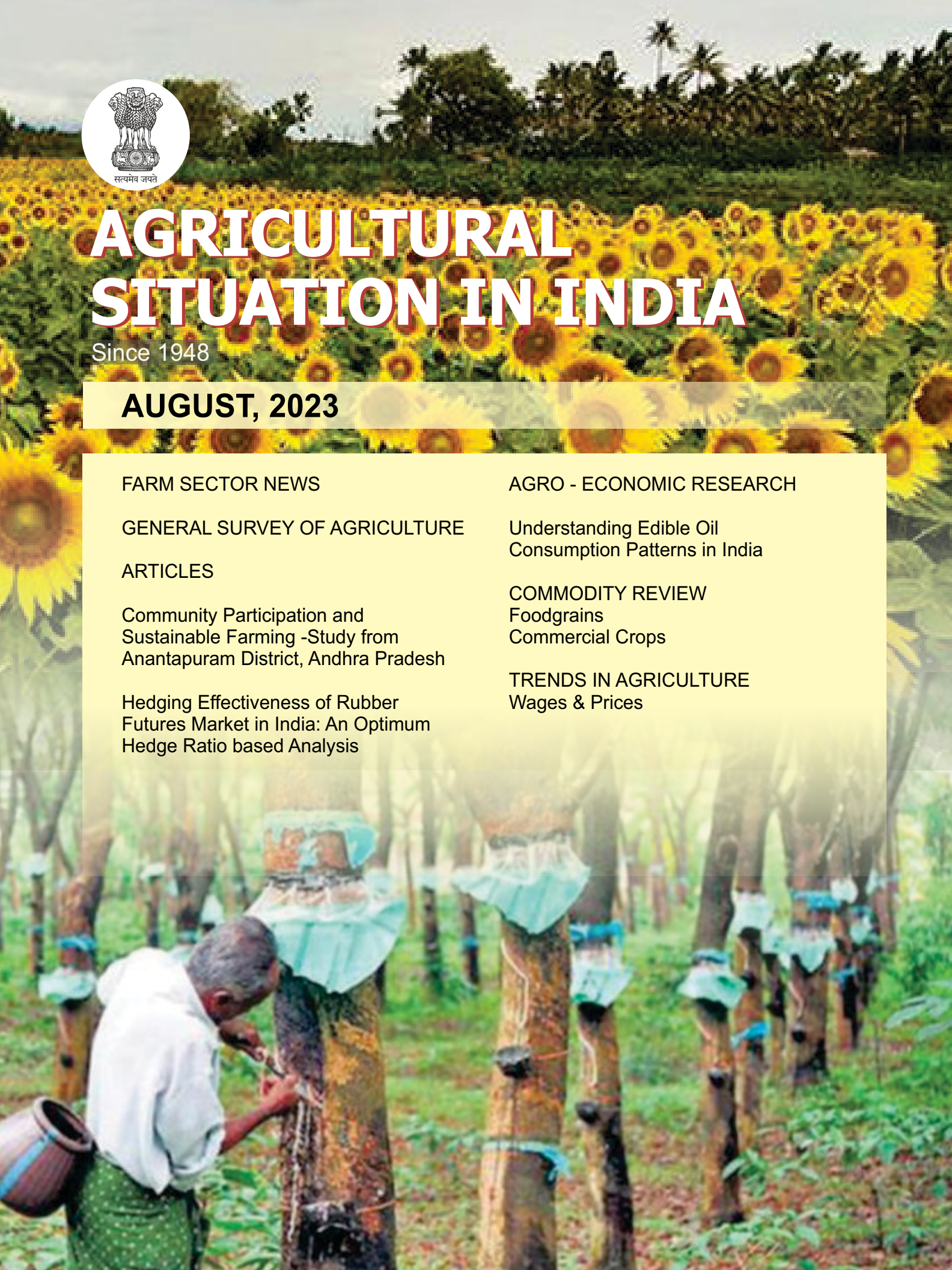

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Hedging Effectiveness of Rubber Futures Market in India: An Optimum Hedge Ratio based Analysis

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Editorial Desk

This issue of Agricultural Situation in India covers farm sector news, data on production and procurement of foodgrains, price index, inflation rates, state-wise average daily wages of field labourers, etc. The journal includes two research articles, one on Community Participation and Sustainable Farming – Study from Anantapuram District, Andhra Pradesh and second on Hedging Effectiveness of Rubber Futures Market in India: An Optimum Hedge Ratio based Analysis. In addition to this, an Agro-Economic Research study titled "Understanding Edible Oil Consumption Patterns in India" conducted by the Agricultural Economics Research Unit (AERU), Institute of Economic Growth (IEG), Delhi under the Agro-Economic Research scheme of Economics, Statistics and Evaluation Division, DA&FW is part of this edition.

The major farm sector news, inter alia, covers events such as Inter-Ministerial meeting on issues of management of crop residue burning; meeting between Union Agriculture Minister and Minister for Agriculture of New Zealand; National Conclave on "Unleashing the Potential of AgriTech Startups for the Benefit of Farmers". The other major news covered include Mega Oil Palm Plantation Drive which was organized across 11 states and simplification of tractor testing guidelines.

The annual rate of inflation based on all-India WPI decreased from 12.48% percent in August, 2022 to (-) 0.52 percent (provisional) in the month of August, 2023. The annual food inflation rate increased by 5.62 percent in the month August, 2023 (provisional) over August, 2022, whereas on month-on-month basis, the food inflation rate decreased by 0.85 percent in August, 2023 over July, 2023, provisionally. The cumulative monsoon season rainfall in the country during the period 1st June, 2023 to 30th August, 2023 has been 9 percent lower than the long period average (LPA). Current live storage in 150 major water reservoirs in the country is 113.42 BCM, as against the average storage of last 10 years, 125.12 BCM.

The article on "Community Participation and Sustainable Farming – Study from Anantapuram District, Andhra Pradesh" focuses on the role of the Foundation for Ecological Security (FES) in promoting sustainable farming practices and enhancing the livelihoods of small and marginal farmers in the Anantapuram district. The region faces numerous challenges such as irregular monsoons, inadequate infrastructure, low market access, and climate-related disasters, which are leading to distress among farmers and migration to urban areas. The study finds that FES has addressed issues like water management, particularly in drought-prone areas, and introduced modern agricultural technologies and innovative farming methods to increase productivity and reduce production costs. Market inefficiencies and exploitation by middlemen have been addressed through FES's intervention. The study highlights the positive impact of FES on various aspects of rural livelihoods, including income generation, employment opportunities, education, and healthcare access. Migration rates have significantly decreased post-FES intervention, indicating improved economic conditions and livelihood stability among farmers. In conclusion, the study underscores the crucial role of community participation and sustainable farming practices in promoting rural prosperity. FES's initiatives in Anantapuram District serve as a model for addressing agrarian challenges and improving livelihoods, paving the way for a more sustainable and resilient agricultural sector in India.

The article on "Hedging Effectiveness of Rubber Futures Market in India: An Optimum Hedge Ratio based Analysis" investigates the effectiveness of hedging in the rubber futures market in India and examines its relationship with factors such as trade volume, seasonality, and learning effect. Overall, the study found that risk minimization was considered the primary motive for hedging. Futures markets are being utilized to manage price risk, with hedgers aiming to minimize risk arising from cash market transactions. The results show that hedging effectiveness in the rubber futures market was generally low, with no significant relationship observed between trade volume, seasonality, and hedging effectiveness. The study concludes that risk reduction in the rubber futures market was not very effective. The lack of a significant impact of trade volume on hedging effectiveness may be attributed to the low scale of operation in the rubber futures market. Overall, the findings suggest that further research and measures may be needed to enhance hedging effectiveness in the Indian rubber futures market.

The Agro-Economic Research on "Understanding Edible Oil Consumption Patterns in India" delves into the consumption patterns of edible oils in India, focusing on both rural and urban populations across eight states. Employing a mix of secondary data analysis and primary household surveys, the study aims to understand consumption preferences, socio-economic factors, and regional variations regarding edible oil consumption. Findings highlight increasing per capita consumption of edible oils over the years, with shifts in preferences observed. While groundnut and mustard oils were dominant in earlier years, there has been a perceptible shift towards oils like sunflower and soybean. Additionally, regional variations are evident, with zones like the North and East showing different consumption patterns compared to the Central Zone. The study underscores the need for policy interventions to align consumption patterns with nutritional guidelines and promote self-sufficiency. Recommendations include awareness campaigns, promotion of healthier oils, blended varieties, and crop diversification. Encouraging farmers to cultivate oilseeds, providing access to technology and high-yield seed varieties, and expanding cultivation areas are crucial steps towards reducing import dependency and achieving self-sufficiency in edible oil production.

Promodita Sathish

Farm Sector News

Meetings and Events

Inter-Ministerial Meeting on issues of Management of Crop Residue Burning held

A high level inter-Ministerial meeting was held on 04 August, 2023 under the co-chairmanship of Minister of Agriculture & Farmers Welfare, Shri Narendra Singh Tomar and Minister of Environment, Forest & Climate Change, Shri Bhupender Yadav to review the preparedness of the States of Punjab, Haryana, Uttar Pradesh and NCT of Delhi in preventing paddy stubble burning in the current season.

The high-level meeting was attended by Shri Surya Pratap Shahi, Agriculture Minister, Government of Uttar Pradesh, Shri Gurmeet Singh Khudian, Agriculture Minister of Punjab, Shri Jai Prakash Dalal, Agriculture Minister of Haryana and Shri Gopal Rai, Environment Minister of NCT of Delhi. Senior officers of Ministry of Agriculture, Ministry of Environment, Government of India and from the states of Punjab, Haryana, Uttar Pradesh, NCT of Delhi and ICAR were also present.

During the meeting, the States presented their action plan and strategies for preventing stubble burning in the current season. The States were advised to utilize the funds provided for crop residue management, make Crop Residue Management (CRM) machinery available well before harvesting season and carry out Information, Education and Communication (IEC) activities in collaboration with ICAR and other stakeholders to bring awareness amongst farmers against paddy stubble burning.

Speaking on the occasion, the Union Minister for Environment stated that efforts to prevent paddy stubble burning for the last five years are bearing good results. Due to the concerted efforts of agencies like Commission for Air Quality Management, burning instances in the States of Punjab, Haryana, Uttar Pradesh, NCT of Delhi has come down. There is a need to encourage ex-situ management of paddy straw which will provide raw materials to user industries like power, biomass, etc.

The Minister for Agriculture, Shri Narendra Singh Tomar observed that due to the efforts of all the stakeholders, the events of paddy stubble burning are continuously coming down. He added that paddy stubble burning is not just related to pollution in Delhi and its adjoining areas; it is also creating a detrimental effect on the farm land by adversely affecting the soil health and fertility. Hence, efforts have to be both for fighting air pollution in Delhi and for protecting the soil health, thereby protecting the ultimate interests of our farmers.

Meeting between Union Agriculture Minister and Minister for Agriculture of New Zealand

A meeting between Minister for Agriculture & Farmers Welfare, Shri Narendra Singh Tomar and Minister for Trade & Export Growth, Minister for Agriculture, Minister for Biosecurity, Minister for Land Information and Minister for Rural Communities of New Zealand, Mr. Damien O'Connor was held on 29th August, 2023. Both the leaders reiterated their commitments to work together in strengthening the agricultural cooperation and collaboration between the two countries.

Welcoming the New Zealand Minister and his delegation, Minister for Agriculture & Farmers Welfare mentioned about the importance of relations between India and New Zealand and its steady progress. He highlighted the resumption of Joint Trade Committee after a gap of 14 years and initiation of discussions on market access issues for agricultural products under its framework. He also thanked the New Zealand Minister for granting market access to Indian pomegranate arils and lifting suspension on import of mangoes from MSAMB VHT facility in India.

Shri Tomar informed the New Zealand Minister about India's initiatives in celebrating the year 2023 as International Year of Millets and sought their cooperation in promoting the health and other benefits of millets. Both Ministers emphasised the potential of the partnership envisaged in the Memorandum of Cooperation (MoC) being finalized between the two countries for overall development of horticulture.

The Ministers assured each other of their commitments towards maintaining quality and safety of the agricultural commodities being traded between the two countries and resolved to continue working on phytosanitary measures and systems. The Ministers also discussed the importance of developing a sustainable and climate resilient agricultural system. The New Zealand Minister invited India to join the Global Research Alliance which is an alliance of 67 countries for sharing researches on mitigation of climate change impacts on agriculture.

National Conclave "Unleashing the Potential of AgriTech Startups for the Benefit of Farmers"

Ministry of Agriculture and Farmers Welfare in partnership with FICCI, CII and PHDCCI organised a National Conclave "Unleashing the Potential of AgriTech Startups for the Benefit of Farmers," on 31st August, 2023. Secretary, Shri Manoj Ahuja, Additional Secretary, Shri Faiz Ahmed Kidwai, Joint Secretary (RKVY), Shri Ashish Kumar Srivastav and Joint Secretary (Extn.), Samuel Praveen Kumar along with other senior officers from Ministry of Agriculture & Farmers Welfare and representatives of FICCI, CII and PHDCII attended the conclave.

The conclave aimed to discuss and identify comprehensive support systems for Agri startups in India that will foster innovation, sustainability, and profitability and make their solutions accessible to farmers. The conclave also explored strategies to overcome challenges, leverage technology, and capitalize on market opportunities to empower Agri Startups and drive positive impact in the agriculture sector.

FICCI organized two breakout sessions. The theme for session 1 was "The State Government's Vital Role in Building enabling ecosystem for AgriTech in partnership with state governments". Session 1 brought out the challenges faced by start-ups at the state level and recommendations on how the state governments can help in building an enabling ecosystem to overcome these. The major recommendations includes- creating an AgHub: An inclusive agri innovation ecosystem, Agri Data Management Framework (2023), creating a nodal agency for start-ups within the state governments, developing a start-up portal with a repository of information, knowledge and schemes with a chatbot facility, Start-up India can include exclusive website with information on agriculture start-ups.

The theme for Session 2 was "Enabling Digital Public Infrastructure in AgTech: Enabling access of data to agri startups through public digital goods". A few recommendations from the session were - core data sharing by government where private sector can also contribute, farmer data & land records (geo referencing & farm boundaries), build mechanism for data dissemination, value chain approach like procurement data can be integrated to the guiding principles, participation of state government is key.

CII organized a breakout session under the theme "Empowering the Start-up Incubation Ecosystem to Translate Innovative Concepts into Practical Solutions for Farmers." The session extensively deliberated on a synchronized and synergistic approach between start-ups and incubators, emphasizing its potential to significantly enhance positive outcomes in agricultural economics and the feasibility of establishing a direct connection with farmers during the final stages of technology implementation.

PHDCCI organised a session on "Social Innovations to make AgriTech Solutions Accessible to Farmers". The panelists felt that there is a need to place the farmer at the heart of innovation. Supply chain and commodity focused innovations have not considered the farmer's ease of adoption and ROI on tech investments. There is a need for a demand/need-led innovation ecosystem.

Simultaneously, a technical session was also held under the theme "Policy Support for Enhancing the Startup Ecosystem" by CII. This session concentrated on the array of enabling policies that have been put in place by both the Central and State Governments to support agri startups. These policies are designed to facilitate their smooth initiation, early growth, and successful operations.

A technical session on "AgriTech Innovation and Role of Social Networks in Technology Adoption" was

also organised by PHDCCI. The panelists felt that there were tremendous opportunities in the agriculture sector for start-ups and FPOs who by innovating and having sustainable business models can transform the lives of small farmers.

An exhibition was also organized during the conclave where various start-ups showcased their innovative products and technology. On this occasion more than 250 participants attended the conclave.

General Agricultural Sector News

Mega Oil Palm Plantation Drive organized in 49 districts of 11 states

Under the National Mission on Edible Oils – Oil Palm, the state governments along with oil palm processing companies initiated a 'Mega Oil Palm Plantation Drive' that commenced on 25th July, 2023 to further promote and increase oil palm cultivation, making the country and its farmers 'AtmaNirbhar' in edible oils production. This will further assist in achieving the target of bringing an additional area of 6.5 lakh ha under oil palm production by 2025-26.

The major oil palm growing states where the plantation drive was organized were Andhra Pradesh, Arunachal Pradesh, Assam, Goa, Karnataka, Mizoram, Nagaland, Odisha, Tamil Nadu, Telangana, and Tripura. Oil palm processing companies such as Patanjali Food Pvt. Ltd., Godrej Agrovet, and 3F participated actively in the drive. Apart from that, other regional companies also participated in the drive. The mega oil palm plantation drive concluded on 12th August, 2023. Through this drive, the states and the companies were able to reach out to more than 7000 farmers in 77 villages of 49 districts in 11 states, covering approximately 3500 ha. of the area and planting more than 5.00 lakh planting material.

As part of the mega plantation drive, the companies also organized unique and intensive large-scale technical training seminars on oil palm cultivation for farmers along with the department staff. The aim of the seminars conducted was to make the farmers and the staff more aware of the management packages which will help to ensure the plants' health, thereby enhancing productivity and creating sustainable income sources.

Simplification of tractor testing guidelines

In a major step towards encouraging ease of doing business and promote trust-based governance, the Government has simplified the process of testing of tractors for performance evaluation on 28th August, 2023. Tractor manufacturers shall now be allowed to participate in the subsidy scheme on the basis of CMVR/Conformity of Production (COP) certificates and a self-declaration to be given by the company that the tractor proposed for inclusion under subsidy conforms to the benchmark specifications given by Department of Agriculture & Farmers' Welfare. Simultaneously, the manufacturer shall also confirm that the tractor model has been submitted for tests and the test report on the same shall be submitted to DA&FW within 6 months. The manufacturers shall give a minimum of three years warranty on the tractor to be supplied under subsidy.

The following process will henceforth be followed for the mandatory tests:

- Drawbar Performance Test: The drawbar performance test through the use of load car may be done at Central Farm Machinery Training and Testing Institute Budni or at Mahindra Research Valley (MRV), Chennai. The manufacturers shall also have an option to get it done from any other Government authorized institute or at their own facilities provided that adequate infrastructure is available to conduct this test. In case of the test done at the manufacturers facilities, the test data as may be provided by the manufacturers shall be included in the test reports released by the CFMTTI Budni or the chosen government authorized institution, with the remarks that the tests have not been carried out by the institute and performance results are self-certified by the manufacturer.
- PTO Performance and Hydraulic Performance Test: Manufacturers shall have the option to conduct this test at their facilities and the test data may be provided to the CFMTTI, Budni or the chosen Government authorized institution for generation of the test report with a self-certification that this test has been carried out as per applicable BIS Codes. The test data as may be provided by the

manufacturers shall be included in the test reports released by the CFMTTI Budni or the chosen government authorized institution, with the remarks that the tests have not been carried out by the institute and performance results are self-certified by the manufacturers. The manufacturers shall also have the option of getting it done either at CFMTTI, Budni or at any other Government authorized institutes/facilities having adequate infrastructure to conduct this test.

- Brake Performance: This test shall be done as per the requirements under CMVR. The test already done under CMVR at the authorized institutions shall not be repeated at CFMTTI Budni or any other Government authorized institutes and the same data shall be incorporated in the test reports.

General Survey of Agriculture

Trend in Food Prices

The rate of inflation, based on all-India WPI, stood at -0.52% (Provisional) for the month of August, 2023 as compared to 12.48% during the corresponding period of last year.

WPI Food Index (Weight 24.38%): The Food Index consisting of 'Food Articles' from Primary Articles group and 'Food Product' from Manufactured Products group decreased from 187.7 in July, 2023 to 186.1 in August, 2023. The annual rate of inflation (Y-o-Y) based on WPI Food Index changed from 7.75% in July, 2023 to 5.62% in August, 2023.

Based on Wholesale Price Index (WPI) (2011-12=100), the WPI of pulses, cereals and vegetables increased by 10.45 percent, 7.25 percent and 48.39 percent, respectively, and for fruits, it decreased by 12.88 percent in August, 2023 over corresponding period of last year. On month-on-month basis, the WPI for cereals, fruits and pulses increased by 1.61 percent, 3.61 percent and 3.02 percent, respectively, and for vegetables, it decreased by 8.31 percent in August, 2023 over July, 2023.

Among cereals, the WPI based rate of inflation for wheat and paddy increased by 5.81 percent and 9.18 percent, respectively, in August, 2023 over August, 2022 while on month-on-month basis, the WPI for paddy and wheat increased by 1.71 percent and 1.92 percent, respectively, in August, 2023 over July, 2023.

Rainfall and Reservoir Situation, Water Storage in Major Reservoirs

Cumulative Monsoon Season (June-September), 2023 rainfall for the country as a whole during the period 1st June, 2023 to 30th August, 2023 has been 9% lower than the Long Period Average (LPA). Rainfall in the four broad geographical divisions of the country during the above period has been higher than LPA by 4% in North-West India but lower than LPA by 10% in Central India, by 16% in East & North East India and by 17% in South Peninsula. Out of 36 meteorological sub-divisions, 04 meteorological sub-divisions received large excess/ excess rainfall, 21 meteorological sub-divisions received normal rainfall and 11 meteorological sub-divisions received deficient/large deficient rainfall.

Out of 714 districts for which rainfall data is available, 25 (3%) districts received large excess rainfall, 92 (13%) districts received excess rainfall, 299 (42%) districts received normal rainfall, 283 (40%) districts received deficient rainfall and 15 (2%) districts received large deficient rainfall.

Current live storage in 150 reservoirs (as on 31st August, 2023) monitored by Central Water Commission having Total Live Capacity of 178.78 BCM was 113.42 BCM as against 146.83 BCM on 31.08.2022 (last year) and 125.12 BCM of normal storage (average storage of last 10 years). Current year's storage is 77% of last year's storage and 91% of the normal storage.

All-India Crop Situation- Kharif 2023-24

As per progress of area coverage report, area sown in the current year 2023 is 1077.82 lakh ha (96% of normal area) as compared to 1073.22 lakh ha during the corresponding period of last year. Higher area has been covered under rice (14.30 lakh ha), coarse cereals (1.93 lakh ha) and sugarcane (4.26 lakh ha) as compared to corresponding period of last year.

A statement indicating comparative position of area coverage under major crops as on 01.09.2023 during current Kharif season *vis-a-vis* the coverage during the corresponding period of last year is given in the Annexure.

Annexure-I

All India Crop Situation - Kharif (2023-24) as on 01.09.2023

(in lakh ha.)

Crop Name	Normal area of whole kharif season	Area sown reported			Absolute change
		This year 2023	% of normal for whole season	Last year 2022	
Rice	399.45	398.08	99.7	383.79	14.30
Jowar	17.36	14.06	81.0	15.57	-1.51
Bajra	73.24	70.81	96.7	70.41	0.40
Maize	75.71	82.86	109.4	80.66	2.20
Ragi	10.94	8.13	74.3	7.73	0.40
Small Millets	4.66	5.21	111.7	4.77	0.44
Sri Anna cum Coarse Cereals	**181.91**	**181.06**	**99.5**	**179.13**	**1.93**
Tur	46.29	42.66	92.2	45.27	-2.61
Urad	39.23	31.68	80.8	36.65	-4.97
Moong	36.56	30.98	84.7	33.57	-2.59
Others Pulses	17.62	13.77	78.2	14.64	-0.87
Total pulses	**139.70**	**119.09**	**85.3**	**130.13**	**-11.04**
Total foodgrains	**721.05**	**698.24**	**96.8**	**693.05**	**5.19**
Groundnut	45.04	43.37	96.3	45.00	-1.63
Soybean	117.44	125.13	106.6	123.91	1.22
Sunflower	1.23	0.69	56.3	1.98	-1.29
Sesamum	15.94	11.83	74.2	12.80	-0.97
Niger seed	1.48	0.45	30.2	0.82	-0.37
Castor seed	8.68	8.53	98.3	7.26	1.27
Total oilseeds	**189.81**	**190.11**	**100.2**	**191.91**	**-1.80**
Cotton	128.67	122.99	95.6	125.63	-2.65
Sugarcane	48.85	59.91	122.6	55.65	4.26
Jute & Mesta	6.90	6.57	95.2	6.97	-0.40
All crops	**1095.29**	**1077.82**	**98.4**	**1073.22**	**4.60**

Source: Crops Division, DA&FW

Articles

Community Participation and Sustainable Farming – Study from Anantapuram District, Andhra Pradesh

TRINADH NOOKATHOTI[1], VALLEM YOGANAND REDDY[2] AND BONDITA SAIKIA[3]

Abstract

India lives in rural areas and India cannot prosper without the prosperity of rural areas and rural areas in turn cannot prosper without the prosperity of farming. The agricultural sector is vital in eradicating poverty/hunger, sustaining livelihoods, and accomplishing sustainable development goals. In this context, as the state of Andhra Pradesh is predominantly an agrarian state, Anantapuram district is identified as one of the backward districts. The study focuses on the functional achievements of a developmental NGO, i.e. Foundation for Ecological Security (FES) working for the sustainable farming and the livelihood sustainability of the farmers in the Anantapuram district of Andhra Pradesh. Performance of FES has drawn wide attention from international media like BBC. From the ground level, it is observed that FES has brought in significant positive transformations in the farm and livelihood sustainability, while maintaining ecological balance through efficient interventions like logistics, water management, innovations, marketing and credit facilities.

Keywords: *Community farming, sustainable farming, Indian agriculture, economy of Andhra Pradesh, farm interventions.*

1. Introduction

India is predominantly an agrarian economy, where the primary sector contributes to 14 percent of the nation's Gross Domestic Product (GDP) (Solanki *et al.,* 2020) and accommodates 43 percent of the total workforce (International Labour Organization, 2021). The share of agriculture and allied sectors in the country's Gross Value Added (GVA) at current prices in 2021-22 was 18.8 percent. It grew at 3.9 percent in 2021-22 and 3.6 percent in 2020-21 (GoI, 2022). India has about 160 million hectares of arable land, the second largest after the United States of America. It experiences all 15 prominent climates with 46 of 60 soil types (India Brand Equity Foundation, 2022). About 50 percent of its total geographical area is cultivated, which ranks it among the top user of land for agriculture. India is today the largest producer of milk, pulses, and jute, and the second largest producer of rice, wheat, cotton, fruits, and vegetables worldwide. It is also one of the leading producers of spices, fish, poultry, livestock, and plantation crops (Pathak *et al.,* 2022). It is herculean to imagine prosperity in India without the prosperity of agriculture. This is essential to achieve the goal of sustainable and healthy diets for all (Global Panel on Agriculture and Food Systems for Agriculture, 2000). However, the Indian agricultural sector has long suffered a plethora of structural infirmities that have contributed to the deepening crisis (Dhar and Kishore, 2021). The farming community, more particularly the small and marginal farmers/tenants, has been exposed to the vagaries of agricultural distress (Sen and Ghosh, 2017). Farming has been confronted with severe challenges in terms of irregular monsoon (only 40 percent of land is irrigated), depleting public Gross Capital Formation (GCF, manifested in terms of the creation of capital assets like irrigation projects, marketing avenues, storage, transport), Minimum Support Price (MSP), institutional credit facilities, crop insurance and finally the climatic catastrophes (De *et al.,* 2017). The small and marginal farmers face high transaction costs in marketing their produce owing to low marketable surplus, low market density and poor

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market connectivity, low bargaining power, and colossal transaction cost in selling their produce (Pingali *et al.,* 2019). Thus, there has been deep distress among the farming community as most have been slowly quitting agriculture, which is very evident as the number of the farming community is dwindling while that of agricultural labour is on the rise (Birthal *et al.,* 2015). Meeting the growing urban demand for food and other agricultural products, non-farm employment provides new growth opportunities for rural economies; the challenge is to ensure that it is inclusive of the poor (Pingali *et al.,* 2019). Nevertheless, employment opportunities in non-agricultural sectors are not growing fast enough (Nadkarni, 2018). In this context, we may be exposed to immediate threats like food insecurity – hunger, increased poverty levels, rural distress, migration, and social gaps.

1.1 State of Andhra Pradesh

Andhra Pradesh (AP) is an agrarian state in southern India, known for its rich coastal plain and delta region. Agriculture is the mainstay of the state's economy and a significant livelihood source for a large portion of the population. The agriculture sector's contribution to GVA in 2019-20 at current prices was 35.08 percent, whereas it is 18.40 percent at the all-India level (Andhra Pradesh Economy in Brief, 2020). The state is known for its rich diversity of crops, with a focus on crops such as rice, sugarcane, tobacco, chilli, cotton, etc. Andhra Pradesh is known as "India's bejeweled rice bowl." Agriculture is vital to people's livelihoods because 70.4 percent of Andhra Pradesh's population lives in rural areas and depends on agriculture and related livelihood possibilities (RadhaKrishnan, 2021). The agriculture sector contributes to 27 percent of the Gross State Domestic Product (GSDP). Andhra Pradesh has six agro-climatic zones and five different soil types, allowing it to cultivate a wide range of crops year-round.

Farmers often face volatility in crop prices and a lack of market access, leading to low incomes and economic insecurity. According to the World Bank (2021), the average land productivity in India in 2021 was around 1.8 metric tons per hectare (Mt/ha) for cereals and 1.2 Mt/ha for pulses. This is lower than the global average of approximately 4.3 Mt/ha for cereals and 2.2 Mt/ha for pulses. Significant challenges still need to be addressed to ensure the sustainable development of the primary sector.

1.2 Foundation for Ecological Security (FES)

FES was established in 2001 in Anand, Gujarat. The central concept of FES is based on three interconnected elements: (a) Connecting individuals to the Commons (b) Understanding, and (c) Respecting the interdependencies of various living forms and ecological systems. It empowers local communities to uphold their rights and transition to more sustainable land-use techniques that benefit and generate economic opportunities and conservation. The organization served in Rajasthan, Andhra Pradesh, Karnataka, Orissa, Madhya Pradesh, Gujarat, and North-Eastern Region, where 30,201 village-level habitations have strengthened 1618 million people. FES has also worked around the Papagni River's rain-fed zones in Anantapur and Chittoor districts of Andhra Pradesh. This region, formerly known for its scanty irrigation facilities, is threatened by severe droughts and low water levels.

The FES is an organization that helps construct and restore water and land resources in the country's ecologically fragile, marginalized regions that are degraded by the collective and concentrated efforts of village communities. Finding ways to create ecosystems like those seen in nature, FES strives to restore and conserve degraded grasslands, water bodies, and forests. The interconnections between the agriculture, commons, and animal production systems are viewed at a landscape level, and livestock keepers with natural resource conservation and linking a broader constituency of farmers. FES works with rural communities to maintain nutrient and hydrological cycles, improve soil health, conserve indigenous biodiversity, and promote local land-use decisions since ecological security is critical to social and economic well-being. According to FES, better forest and grassland management is linked to increased water, feed, and pollinator availability for animal production systems and farming. Crops are guaranteed, revenue is varied, and returns are higher. It supports ecologically sound, socially just, and economically gratifying livelihoods through the

effective use of public funding, improves leadership and reduces conflicts, and enhances collective action for cost-effective natural resource management.

1.3 Objective of the paper

The performance of an organization named FES that has been working over many states with a prime focus on rural empowerment has been worked out. The district of Anantpuram, Andhra Pradesh has been selected to study their functional efficiency among the small and marginal farmers, as it produced some compelling results. The study focuses on the FES organization and its transformation of farming activities through community participation. It aims to find FES's direct and indirect impact on farmers' livelihoods in the Anantpuram district. Due to heavy agricultural loss, loans, and fewer agriculture returns, many farmers left agriculture and migrated to nearby cities in the study area. So, one of the main aims of this research is to find out the intervention and impact of FES in this region.

2. Data sources and methodology

This research is based on primary data. The data is collected through the sampling method during January and February, 2022. The primary data has been collected through a well-structured questionnaire and interviews. The questionnaire consists of both open-ended and closed-ended questions. The data was collected regarding the education and job profiles, method of cultivation, changes brought by the FES, new methods introduced by FES in their fields, changes in farmer's life and incidence of migration, etc. The sample for this study was selected from a Mandal named Nambula Pulakunta, Anantpuram district, Andhra Pradesh. The location is chosen because the FES has been functioning in N. P. Kunta Mandal under the Thambalapally block. The sample consists of 70 farmers who have been the beneficiaries and participants of the FES structure. These 70 samples were collected from 5 villages, *i.e.* Somarajukunta, Dhaniyalacheruvu, Kottamvaripalle, Gollapalli, and Kuntlapalli. Descriptive statistics like the mean and median are used to analyze the data.

3. Results and discussion

The soils of the Anantapuram district are shallow in depth (10–15 cm), neutral in reaction, low in organic matter, and medium to high in available phosphorus and available potassium contents. These soils are mostly granite genesis and coarse-grained granites. District's soil comprise 87.4 percent red soil, 12.5 percent black cotton soil, and 0.1 percent problematic soil (Sankar *et al.,* 2014). Groundnut accounts for 86 percent of total land under cultivation, paddy for 3.3 percent, and other crops for 10.7 percent. Groundnut is the main crop farmed over 7.0 lakh hectares across red soils under rain-fed conditions. The district's overall geographical area is 19.13 lakh acres. The area seeded is 9.70 lakh acres, or 51 percent of the total area.

TABLE 1: NATURE OF LAND AND TYPE OF LANDHOLDINGS

Panel (a): Nature of land		
Soil type	**Frequency**	**Percentage (%)**
Red soil	68	97.1
Black soil	6	8.5
Alkaline soil	6	8.5
Panel (b): Type of landholdings (in acres)		
Size	**Frequency**	**Percentage (%)**
1 – 3	28	40
3 to 6	28	40
6 to 9	8	11.4
9 to 12	4	5.8
>12	2	2.8
Total	70	100

Source: Author's field study

Table 1, panel (a), shows the nature of the soil. Almost 97 percent of respondents have been cultivating across red soil with six respondents having black soil and another six respondents having alkaline soil. The low–medium organic content, low–medium cation exchange capacity and percent base saturation, tendency for acidity/alkalinity–sodicity, etc. are the major chemical characteristics of the soils of the district that act as the limiting factors for proper crop establishment and growth (Rukmani & Manjula, 2009).

Eighty percent of respondents in the study area have land below 6 acres, 12 percent have 6-9 acres while only 8 percent of respondents have more than 9 acres. In the selected 70 samples, majority of the farmers belong to small farmer category (Table 1-Panel B). The declining size of holdings means that those households which solely depend on agriculture will find it increasingly difficult to sustain their livelihoods and hence they must discover subsidiary ways to support their livelihood (Yadu, 2016).

3.1 Crops production

Groundnuts, vegetables, and other plants only grow on red soil while red gram, cotton, and other plants grow in black and alkaline soil. Red soil is considered the most fertile because it has a high-water retention capacity and benefits all crops equally.The main crop is groundnut, grown on 7.5 lakh ha under rain-fed conditions during the kharif season. Canals account for 19.3 percent of the 1.72 lakh hectares of gross irrigated land, tanks cover 3.2 percent, tube wells 39.6 percent, and wells and other sources account for 37.9 percent of the gross irrigated land. The following table shows the crops under cultivation.

TABLE 2: CROPS UNDER CULTIVATION

Type of	Frequency	Percentage (%)
Groundnut	66	94.2
Paddy	30	21.4
Vegetables	20	28.5
Red gram	18	25.7

Source: Author's field study

94.2 percent of respondents cultivate groundnut, 21.4 percent paddy, 28.5 percent vegetables, and 25.7 percent red gram (Table 2). Most respondents cultivate groundnuts because the red soil is very fertile and suitable. The respondents who have borewell facilities and get water throughout the year are likely to cultivate paddy and vegetables, while those who depend on the monsoons are likely to produce red gram and groundnut. The portion of cultivable land in the village that derives irrigation from the stream and tank is predominantly covered by black soil, which is unsuitable for groundnut cultivation. Therefore, with the decline in the water flow in the stream and tank, farmers are forced to dig tube wells to continue cultivation. If a farmer cannot dig a bore well, he is left with no choice. So, he must permanently withdraw this land from cultivation or wait until water is available for irrigation.

3.2 FES and sustainability in farming

Droughts and declining water levels are generally the locations where the FES lays more emphasis. Two farmers' federations, Palamaner Mandala Vayalaga Rythula Samakhya and Punganur Mandala Vayalaga Rythula Samakhya worked along with FES to conserve and restore commons. They identified roughly 28,540 acres of commons with the help of 268 village institutions in 66 gram panchayats. These commons' restoration plans have been produced and submitted for MGNREGS implementation. FES enabled the

strengthening of a total of 5,240 village institutions, wherein FES has been directly and completely involved in the strengthening of 844 institutions, and the remaining 4,396 institutions were strengthened with the association of government and other NGO partners. According to the Annual Report of FES, 2020-21, Andhra Pradesh, 3,737 thousand livelihoods have been strengthened/transformed by FES and 1,492 thousand acres of common land was turned into a sustainable and cultivable land through community participation.

3.3 FES and irrigation

FES tried to instill robust institutional arrangements based on principles of universal membership, social inclusion, and social justice to foster collective action. It also develops locally agreed norms for resource usage, democratize decision-making processes, and improve the governance of common land and water resources. It nurtures a 'systems perspective' towards establishing and reinforcing the inter-linkages between different resource systems (forest-farm-water) and production systems (commons agriculture-livestock) (FES, 2015)

TABLE 3: IRRIGATION FACILITIES

Source	Frequency	Percentage (%)
Borewells	40	57.1
Rain fed	20	28.5
Wells	12	17.1
Lakes	14	20

Source: Author's field study

In the study area, 57 percent depend on borewells for irrigation and 29 percent rely on rain, 17 percent on wells, and the remaining 20 percent are dependent on lakes (Table 3). Those with enough water can grow two or three crops every year. Borewells and wells existed before the FES also, but their utilization was poor due to low groundwater levels. After FES began functioning, out of sustainable practices to raise groundwater levels, borewells and wells began to fill up with water, and farmers began to reuse borewells. FES helps to determine the water-holding capacity and texture. It carries out a variety of activities to improve groundwater levels, including deep ploughing, silt application which is done by removing soil from deeper lakes and canals, stone bunds, plantation, RFDs (Rock Filled Dams), and check dam construction to store water for future shortages in summer.

TABLE 4: IRRIGATION INTERVENTIONS

Measures	Frequency	Percentage (%)
Groundwater treatment	36	51.43
Afforestation	24	34.29
Check dams	36	51.43

Source: Author's field study

Table 4 indicates the measures for irrigation that FES initiated. Groundwater treatment includes RFDs, check dams, and ecological restoration. Out of 70 respondents, 51 percent expressed that irrigation measures have stimulated groundwater levels. Afforestation is also done by replanting trees and regular watering. 51 percent respondents also felt that check dams also enabled them to have irrigation. FES

has also tried to maintain ecological balance through various community sustainable farming practices. FES also ensured that lakes, borewells, and wells are automatically filled and stored with rain water. Although the FES did not initiate in any new borewells, the groundwater level has increased due to their practices like restoration, community participation, and maintenance. Farmers were also able to utilize even the old abandoned borewells post-FES intervention.

3.4 FES and production pattern changes

FES primarily assists farmers in introducing modern technologies and innovative/sustainable farming methods. Almost every farmer in the FES program has utilised the technology facilitated. They encompass machinery into fields, subsidize prices, and provide low-cost HYV seeds. These interventions have mitigated the overall cost of cultivation, allowing farmers to avoid unwanted/unbearable investments.

To increase yield, FES has implemented revolutionary farm techniques in the fields which include deep ploughing for soil loosening, silt application to enhance soil moisture, stone bunds to prevent soil erosion, soil testing, tree planting, Sankalp pits for irrigation, HYV seeds to increase yield, RFDs and check dams to store water. The ecological balance and recreation/ restoration of forest areas are more critical to FES success.

TABLE 5: INTERVENTIONS IN PRODUCTION

Changes	Frequency	Percentage (%)
Technology	66	94.2
Storage	60	85.7
Market facilities	70	100
Providing plants	16	22.8

Source: Author's field study

Out of total respondents, 94 percent could use sprinklers, fertilizer, tractors, etc. Usage of technology has led to the deceleration in the cost of production. Technological inputs have been provided to the farmers at subsidized rates. Training and fieldwork are also offered to farmers to understand and operate the new technology. Eighty six percent could store their produce in godowns and cold storages, enabling farmers to sell the produce during the right season to get better returns. One hundred percent of respondents were provided with better marketing facilities. FES also purchases the farmers' produce at a reasonable rate compared to the rate given by the middleman. They sell the produce to Government or private enterprise, thus assisting farmers to discover better prices and avoid any probable loss. FES credits the total amount directly to farmers' bank accounts without deducting any commission charges. In the study area, there is also a threat of wild animals damaging the crops. In order to counter this, FES has grown thorny plants to protect the crop. All the activities of FES have been carried forward in complete association and cooperation of the community. It always wants to modify the farm sector to facilitate better returns and high yields. FES also engages field classes to farmers to sensitize and enable concerning farming practices and technology utilization in cultivation of different crops.

TABLE 6: INNOVATIVE FARM TECHNIQUES - FES

Type of measure	Frequency	Percentage (%)
Deep ploughing	16	22.9
Silt application	42	60
Stone bunds	52	4.28
Plantation	12	17.14
Providing HYV seeds	22	31.43
RFD (Rock Filled Dams)	16	22.9
Canals	8	11.43
Soil Testing	14	20

Source: Author's field study

22.9 percent of respondents were able to practice and benefit from new approaches like deep ploughing; 60 percent of respondents utilized work-related silt applications; 74.28 percent of respondents also benefited from stone bunds to maintain boundaries and protect the fields from wild animals. Plantation has been found beneficial by 17 percent of respondents, and High Yield Variety (HYV) seeds have been utilized by 31.43 percent of respondents to increase yield and decrease pests. RFDs (constructed by keeping stones around ponds) have been successful to improve groundwater levels. RFDs have been constructed at the foothills to collect and store rainwater. Canals are also built to connect check dams and agricultural fields. Soil testing has also been facilitated to the farmers to enable them to select their crops for cultivation and also to apply fertilizers.

FES communities conduct regular soil fertility tests as well and supply organic fertilizers to farmers to avoid synthetic fertilizers. These organic fertilizers are highly productive to farmers.

TABLE 7: EXCLUSIVE BENEFITS UNDER FES

Type of Benefit	Frequency	Percentage (%)
Decreased cost of cultivation	52	73
Soil fertility test	54	77.1
Storage/Godowns	42	60
Credit facility	42	60
Reduction in the usage of chemical fertilizer	16	22.8

Source: Author's field study

Farmers' cost of cultivation has decreased due to the subsidized inputs/practices/interventions facilitated by FES like machinery, seeds and fertilizers. The farmers could resist unnecessary usage of fertilizers and HYV seeds as the FES educates them consistently on the pros and cons of fertilizers, weedicides, and pesticides. Nearly 77 percent of respondents undergo soil tests in their field from season to season (Table 7). FES suggests cultivation of crops only after evaluating results from the 'soil test.' The crop loans are offered with low-interest rates, with sixty percent of respondents opining that they have benefited from this kind of crop loan from FES (Table 7). The use of chemical fertilizers is totally curtailed.

TABLE 8: RESPONSE TO ORGANIC FERTILIZERS

Farmer rating (Out of 5)	Frequency	Percentage (%)
3	16	32
4	18	36
5	16	32
Total	50	100

Source: Author's field study

FES has facilitated organic fertilizers to 50 out of 70 respondents (Table 8) with almost all the respondents rating it 3 or above out of 5. This is a positive outcome of farming assistance offered by FES. The FES organization promotes organic farming through neem oil, Navaamrutam, neem cake, Samrum and others. They process neem leaves to produce neem oil and also store the neem leaves for an extended period. Neem oil is high in nutrients such as NPK and could enhance the yield by 15 to 25 percent over regular periods. FES provides neem oil to farmers either for free or at subsidized pricing. Navvamrutha and Samrum are also beneficial to increasing yield. FES provides all these fertilizers at a reduced cost or, occasionally, for free. These organic fertilizers can help farmers enhance their prospects from harvest.

3.5 FES and market efficiency

Farmers' income can improve substantially if they can capture a more significant share in the supply chain, *i.e.* from farm gate to consumer plate. To fulfill this objective, farmers must be free to sell what they want, where they want, and when they want without any restrictions on stocking, movement, and export of farm produce. This necessitates legal and institutional changes, significant investments in market infrastructure and storage (including cold-chain storage), and incentives for creating and operating infrastructure (Gulati *et al.*, 2020).

FES protects farmers from intermediaries and other private individuals who procure crops at a low price with concomitant malpractices. However, with the support of the village community, FES has created an ideal market platform.

TABLE 9: MARKETING AVENUES

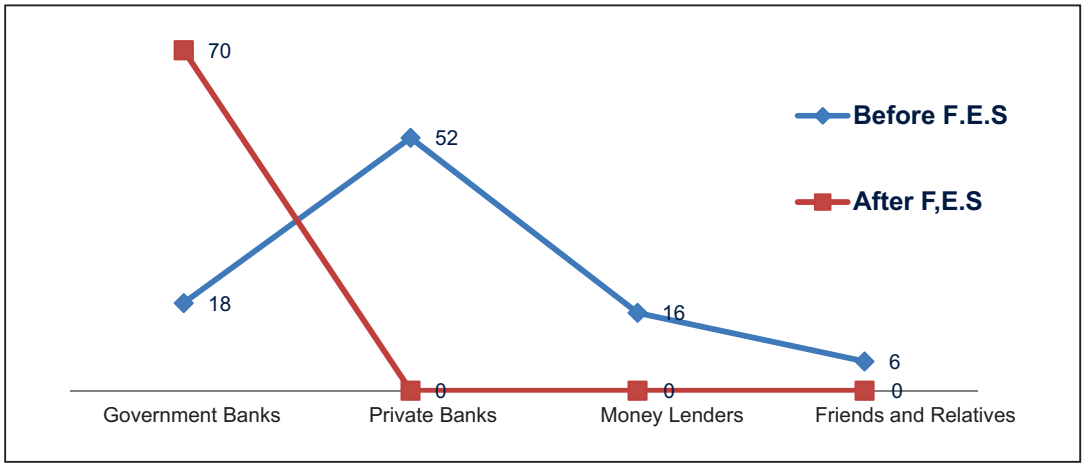
Platform	Before FES	After FES
Government	00	70
Local private market	56	00
Middleman	66	00
Collection centers	10	00

Source: Author's field study

The organization itself initiates and sells the crop to government and other agencies. Before the induction of FES, crops were only sold to middlemen. Farmers stopped selling their harvests to middlemen and other mediator firms after the FES arrival as they began to understand actual prices and sold only to the avenues facilitated by FES (Table 9). They pay all farmers the exact amount and weigh the produce transparently. Also the money is directly deposited into farmers' bank accounts, with no intermediary commission or charges.

Apart from that, FES provides loans to farmers at a low interest rate of 12 percent without mandating for collateral. The village community, created and guided by FES, serves as a bridge between the bank and the farmer. It is especially beneficial to small farmers and tenant farmers. Earlier farmers used to obtain loans from private banks or money lenders at exorbitant rate of interest that too with collateral or through mortgaging their assets.

Graph 1: Credit Facilities



Source: Author's field study

Before FES, the government banks provided loan for only 18 percent of respondents. After FES, all the respondents took loans from government banks as the rate of interest was low. 52 percent of respondents, before FES, took loan from private banks but after FES, no one took credit from private banks. 16 percent of respondents borrowed money from money lenders, and post-FES, no one borrowed from money lenders. Earlier, 6 percent of respondents got credit from relatives and friends; after the arrival of FES, no one took credit from relatives and friends (Graph 1). FES provides loans to eligible persons with certain specifications with the support of village-level communities. Farmers are not mandated to undergo any documentation/verification while banking with the FES community. Community members serve as trustees and issue loans at lower rates of interest. Farmers can invest more money in agriculture and allied activities, resulting in higher yields. These banks grant loans up to a certain amount suggested by the community member

TABLE 10: AVAILING SUBSIDIES AND LOANS FROM FES

Panel (a): Availing Subsidies from FES		
Response	**Frequency**	**Percentage (%)**
Yes	54	77.14
No	16	22.86
Total	70	100

Panel (b): Loans from FES		
Response	**Frequency**	**Percentage (%)**
Yes	42	60
No	28	40
Total	70	100

Source: Author's field study

FES provides subsidies to farmers with small holdings and those who are living below the poverty line. 77 percent received subsidies in terms of seed subsidies, fertilizers subsidy, machinery subsidy, etc. (Panel (a) Table 10). It has immensely helped the farmers to reduce the cost of production. 60 percent got a loan from FES without any collateral. The remaining 40 did not receive any loan as they had more land or were above the poverty line. The respondents who do not have assets can also get loans from government banks with the intervention of the village community. The FES works as a medium in this mechanism. Tenant farmers can compete with the large farmers just because of the interventions offered by FES.

3.6 FES and livelihood promotion

From the stage of procuring the produce to weighing and depositing amounts straight into farmers' bank accounts, the process under FES is very much transparent. The whole objective of FES is to empower rural livelihoods through increasing farmers' income levels and also their living standards. From our study, it is found that, post FES, respondents have better access to relatively high-quality education, health care, and basic sanitation, among other things. Some have stated that they have also initiated pretty businesses with the income generated from farming. Gradually this has led to the betterment of village infrastructure in terms of schools, temples, and public buildings.

TABLE 11: SIGNIFICANT INTERVENTIONS UNDER FES

Changes	Frequency
Employment	70
Income increases	70
Health	70
Education	70
Social infrastructure	70

Source: Author's field study

Farmers under the study appear to have been benefited in 5 different ways. They include employment, socio-economic condition, education, and income (Table 11). FES uses local labor for the activities in the field so that they can get employment. Income has also increased due to an increase in employment and productivity levels. Levels of education and health also have increased as they could afford quality food and better services.

3.7 FES and incidence of migration

Distress migration has also resulted from land appropriation for farming, water-intensive crops, increasing cultivation costs, climate change and market fluctuations.

TABLE 12: TRENDS OF MIGRATION BEFORE FES

Response	Frequency	Percentage (%)
Yes	28	40
No	42	60
Total	70	100

Source: Author's field study

Almost 40 percent of the respondents migrated to other places for bread and livelihood before FES which shows the intensity of the migration in the research area (Table 12). However, migration rate came down to effectively zero percent after FES began functioning.

TABLE 13: TRAJECTORY OF MIGRATION (Total 28)

Factor	Frequency	Percentage (%)
Agricultural loss	26	92.8
Financial liabilities	28	100
Unemployment	12	42.8

Source: Author's field study

93 percent had migrated due to distress in farming, and all 28 respondents had one or the other financial liabilities all together compelling them to migrate; 43 percent migrated due to unemployment. Farmers could obtain loans from government banks with cheap interest rates and no collateral proof once FES began functioning and thereby led to reduction in the incidence of migration.

4. Findings and conclusion

FES was established with "ecological security" as the pillar of equitable development and sustainability, committed to improving, reviving, and restoring conservation and ecological succession in terms of forest, water resources, livelihoods, and land. Interventions like improvements on land, restoration, preservation, and maintenance of water resources in the country's highlands with the participation of coordinated human effort and governance processes have yielded fruitful results. Intervention towards recovery and conservation, coordination with panchayats and other democratic village agencies, and civil society organizations have provided technical and financial support and strengthened farm activities. What began as a field-level experiment in a few villages in a few lands in 1986 has now grown to thousands of villages throughout 10 Indian states. FES aims to make significant and demonstrable progress toward a long-term vision of gender equality and inclusive community initiatives led by active community participation to improve rural economic and ecological outcomes. There is an imminent need to transform the system to connect ecosystems to rural economic prospects through programs and policies. The policy objective, legal mandate, local ability, and the agency and leadership of the local communities are all better aligned via FES. It works directly with the village communities to protect and strengthen collective action for inclusive natural resource governance and community land rights and rebuild landscapes with the help of public funds. They reach scalability by integrating knowledge, information, and analytics into core activities and landscape-level conservation planning. FES collaborates with the local governments, international and national NGOs and their networks to assist communities at the ground level through policy

implementation and enable governments and NGOs to access the power of information technology to take up appropriate initiatives that have yielded dividends in our field study.

5. Policy implications and way forward

After FES began to operate, the entire agricultural landscape got transformed in the study area from a dry and tropical region to a land of intense farming. If a small organization like FES could have a massive impact, governments at different levels can transform rural livelihoods with coordinated and dedicated efforts. If governments investigate and study FES deeply, they can learn a lot. They can also try to implement these measures, such as water conservation, ecological restoration, offering loans to eligible farmers, adopting new agricultural techniques, and providing High Yielding Varieties (HYV) of seeds. The country can recover from major agricultural crises if these methods are emulated. They have the potential to save farmers and agriculture which can save the country from hunger as well. The government can improve small and tenant farmers' livelihoods through the practices adopted by FES. The government should encourage and even promote organizations like this along the lines of Public Private Partnership (PPP) which could help increase country's farm output, and prices could be stabilised.

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Hedging Effectiveness of Rubber Futures Market in India: An Optimum Hedge Ratio based Analysis

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Abstract

The study analyzes the hedging effectiveness of rubber futures market in India by applying variance reduction measure. The optimum hedge ratios were employed on the contract wise data obtained from the leading exchange, NMCE for the time period 2004-2018. The variances of hedged and un-hedged portfolios were calculated and proportionate variance reduction for hedged portfolio was obtained for each contract. It is found that hedging effectiveness is generally low for the rubber futures trade analysed. Neither the volume of trade nor the seasonality is found to have any significant relationship with hedging effectiveness. The hedging effectiveness has improved in the second period (2011-18) compared to the first period (2003-10), showing better basis stability during the latter period.

Keywords: *Futures, hedging, optimum hedge ratio, variance reduction, rubber, India*

1. Introduction

The first and foremost function of a futures market is to manage price risk in a world of uncertainty and attenuated risk. In any economy, the origin of futures trade was part of an evolutionary development which at each point in time was fostered by the need to manage price risk at large (Williams, 1982). Commodity futures exchanges facilitate shifting of risks due to unknown future changes in commodity prices. In traditional literature on hedging, the hedgers are conceptualised as aiming at minimising risk originating from cash market transactions. The approach was popularised by Keynes (1930) who based his theory of Normal Backwardation on this conceptualisation. The stability of the basis, which is the difference between spot and futures prices, is the primary condition for the success of a routine hedging as per this approach. In most of the early writings on futures market, the hedgers are preoccupied with the goal of minimising risk and all hedgers are characterised with high degree of risk aversion. In this approach, hedgers are supposed to hedge their entire spot market commitments.

Working (1953) challenged the traditional view of hedging that hedging is purely for risk minimisation. He conceptualised the hedger as one who undertakes hedging for maximising profit and contended that hedging is so mixed up with speculation that it is really difficult to discriminate between the two. In the real world, it is difficult to categorise a particular trade as originating from hedging motive or from speculative motive. A hedger would hedge only if it is profitable to him and he would not hedge and keeps unhedged positions if he expects favourable changes in spot prices. If a trader keeps unhedged stocks, he is actually speculating on the basis of future spot price expectations. Also, a trader can have futures positions in excess of his spot market commitments, which is also a case of speculation. Under this approach, the success of hedging depends on favourable movements in basis. The basis is the difference between spot and futures prices.

Johnson (1960) and Stein (1961) theorised that spot market dealers would hedge an optimum proportion of their cash market position by maximising

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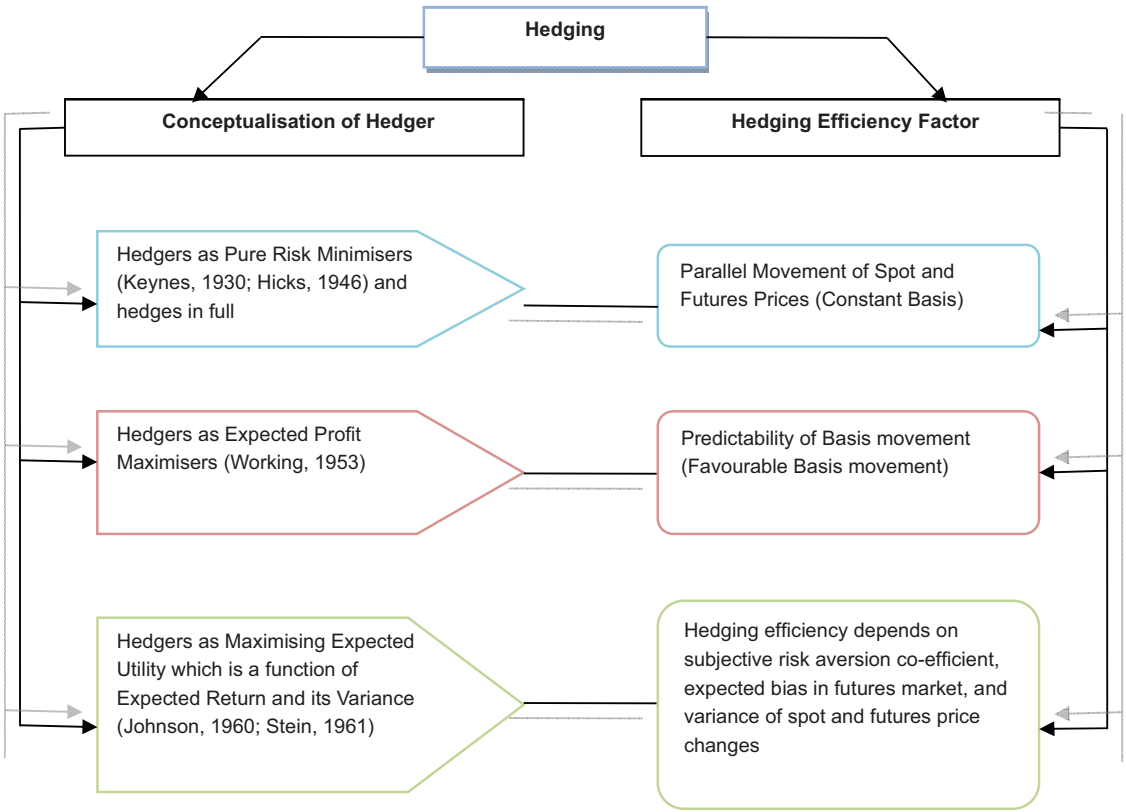
expected utility subject to risk constraint. Hedging efficiency depends on subjective risk aversion co-efficient, expected bias in futures market, and variance of spot and futures price changes. This approach makes a compromise between risk minimisation and expected profit approach towards hedging and state that theoretically the hedge ratio can take value from zero to one depending on the factors mentioned. The approach finds hedging as a part of portfolio decision making.

Chart 1: Hedging Efficiency Factor from Different Points of View



Source: Author's field study, 2021

1.1 Review of literature

The relative co-movement of spot and futures price is the primary factor which determines the hedging effectiveness (McKenzie *et al.,* 2002). The effectiveness of hedging would be reduced when movements of cash and futures prices diverge. Other factors that limit the effectiveness of hedging is the difference between basis variety and stock in hand, which leads to imperfect hedge (Blau, 1944; Aggarwal, Jain and Thomas, 2014). Yamey (1951) classified the hedging effectiveness into four; perfect, over-compensating, under-compensating and aggravating, on the basis of the degree to which the spot market loss is mitigated through futures transactions. Graph (1953) had a similar finding in the case of wheat, corn and oats markets in USA. Tomek and Gray (1970) show that cash and futures prices are equally variable for commodities with continuous inventories and routine hedging cannot stabilise revenue. Carter (1984) applied two different measures of hedging efficiency, one for relative variability of the basis over spot price and the other being simple OHR, for analysing the efficiency of barley and corn futures markets. Gordon (1984) studied the hedging efficiency of three thinly traded futures markets of sunflower seed, rough rice and milled rice in USA and found relative disadvantage for these markets in providing hedging services *vis-a-vis* the heavily traded futures market in soybean.

The studies with explicit focus on hedging effectiveness are less in Indian commodity futures markets. Pavaskar (1968) analysed the hedging effectiveness of cotton futures contracts traded by East India Cotton Association, Bombay. The other study by Pavaskar (1977) was made on two oilseed futures markets of groundnut and castor seed traded at Bombay Oilseeds and Oil Exchange.

Most of the studies, which used evidences from national exchanges, found that generally hedging effectiveness is low in India though the case of agricultural commodities is slightly better (Aggarwal, Jain and Thomas, 2014; Kumar and Pandey, 2009; Kumar, Singh and Pandey, 2008). Aggarwal, Jain and Thomas (2014) calculated static optimum hedge ratio and percentage variance reduction for various commodities including castor seed, pepper, rubber, soya oil, sugar, wheat, crude oil and gold. A study by Multi Commodity Exchange of India (MCX, 2013) found high hedging effectiveness in the case of many commodity futures traded at the exchange at par with global exchanges. Kumar & Pandey (2008) analysed hedging effectiveness of agricultural and non-agricultural futures contracts traded in India and found that agricultural futures contracts provided higher hedging effectiveness as compared to non-agricultural futures. Lokare (2007) employed ratio of standard deviation of basis to that of spot price to measure hedging effectiveness and found significant differences between commodities and between different contracts for same commodities in managing price risk. The reasons for low hedging effectiveness include poor acceptance of warehouse receipts, absence of standardisation of commodities and mismatch between basis variety and deliverable stock, government control on the spot market, frequent interventions of government in futures trade through suspension or volume controls, low awareness, high transaction costs in spot and futures markets and inadequate contract design (Aggarwal, Jain and Thomas, 2014; Lokare, 2007).

1.2 Objectives of the study

Hedging effectiveness in futures market from the risk minimisation point of view depends on basis stability. If spot and futures prices move parallel in the same direction, then basis will be more or less the same. Generally, futures market with high trade volumes facilitates smooth flow of information between spot and futures markets and makes way for basis stability. In India, the commodity futures market has a chequered history with frequent bans on trade and suspension of contracts. National level trading platforms for commodity futures were organised only after the year 2000. Generally, the commodity futures markets in India are thin with low trade volumes, the case being same for rubber. The objective of this paper is to analyse the hedging effectiveness of rubber futures market in India by taking the leading exchange NMCE as the case. NMCE carried out more than 80% of the total futures trade volume in rubber during the study period. Another motivation behind the study is to analyse the relationship between hedging effectiveness and factors like trade volume, seasonality and learning effect. Apart from the volume, seasonality may play a role in determining the hedging effectiveness. The linkage between spot and futures markets is conditioned on information regarding future spot price and the assimilation of such information to futures price formulation. The information on spot price is related to seasonal nature of the commodity.

2. Materials and methods

The spot and futures price data were collected from the NMCE website. The official agencies like FMC or SEBI usually adopt closing quotation of each day as an adequately representative futures price of that day. As there is no specific reason to deviate from the said practice, the closing quotations of the futures contracts are used in this study as representative futures prices. Broadly, the data was for the period April, 2003 –March, 2018. The basis variety is Ribbed Smoked Sheets – 4 (RSS 4) and the basis locality is Kochi. The spot price represents the daily price for the basis variety at the basis centre and is directly comparable with the futures price.

In view of the paramount importance of risk minimisation over expected profit maximisation as far as a trader is concerned, the present study considers only the risk minimisation motive for hedging. The measure of risk managing capacity of a futures market measures the extent to which a hedged portfolio reduces variation in return compared to an unhedged portfolio.

$$\text{Var.}(\text{hedged})_i = \text{Var.}\left(r_{spot,i,t} - \delta r_{futures,i,t}\right) \quad \ldots\ldots 1$$

$$\text{Var.}(\text{Unhedged})_i = \text{Var.}\left(r_{spot,i,t}\right) \quad \ldots\ldots 2$$

where,

$r_{spot,i,t}$ is the return from spot market for the commodity 'i' on day 't'

$r_{futures,i,t}$ is the return from futures market

δ is the hedge ratio.

The hedge ratio, δ is calculated as the slope term of the regression of spot price changes on futures price changes. Now, the variance reduction (Var. Redn) in percentage for commodity 'i' derived from hedging can be computed as,

$$\text{Var. Redn}_i = 100\left[1 - \frac{\text{Var.}(\text{hedged})_i}{\text{Var.}(\text{unhedged})_i}\right] \quad \ldots\ldots 3$$

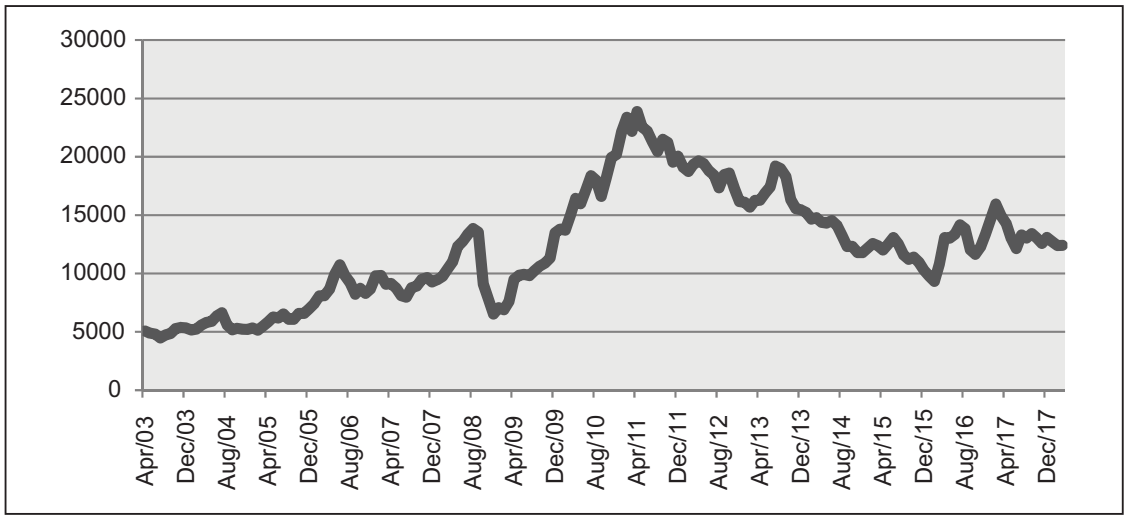
A contract period as such has been taken as the hedge duration and variance of daily returns for hedged portfolio has been compared with that of an unhedged portfolio. The hedge ratio used is the optimum hedge ratio which minimises risk. It means that the variance reduction estimates are the upper bound estimates of risk minimisation and may be overestimations of average hedging effectiveness. The use of arbitrary hedge ratios has been avoided as the actual hedge ratio may still be different from the ones selected.

3. Results, analysis and discussion

3.1 Evolution of rubber spot price

The spot price of rubber had a steady increase during 2003-2008 as is visible from Figure 1. The rubber price was as low as around Rs.5000 per quintal in 2003-2004 and after continuous rise, the annual average price in 2007-08 was around Rs.10000. During 2008-09, the rubber price went through a heavy fall which was short-lived. Immediately after this, a phase of rapid price rise occurred during the period 2009-2011. The price more than doubled in such a short time that the monthly average price peaked around Rs. 23000 in February, 2011. Then started a period of gradual fall in rubber price and the average rubber price in 2015-16 was approximately Rs. 11300. In 2017-18, the average price slightly improved to Rs.13000.

Figure 1: Monthly Average Price of Rubber in India 2003-2018



Source: Estimated using NMCE spot price information

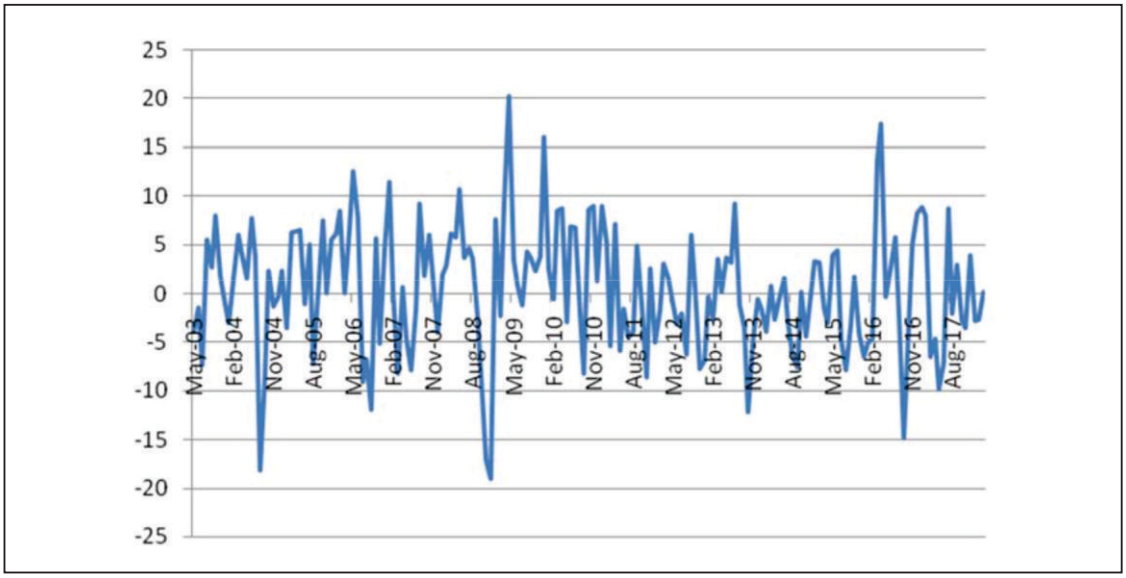
Many factors like the price of synthetic rubber, supply levels in competing countries, growth performance of manufacturing sector, etc. affect price of natural rubber. The early rise in rubber price in India was due to certain advantageous conditions like growing manufacturing output at global level along with less supply of synthetic rubber. Also, the supplies of natural rubber by the competing countries except

Malaysia were less. These positive factors did not last long, and things started reversing with more countries producing natural rubber at a time when the supply level was on the rise in India itself. More production of synthetic rubber was coupled with a declining global manufacturing sector due to the global financial crisis, which has its genesis in the USA. This led to a heavy fall in the price in the price of rubber in India.

3.2 Volatility in rubber spot price

As already stated, the very need for price risk management in a commodity depends on the extent of volatility in its spot price. The risk involved is high; the more is the volatility on either side of the price change, upward or downward. Figure 2 gives proportionate change in average monthly price of rubber expressed as percentage of monthly average price. The figure shows that even the average price over a month is highly volatile in the case of rubber. The volatility persistence or clustering is also seen with some periods having highly intensive price changes, followed by an episode of less pronounced changes.The high volatility in the spot price indicates the intensity of the need which the dealers in physical market might have felt for managing their risk. How far the futures market assisted them in covering their price risk has been analysed in the section following.

Figure 2: Proportionate Change in Monthly Average Price of Rubber



Source: Estimated using NMCE spot price information

3.3 Variance reduction through hedging of rubber

The distribution of contracts on the basis of the extent of variance reduction, for NMCE, is given in Table 1. Around 60% of the contracts provided variance reduction only up to 20% as a proportion of the variance of unhedged portfolio. This, considering the fact that these are upper bound estimates of variance reduction, is poor in any respect.

TABLE 1: VARIANCE REDUCTION THROUGH HEDGING OF RUBBER AT NMCE

Proportionate variance reduction (in %)	NMCE	
	No. of contracts	Proportion of contracts
Less than 10	39	22.29
10-20	65	37.14
20-30	45	25.71

Proportionate variance reduction (in %)	NMCE	
	No. of contracts	Proportion of contracts
30-40	14	8.00
40-50	8	4.57
50-60	3	1.72
Above 60	1	0.57
Total	175	100
Mean		19.18
Std. deviation		11.53

Source: Computed by author

Another 38% of contracts provided for variance reduction between 20% and 50%. Only around 2% of contracts provided for variance reduction in excess of 50%. These observations lead us to conclude that protection against risk offered to the hedgers by the NMCE rubber market is significantly low. The average level of variance reduction is 19.18%, showing that a routine hedger can reduce the variation in his return up to only 19% as a proportion of the variation of returns for a non-hedger. The standard deviation of variance reduction is high at 11.53%, showing that the variance reduction varies much from contract to contract and that hedging effectiveness is highly inconsistent across contracts.

3.4 Seasonality in variance reduction for rubber

The seasonal behaviour of variance reduction for NMCE is presented in Table 2. The variance reduction is almost uniform around 20% for all the seasons with October and November having exceptionally low average variance reduction. It shows that the seasonal difference in hedging efficiency is not so pronounced in the case of rubber futures at NMCE.

TABLE 2: SEASONAL PATTERN OF VARIANCE REDUCTION IN RUBBER AT NMCE

Contract maturing month	Average hedge ratio (in %)	Average variance reduction (in %)	Variance reduction (in %)	
			Max	Min
January	0.29	18.69	41.24	0.72
February	0.30	18.71	35.28	2.92
March	0.31	18.07	26.72	6.87
April	0.31	18.15	34.17	7.32
May	0.35	20.56	43.85	3.96
June	0.33	21.71	50.89	0.08
July	0.31	19.76	45.58	0.20
August	0.33	22.91	50.84	2.7
September	0.31	21.87	67.26	3.42
October	0.26	14.05	25.63	2.03
November	0.28	16.18	40.57	2.25
December	0.31	19.44	43.19	1.35
All	0.31	19.18	67.26	0.08

Source: Computed by author

3.5 Inter-period shift in variance reduction for rubber

Here again, we have considered only NMCE rubber contracts for inter-period analysis. From Table 3, it can be observed is the significant improvement in variance reduction happened across these periods. For all the seasonal contracts the improvement is visible as shown by the higher value of the proportionate variance reduction. For many contracts, the average variance reduction almost doubled, showing a doubling in the efficiency of hedging across the periods. The improvement is relatively more significant for the contracts from May to December than the other contracts.

TABLE 3: INTER-PERIOD SHIFT IN VARIANCE REDUCTION OF RUBBER AT NMCE

Contract maturing month	Average variance reduction	
	Period 1	Period 2
January	15.84	21.19
February	16.01	21.08
March	15.28	20.51
April	13.81	23.10
May	12.37	29.93
June	11.66	33.18
July	13.93	26.43
August	16.79	29.02
September	13.55	30.19
October	9.35	18.74
November	10.50	21.86
December	13.38	25.50
All	13.54	25.06
'p' value for significance of inter-period change in average variance reduction (One tailed)		1.106e-037***

Source: Author's field study

3.6 Determinants of hedging efficiency of rubber at NMCE

The hedging efficiency measured as proportionate variance reduction at NMCE was regressed on the volume, seasonality dummies, and the period dummy to analyse which of these explanatory variables influence hedging efficiency. A description of dummy variables used in the multiple regression is given in Table 4 and the results of the analysis are shown in Table 5. The model adequacy test rejected the null hypothesis of model adequacy; however, the errors were found to be homoskedastic at 5% level of significance. Again, the null hypothesis of normality of residuals was also rejected at the same level of significance.

TABLE 4: DUMMY VARIABLES USED IN MR FOR HEDGING EFFICIENCY RUBBER AT NMCE

Category	Dummies used	Values assigned	Base group
Seasonality	D Feb to D Dec (11 Dummies)	= 1, if the contract matures in the relevant month from February to December = 0, otherwise	January
Period	D Period 2 (1 Dummy)	=1, if the co ntract is for the period 2011-18 = 0, otherwise	First period (2003-10)

Source: Computed by author

From Table 5, it can be seen that the coefficient of volume is not at all significant in determining the potential variance reduction. Also, the sign is negative showing that there is inverse relationship between volume and variance reduction. This is totally unexpected one as more volume could bring more information, leading to better alignment between spot and futures markets and better risk reduction.

TABLE 5: FACTORS INFLUENCING HEDGING EFFICIENCY OF RUBBER AT NMCE – Results from MR

Variable	Coefficient	Std. Error	t-ratio	p-value
Const	13.8135	2.94008	4.698	<0.0001***
Volume	- 1.44903e-05	1.28978e-05	- 1.123	0.2629
D Period 2	11.4168	1.52320	7.495	<0.0001***
D Feb	- 0.0100484	3.66977	- 0.002738	0.9978
D Mar	- 0.314933	3.67964	- 0.08559	0.9319
D Apr	0.331220	3.67230	0.09019	0.9282
D May	2.70130	3.67143	0.7358	0.4629
D Jun	3.77509	3.67105	1.028	0.3053
D Jul	1.75887	3.67176	0.4790	0.6326
D Aug	4.78521	3.73862	1.280	0.2024
D Sep	3.53821	3.73503	0.9473	0.3449
D Oct	- 4.63795	3.75027	- 1.237	0.2180
D Nov	- 2.56236	3.75502	- 0.6824	0.4960
D Dec	0.895728	3.74096	0.2394	0.8111
No. of observations			175	
R^2			0.297	

Source: Computed by author

The coefficients of seasonal dummies are all insignificant. The coefficients are positive for the contracts from April to September, showing slightly better variance reduction for these contracts. There is significant learning effect as shown by the highly significant positive co-efficient for the dummy variable representing the second period 2011-2018. The magnitude of the co-efficient is large at 11.42, showing that the average variance reduction is higher in the second period by around 11.5%. The R^2 value of the regression is 0.297 (29.7%) and the F test for overall significance rejects the null hypothesis that the co-efficient are jointly insignificant.

4. Conclusion

The study analysed the hedging effectiveness of rubber futures market in India by using the variance reduction measure, employing optimum hedge ratio. It is seen that risk reduction in the market is not very effective. The hedging effectiveness varies with neither seasonality nor volume of trade. The result that trade volume does not affect hedging effectiveness is contrary to the common logic. High trade volume can arrange for a more synchronised movement in spot and futures prices and resultant more basis stability. In the case of rubber futures trade, the study finds no evidence for such a connection. It may be due to the low scale of operation of the rubber futures market with which it is impossible to establish a linkage.

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Agro-Economic Research

Understanding Edible Oil Consumption Patterns in India

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Abstract

This study investigates the consumption patterns of edible oils among rural and urban populations in India, employing a combination of secondary data analysis and primary household surveys conducted across eight states. By utilizing logistic regression and behavioural methodologies, the study elucidates regional preferences, socio-economic determinants, and health awareness regarding edible oil consumption. The findings highlight substantial correlations between production and consumption, emphasizing the need for increased cultivation of oilseeds to reduce dependence on imports. The study recommends awareness campaigns to promote the use of healthier oils, blended varieties, and crop diversification to align consumption with nutritional guidelines and promote self-sufficiency.

Keywords: *Edible oil, fatty acids, nutrition, consumption pattern, India*

1. Introduction

India's diverse agro-climatic conditions favour the cultivation of various crops, with oilseeds holding significant importance alongside foodgrains. Government initiatives have led to an increase in oilseed production from 31.46 million tonnes in 2017-18 to 35.95 million tonnes in 2020-21. However, due to a domestic supply-demand gap, India imported 14.46 million tonnes of edible oil valued at Rs. 68,558 crore in 2019-20. Globally, oilseed production reached 593.6 million tonnes in 2020-21, with 31% being traded internationally. Major oilseeds cultivated worldwide include soybean, rapeseed & mustard, sunflower, groundnut, and cotton seed. India ranks among the top producers and importers of edible oils globally, owing to its diverse agro-ecological landscape conducive to various oilseed crops. Key oilseeds grown in India include groundnut, rapeseed & mustard, sesame, soybean, and sunflower. Despite efforts, oilseed cultivation remains heavily reliant on rainfed conditions, covering approximately 16.2% of the total cultivated area. Rajasthan leads in oilseed production, followed by Gujarat, Madhya Pradesh, and Maharashtra. Groundnut, soybean, and rapeseed & mustard collectively contribute around 92% of India's oilseed production, with regional preferences dictating specific oil usage.

Disruptions such as trade restrictions on palm oil and conflicts impact imports, resulting in elevated prices. It is imperative to comprehend consumption patterns and preferences across various Indian states, particularly addressing rural-urban disparities. Further examination of international and domestic oil prices is indispensable for making informed policy decisions aimed at achieving oilseed self-sufficiency. Govindaraj *et al.* (2012) employed a Markov chain model and concluded that the consumption pattern of edible oil has remained static over the years in the state of Tamil Nadu.

1.1 Objectives of the study

The primary aim of this study is to enhance the existing literature by comprehensively understanding the current consumption patterns of edible oil among both rural and urban populations in India. Additionally, the study conducts a comparative analysis to assess preferences for edible oils between rural and urban demographics, considering socio-economic status

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across various regions of the country. It analyses trends in the consumption patterns and per capita consumption of edible oils across different zones of India. Furthermore, the study aims to examine the consumption scenarios and purchasing decisions regarding edible oils in various states and zones of India, while also assessing awareness levels regarding health implications related to the consumption of edible oils. Finally, the study explores the optimal utilization of edible oils in accordance with recommendations provided by the Indian Council of Medical Research (ICMR).

2. Data sources and methodology

The present study is based on both secondary and primary data. The secondary data is collected from various government sources such as, U.S. Department of Agriculture (USDA), Directorate of Economics and Statistics (DES), Agricultural Statistics at a Glance and Commission of Agricultural Cost and Prices (CACP). Also, the data on per capita consumption of edible oil is compiled from various rounds of NSSO. For primary data, a survey was carried out to collect the information on different edible oils consumed by rural and urban households of various states of India. Stratified multistage random sampling method was used to collect the household consumption data. Six zones have been selected to geographically represent the country – North, South, East, West, Centre and North-West. From these, eight states are selected *viz.*, Uttar Pradesh and Haryana in the North, Gujarat and Maharashtra in the West, Rajasthan in North-West, Madhya Pradesh in Centre, Tamil Nadu in South and West Bengal in the East zone. The percentage share of production of each selected state in total production of oilseeds in 2019-20 is as follows – Rajasthan (20.4%), Gujarat (20%), Madhya Pradesh (19.4%), Maharashtra (15.6%), Haryana (3.5%), Uttar Pradesh (3.5%), Tamil Nadu (3.2%) and West Bengal (3.1%). Further, each state is divided into zones - North, South, East, West and Centre and from each zone, one district is randomly chosen and 100 households are selected. Therefore, from each state, 500 households were surveyed. In total 4000 households were surveyed across eight states. In each district, survey was done for both urban and rural population. The ratio of rural and urban was according to the population in the district as per census. The urban and rural households selected were interviewed using a structured questionnaire developed for this study.

The logistic regression model is another statistical technique that is utilized to show the comparative analysis of preference of edible oil in urban and rural households of India. The general mathematical equation for logistic regression is:

$$\log\left(\frac{p(x)}{1-p\ x}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p$$

where,

p(x) is the probability characteristic of interest. In our case, oil used; is the jth predictor and Bj is the regression coefficient.

The following equation can be utilised to estimate the probability that the given equation takes the value 1 as:

$$p(x) = \frac{1}{(1 + e^{-(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p)})}$$

3. Results and discussion

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

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

This section describes the preferences of edible oil in different zones of India with respect to urban and rural areas, shift in the consumption pattern of different edible oils in five years, brand preferences, influence on purchase decisions and health impact along with awareness among households regarding edible oils. The survey used 12 items for edible oil consumption such as, groundnut oil, mustard, soybean, sesame, sunflower, flaxseed oil/linseed oil, canola oil (rapeseed

oil), coconut, olive, rice bran oil, corn/maize oil, cotton seed oil, ramtil (nigerseed) oil, palm oil, safflower, avocado and vanaspati, and residual items are clubbed into "others" category.

3.1.1 Evidence from secondary sources

As is evident, the share of oilseeds in Indian agriculture plays a prominent role. The area under oilseeds is increasing; however, the import of edible oils has also been on the rise. This increasing trend in imports of oil can be understood by analyzing the past consumption trends of edible oil in India. For this purpose, the consumption data on the select Indian states and the country as a whole are analysed.

The data is derived from the National Sample Survey Organization (NSSO) which publishes data on different edible oils consumed by the rural and urban households for different states and for different rounds. The latest 68th round of NSSO data pertains to the period 2011-12. The NSSO data encompass only five oils *viz.*, vanaspati/margarine, mustard oil, groundnut oil, coconut oil and Other Edible Oils (OEO's). However, in the 68th round, refined oil was included in the data. Moreover, information on the important oils consumed by the households in recent years like sunflower oil, soybean oil, rice bran oil, palm oil and the traditional oils like sesame are completely lacking in the NSSO data. Thus, the assessment is done based on the published records to understand the consumption patterns of households in previous years. The monthly per capita consumption of edibles in India during last four NSSO reports for the periods of 1993-94 to 2011-12 are listed in Table 1. The overall per capita consumption of edible oil per month has been increasing in rural households from 0.37 kg per capita per month in 1993-94 to 0.67 kg per capita per month during the 68th round (2011-12). The per capita consumption in urban households increased from 0.56 kg per capita per month in urban population to 0.85 kg per capita per month during same period. It is also observed that during the 50th round (1993-94), the major oil consumed by the rural households were groundnut and mustard oil. The quantity of mustard oil consumed was 0.17 kg per capita per month followed by groundnut oil at 0.12 kg per capita per month.

TABLE 1: MONTHLY PER CAPITA CONSUMPTION OF EDIBLE OILS IN INDIA BETWEEN 1993-2012

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

Source: Compiled from different NSSO rounds.

Over the different rounds, the per capita consumption of mustard oil increased and reached a peak of 0.3 kg per capita per month during the 68th round (2011-12). On the other hand, per capita consumption of groundnut oil decreased by 67% since 1993-94, reaching to 0.04 kg per capita per month during the 68th round (2011-12). During the same period, the consumption of vanaspati oil in rural and urban population has also decreased by 33% and 66%, respectively. This decline in groundnut oil and vanaspati oil consumption in recent years was compensated by higher consumption of mustard oils and OEOs. Comparing the consumption pattern in last two rounds such as 61st and 68th round, it is evident that there is perceptible shift in consumption of edible oil. Since 2004-05, the overall per capita consumption in rural India increased by only 40% and that in urban India by 29%. Except for mustard oil, the consumption of all the remaining oils has declined, both in rural and urban households.

3.1.2 Evidence from primary sources

This section deals with zone-wise consumption of edible oils by urban and rural households (in percent) at present and five years back. The survey used 12 items for edible oil consumption such as, groundnut oil, mustard, soybean, sesame, sunflower, flaxseed oil/linseed oil, canola oil (rapeseed oil), coconut, olive, rice bran oil, corn/maize oil, cottonseed oil, ramtil (nigerseed) oil, palm oil, safflower, avocado and vanaspati, and residual items are clubbed into "others" category.

3.1.2.1 North zone

The percentage of people consuming oil in Uttar Pradesh and Haryana is illustrated in Table 2.

TABLE 2: PEOPLE CONSUMING OIL IN URBAN AND RURAL AREAS OF NORTH ZONE IN %

(present vs. five years ago)

North zone									
Edible oils	Uttar Pradesh				Edible oils	Haryana			
	Urban		Rural			Urban		Rural	
	5 year ago	Present	5 year ago	Present		5 year ago	Present	5 year ago	Present
Mustard	100	100	100	99	Mustard	93.2	96.6	91.2	95.8
Soybean	16	18	1	1	Soybean	24	19.9	7.6	7.3
Sunflower	65	1	26	0	Sunflower	6.2	4.1	-	-
Palm	0	0	2.6	0.3	Palm	-	-	-	-
Safflower	0	0	5.1	0	Safflower	-	-	-	-
Vanaspati	0	0	4	11	Vanaspati	-	-	-	-
Others	37	21	30	31		-	-	-	-

In urban Uttar Pradesh, the consumption of mustard oil stands at 100% presently, soybean consumption has increased from 16% to 18% while that of sunflower oil has declined from 65% to 1%, over the five years. Rural Uttar Pradesh reflects high mustard oil usage at 99%, with decline observed in sunflower, safflower, and palm oil consumption. Urban Haryana shows a similar trend, with an increase in mustard oil consumption from 93.2% to 96.6% but decreased consumption of soybean from 24% to 19.9% and of sunflower oil from 6.2% to 4.1% over the same period. Rural Haryana witnessed increased mustard oil consumption from 91.2% to 95.8%, but reduced soybean oil usage from 7.6% to 7.3%.

3.1.2.2 West zone

In urban Gujarat, the consumption of groundnut oil has increased from 47.2% to 50.8%, while sunflower oil

usage has risen from 9.8% to 18.1% over the five years. Coconut oil consumption increased from 1.6% to 2.1%, and rice bran oil from 1% to 1.6%. However, cotton oil usage decreased from 34.7% to 29%. Rural Gujarat shows increased groundnut oil consumption from 32.9% to 35.5%, but decreased cotton oil usage from 53.7% to 48.5%. Urban Maharashtra reported rising soybean oil consumption from 63% to 74% but decline in groundnut oil consumption from 20% to 13% and of sunflower oil from 21% to 18%. Rural Maharashtra reported rising soybean oil consumption from 55.7% to 59% but reduction in groundnut oil usage from 13% to 7% and of sunflower oil from 29.3% to 27.3% (Table 3).

TABLE 3: PEOPLE CONSUMING OIL IN URBAN AND RURAL AREAS OF WEST ZONE IN %

(present vs. five years ago)

West zone									
	Gujarat					Maharashtra			
Edible oils	Urban		Rural		Edible oils	Urban		Rural	
	5 year ago	Present	5 year ago	Present		5 year ago	Present	5 year ago	Present
Groundnut	47.2	50.8	32.9	35.5	Groundnut	20	13	13	7
Mustard	9.3	7.3	10.7	11.7	Mustard	1	2	0.7	1
Soybean	2.6	2.1	-	-	Soybean	63	74	55.7	59
Sunflower	9.8	18.1	7.5	9.8	Sunflower	-	-	29.3	27.3
Coconut	1.6	2.1	-	-	Coconut	1	2	0.7	0.7
Corn/Maize	2.6	2.6	2	2.3	Olive	1	2	-	-
Rice bran	1	1.6	-	-	Rice bran	1	1	-	-
Cotton	34.7	29	53.7	48.5	Cotton	-	-	0.3	0.3
Safflower	1	1	-	-	Safflower	2	1	-	-
Sunflower	-	-	-	-	Sunflower	21	18	-	-
Palm	-	-	-	-	Palm	3	2	6.7	5.3
Vanaspati	-	-	-	-	Vanaspati	1	0	-	-
Others	-	-	5.9	6.2	Sesame	1	2	1.7	1.7

3.1.2.3 North-West zone

The percentage of households consuming edible oil in urban and rural Rajasthan is presented in Table 4. It can be observed that the households in urban areas majorly consume mustard oil, groundnut oil, soybean oil, sunflower oil, cotton oil and sesame oil. The consumption of mustard oil increased from 45.2% to 47.6% and of soybean oil from 20.2% to 21% in five years' time. However, the percentage of households consuming groundnut oil decreased from 41.1% to 37.9% and consumption of sunflower oil (9.7%), sesame oil (0.8%) and cotton oil (5.6%) remained same. On the other hand, the households in rural areas of Rajasthan consume different types of oil but the most dominant oils are mustard oil, soybean oil and groundnut oil, with few others consuming sesame oil, sunflower oil, coconut oil, and cotton oil. It is observed that the percentage of households consuming mustard oil has increased from 73.1% to 78.7% and for soybean oil from 8.5% to 15.2%. However, in five years, the consumers of

groundnut oil have declined from 18.1% to 12.2% and cotton oil from 6.6% to 2.1%. However, the consumption of sunflower oil (0.5%), sesame oil (1.1%) and coconut oil (0.3%) remained same.

TABLE 4: PEOPLE CONSUMING OIL IN URBAN AND RURAL AREAS OF NORTH-WEST ZONE IN %

(present vs. five years ago)

Edible oils	North-West zone			
	Rajasthan			
	Urban		Rural	
	5 year ago	Present	5 year ago	Present
Groundnut	41.1	37.9	18.1	12.2
Mustard	45.2	47.6	73.1	78.7
Soybean	20.2	21	8.5	15.2
Sesame	0.8	0.8	1.1	1.1
Sunflower	9.7	9.7	0.5	0.5
Cotton	5.6	5.6	6.6	2.1
Coconut	-	-	0.3	0.3

3.1.2.4 Central zone

Oil consumption pattern by the households in urban and rural Madhya Pradesh are depicted in Table 5. In the urban households, the consumers of mustard oil have increased from 21% to 55% in five years' time. Similar trends are observed in groundnut oil where 36% households report to consume groundnut oil as compared to only 25% five years back. Sunflower oil consumers increased from 16% to 24% and rice bran from 2% to 10%. However, soybean oil became less popular, with the consumers decreasing from 80% to 41% and that of ramtil (nigerseed) from 6% to 4% in five years' time. Similar trends are observed in rural Madhya Pradesh where the consumers of mustard oil have increased from 30% to 57% in five years' time. Similar trends can be observed in groundnut oil where 25% households report to consume groundnut oil as compared to only 20% five years back. Consumers of sunflower oil increased from 6% to 10%, rice bran oil from 1% to 7% and ramtil (nigerseed) oil from 2% to 7% in five years' time. However, the consumers of soybean oil have decreased sharply from 79% to 45% in five years' time.

TABLE 5: PEOPLE CONSUMING OIL IN URBAN AND RURAL AREAS CENTRAL ZONE IN %

(present vs. five years ago)

Edible oils	Central zone			
	Madhya Pradesh			
	Urban		Rural	
	5 year ago	Present	5 year ago	Present
Groundnut	25	36	20	25
Mustard	21	55	30	57
Soybean	80	41	79	45
Rice bran	2	10	1	7
Sunflower	16	24	6	10

Edible oils	Central zone			
	Madhya Pradesh			
	Urban		Rural	
	5 year ago	Present	5 year ago	Present
Ramtil (nigerseed)	6	4	2	7
Coconut	-	-	-	-

3.1.2.5 South zone

The percentage of households consuming edible oil in urban and rural Tamil Nadu is depicted in Table 6. In urban areas, households majorly consumed sunflower oil, coconut oil, groundnut oil and palm oil with few consuming safflower and other edible oils. The percentage of households consuming sunflower oil increased from 53.2% to 57.5%, coconut oil from 34.1 % to 39.7%, groundnut oil from 25.6% to 26.2% and that of palm oil from 6% to 9.5% in five years' time. However, the consumers of sesame oil (1.6%), safflower oil (0.8%) and other oils (0.4%) remained same. In contrast, the rural areas of Tamil Nadu consume different types of oil, but the most dominant oil are palm oil, groundnut oil, sunflower and coconut oil, with few others consuming canola, ramtil (nigerseed), sesame, safflower and other oils. It is evident that the percentage of households consuming palm oil has increased from 44.4% to 50.4%, sesame oil from 2% to 4.4%, sunflower oil from 34.7% to 35.9%, and 1.2% now also consume ramtil (nigerseed) oil. On the other hand, in five years, the consumers of groundnut oil have declined from 35.9% to 33.9% and of coconut oil from 16.5% to 15.7%. Presently, safflower oil is not consumed by any rural household as compared to 0.4% being consumed five years ago. However, the consumers of canola oil (0.4%) and other oils (0.8%) have remained the same.

TABLE 6: PEOPLE CONSUMING OIL IN URBAN AND RURAL AREAS OF SOUTH ZONE IN %

(present vs. five years ago)

Edible oils	South zone			
	Tamil Nadu			
	Urban		Rural	
	5 year ago	Present	5 year ago	Present
Groundnut	25.6	26.2	35.9	33.9
Coconut	34.1	39.7	16.5	15.7
Safflower	0.8	0.8	0.4	0
Sesame	1.6	1.6	2	4.4
Sunflower	53.2	57.5	34.7	35.9
Palm	6	9.5	44.4	50.4
Ramtil (nigerseed)	-	-	0	1.2
Others	0.4	0.4	0.8	0.8

3.1.2.6 East zone

The consumption pattern of edible oil in urban and rural West Bengal is depicted in Table 7. In urban areas, the consumption of soybean oil increased from 47.2% to 51.1%, sunflower oil from 39.3% to 39.9%, rice bran oil from 6.7% to 8.4% and that of vanaspati from 0 to 0.6% in five years' time. However, the number of people consuming mustard oil decreased from 95.5% to 94.9%

but the consumption of olive oil (0.6%) and palm oil (2.8%) remained same. Similarly, the households in rural areas consume different types of oil but the most dominant oils are mustard oil, soybean oil, and sunflower oil, with few others consuming olive oil, rice bran oil, palm oil, and vanaspati. It is evident the number of households consuming soybean oil has increased from 37.9% to 41.3%, sunflower oil from 11.5% to 12.4%, rice bran oil from 5.6% to 7.5%, palm oil from 3.4% to 4%, and 0.3% now also consume olive oil. On the other hand, in five years, the consumers of mustard oil have declined from 92.5%to 92.2% and of vanaspati oil from 0.3% to zero.

TABLE 7: PEOPLE CONSUMING OIL IN URBAN AND RURAL AREAS OF EAST ZONE IN %

(present vs. five years ago)

	East zone			
	West Bengal			
	Urban		Rural	
Edible oils	5 year ago	Present	5 year ago	Present
Groundnut	-	-	-	-
Mustard	95.5	94.9	92.5	92.2
Soyabean	47.2	51.1	37.9	41.3
Rice bran	6.7	8.4	5.6	7.5
Sunflower	39.3	39.9	11.5	12.4
Palm	2.8	2.8	3.4	4
Vanaspati	0	0.6	0.3	0
Others	-	-	-	-

3.2 Comparative analysis of preference of edible oil with respect to socio economic factors in India using logistic regression models

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

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

The findings from the logistic regression models are depicted in Table 8. Inferences are made only on the significant values of the study. The findings suggest that as compared to the central zone, the consumers of the groundnut oil in northwest and west zone are comparatively less by approximately 40%. It is also found out that the households that are non-vegetarian are 50% less likely to consume groundnut oil as compared to the households that are vegetarian. It is also observed that the odds of consuming groundnut oil is 40% less in households that belong to SC category as compared to the households that belongs to general category. Also, one unit increase in score of assets owned increases the odds of more households consuming groundnut oil by 1%. It is also observed those households that choose loose oil are 68% less

likely to consume groundnut oil and those who choose both types of oils are 62% more likely to consume groundnut oil as compared to those who prefer branded oil. The results from the model also suggest that odds of consuming groundnut oil by households whose income lies between Rs. 50,000- Rs. 80,000 per month is 46% lower as compared to the households whose income is below Rs. 15,000 per month.

The logistic regression model with the consumption of mustard oil as the dependent variable suggests that the consumers of mustard oil in east and north zone are 30 and 47 times more than the central zone, respectively. However, households that consume mustard oil in west zone are 93% less as compared to the central zone. In comparison to the rural areas, the consumers of mustard oil in urban areas are 40% lower. Similarly, odds of consuming mustard oil by households belonging to ST category are 70% lower and that by SC category is 52% higher as compared to the households that belong to the general category. It is also observed that the likelihood of consuming oil is 62% less in households that have ration cards as compared to those who do not have ration card. Also, the odds of consuming mustard oil by households whose income lies between Rs. 50,000-80,000 per month is 95% higher as compared to the households whose income is below 15,000 per month.

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

The model fitted to consumption of sunflower oil shows that income has no significant impact of sunflower oil consumption. It is also observed that the likelihood of sunflower oil consumption is 93% higher in urban areas as compared to the rural areas and 95% higher in households that are non-vegetarian as compared to the vegetarian households. Another finding from the study is that as compared to the households that belong to the general category, the odds of consuming oil by ST category households is 69% lower. On the other hand, households that have ration card have twice the likelihood of consuming sunflower oil as compared to the households that do not have ration card. It is also evident that one percent increase in the household's assets score increases the odds of consuming oil by 0.87%. However, as compared to the households that prefer branded oil, the odds of consuming the sunflower oil is 73% and 32% lower in households that prefer loose and both type of oil, respectively. The findings suggest that the zone, religion and income do not have any significant impact on the consumption of cotton oil by the households. However, it is observed that as compared to the rural households, the likelihood of consumption of cotton oil is 31% lower in urban households. Also, the likelihood of consuming edible oil is 49% lower in case of households whose food identity is non-vegetarian to those who are vegetarians.

It is interesting to note that as compared to the households that belong to the general category, the likelihood of consuming cotton oil is more than twice in the households that belong to OBC, SC and ST category. On contrary, the odds of consuming cotton oil are 70% and 92% lower in the households prefer loose and both type of oil, respectively, as compared to the households that prefer branded oil. The logistic regression model suggests that except for the zones of India, no other variable included in the study have any significant impact on the consumption of ramtil oil by the households. The findings suggest that as compared to the central zone, the odds of consuming ramtil oil by the south and west zone is 93% and 95% lower, respectively.

TABLE 8: LOGISTIC REGRESSION OF OIL PREFERENCES

		Groundnut		Mustard		Soybean		Sunflower		Cotton		Ramtil	
		Odds ratio	Beta	Odds ratio	Beta	Odds ratio	Beta	Odds ratio	Beta	Odds ratio	Beta	Odds ratio	Beta
Zone	East	8.42E-0	-18.59	30.1259	3.4054***	0.9342	-0.068	0.5524	0.5934***	1.0314	0.0309	3.42E-09	-19.4947
	North	8.70E-0	-18.56	47.7998	3.8670***	0.1716	-1.7627***	1.2247	0.2027	0.5935	-0.5216	2.06E-09	-20.0011
	North-west	0.6038	-0.50**	1.4297	0.3574	0.4057	-0.9021***	0.1494	-1.9011***	5.53E+07	17.83	1.46E-09	-20.3464
	South	1.4371	0.36	5.89E-09	-18.9492	0	-18.2677	2.4647	0.9021***	0.7221	-0.3255	0.0777	-2.5548***
	West	0.6077	-0.50***	0.0767	2.5681***	0.6298	-0.4624***	0.5043	-0.6845***	3.21E+08	19.59	0.0492	-3.0128***
Area	Urban	1.2036	0.19	0.6198	0.4784***	1.7493	0.5592***	1.9275	0.6562***	0.6982	-0.3593**	0.371	-0.9916
Food identity	Non- veg	0.5006	-0.69***	1.1187	0.1122	1.3544	0.3034***	1.9513	0.6685***	0.5097	-0.6740***	0.9778	-0.0225
Social category	OBC	0.9256	-0.08	1.229	0.2062	1.0908	0.0869	0.8135	-0.2064	2.9751	1.0900***	3.2997	1.1938
	SC	0.5986	-0.51***	1.5219	0.4199**	1.2117	0.192	1.0553	0.0538	2.6829	0.9869***	3.5596	1.2696
	ST	0.6451	-0.44	0.3076	1.1788***	4.6482	1.5365***	0.317	-1.1490***	2.2785	0.8235**	4.6073	1.5276
Ration card	Yes	1.323	0.28	0.3885	0.9454***	1.1496	0.1394	2.0828	0.7337***	1.099	0.0944	0.7382	-0.3035
Score		1.0114	0.01***	1.0021	0.0021	1.0052	0.0052	1.0087	0.0087**	0.9861	-0.014	1.016	0.0159
Oil type	Loose	0.3216	-1.13***	5.7798	1.7544***	0.5207	-0.6526***	0.2722	-1.3013***	0.3004	-1.2030***	1.0604	0.0586
	Both	1.6242	0.49**	1.6737	0.5150**	1.552	0.4396***	0.6878	-0.3743**	0.0886	-2.4240**	0.343	-1.07
Religion	Hindu	1.0194	0.02	1.1523	0.1417	0.6994	-0.3575	1.4012	0.3374	0.937	-0.065	0.32	-1.1396
	Muslim	0.3993	-0.92**	1.4193	0.3502	0.3673	-1.0017***	2.2769	0.8228**	2.7779	1.022	0.7197	-0.3289
Income (in Rs.)	15000-3000	1.0011	0	1.2975	0.2605	0.7809	-0.2473**	1.1687	0.1559	0.8822	-0.1254	1.068	0.0658
	30000-5000	0.9908	-0.01	1.0762	0.0734	0.8287	-0.1879	1.0414	0.0405	0.8191	-0.1996	0.9315	-0.071
	50000-8000	0.5418	-0.61***	1.9505	0.6681***	0.5202	-0.6535***	0.9578	-0.0432	1.0389	0.0382	0.3118	-1.1653
	Above 80000	1.1581	0.15	1.2133	0.1934	0.3848	-0.9550***	1.1866	0.1711	1.0339	0.0333	2.1233	0.753
AIC		2585.6		1929.6		3438.9		3357.8		1074.6		325.23	

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

4. Conclusion and policy suggestions

This study primarily focuses on household edible oil consumption. Monthly per capita mustard oil consumption is highest in north zone households, notably Uttar Pradesh and Haryana. In the west zone, Gujarat primarily consumes groundnut oil, followed by cotton oil, while Maharashtra favors soybean oil. Mustard oil dominates consumption in Rajasthan of the northwest zone. In the central zone, Madhya Pradesh leads in monthly mustard oil consumption, followed by soybean oil. Tamil Nadu favors sunflower oil, with coconut oil as a secondary choice. In the east zone, West Bengal tops monthly mustard oil consumption. Notably, some states consume oilseeds they cultivate, like groundnut and cotton in Gujarat, and soybean in Maharashtra and Madhya Pradesh, indicating a strong production-consumption link. Income does not significantly influence the monthly consumption of edible oil, with most states consuming less than 5 litres per month, except for households in Uttar Pradesh, where consumption ranges from 5 to 10 litres per month among lower-income groups.

The logistic regression model indicates that among the zones in India, only geographical location significantly affects ramtil oil consumption by households. Specifically, compared to the central zone, the odds of ramtil oil consumption are 93% and 95% lower in the south and west zones, respectively. According to ICMR recommendations, daily edible oil consumption should be 30 g per person, equivalent to 12 kg per person annually. However, in selected states, per capita consumption is 14.4 kg annually, totaling 57.6 kg per household. This exceeds ICMR guidelines, necessitating increased awareness programs for health benefits, promotion of blended oil usage, and encouragement of oil rotation. Higher demand may lead to heightened reliance on imports.

The study reveals a significant correlation between edible oil consumption and state-level production. Thus, there's an imperative to augment oilseed production by expanding cultivation areas. Encouraging farmers to diversify crops to include oilseeds is vital. Facilitating access to cost-effective technologies and distributing high-yield seed varieties can enhance productivity and elevate farmers' income. Expanding oilseed cultivation areas can stimulate production, reducing import dependency and fostering self-sufficiency goals.

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Commodity Review

Foodgrains

Procurement of Rice

The total procurement of rice during kharif marketing season 2023-24 up to 28.09.2023 is 307 thousand metric tonnes as against 56942 thousand metric tonnes in marketing season 2022-23. The details are given in Table 1. A comparative analysis of procurement of rice for the period of marketing season 2023-24 (up to 28.09.2023) and the corresponding period of last year is given in figure 1. The percentage share of different states in procurement of rice has been given in figure 2.

TABLE 1: PROCUREMENT OF RICE IN MAJOR STATES

(In thousand metric tonnes)

State	Marketing Season 2023-24 (up to 28.09.2023)		Marketing Season 2022-23	
	Procurement	Percentage to total	Procurement	Percentage to total
1	2	3	4	5
Andhra Pradesh	0	0.0	2834	5.0
Telangana	0	0.0	8835	15.5
Bihar	0	0.0	2817	4.9
Chhattisgarh	0	0.0	5865	10.3
Haryana	191	62.1	3977	7.0
Madhya Pradesh	0	0.0	3102	5.4
Odisha	0	0.0	5383	9.5
Punjab	0	0.0	12201	21.4
Tamil Nadu	116	37.9	2296	4.0
Uttar Pradesh	0	0.0	4389	7.7
West Bengal	0	0.0	2184	3.8
Others	0	0.0	3059	5.4
All India Total	**307**	**100**	**56942**	**100.0**

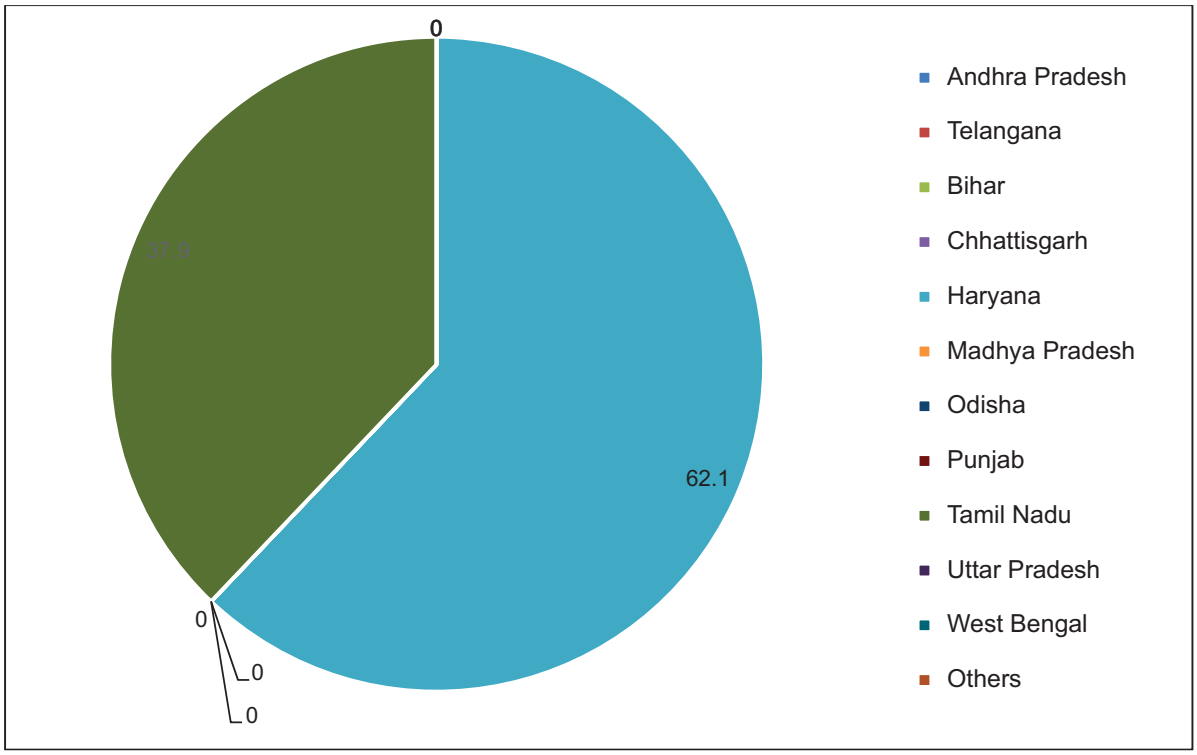
Source: Department of Food & Public Distribution, Govt. of India

Figure 1: Procurement of Rice in Major States

(In thousand metric tonnes)

Source: Department of Food & Public Distribution, Govt. of India

Figure 2: Percentage Share of Different States in Procurement of Rice during Marketing Season 2023-24(up to 28.09.2023)



Source: Department of Food & Public Distribution, Govt. of India

Procurement of Wheat

The total procurement of wheat during Rabi marketing season 2023-24 up to 14.07.2023 is 26202 thousand metric tonnes as against 18792 thousand metric tonnes in marketing season 2022-23. The details are given in Table 2. Figure 3 depicts the comparison of procurement of wheat during the marketing season 2023-24 (up to 14.07.2023) with the corresponding period of last year. The percentage share of different states in procurement of wheat has been given in figure 4.

TABLE 2: PROCUREMENT OF WHEAT IN MAJOR STATES

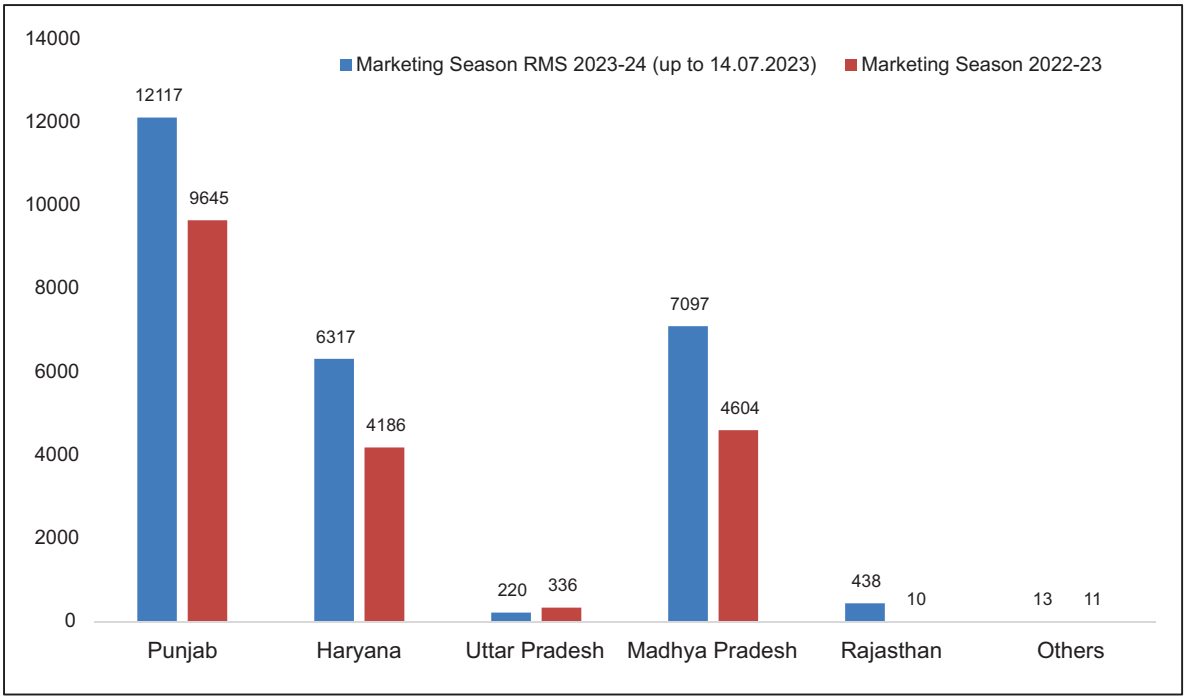
(In thousand metric tonnes)

State	Marketing Season RMS 2023-24 (up to 14.07.2023)		Marketing Season 2022-23	
	Procurement	Percentage to total	Procurement	Percentage to total
1	2	3	4	5
Punjab	12117	46.2	9645	51.3
Haryana	6317	24.1	4186	22.3
Uttar Pradesh	220	0.8	336	1.8
Madhya Pradesh	7097	27.1	4604	24.5
Rajasthan	438	1.7	10	0.1
Others	13	0.1	11	0.1
All India	**26202**	**100**	**18792**	**100**

Source: Department of Food & Public Distribution, Govt. of India

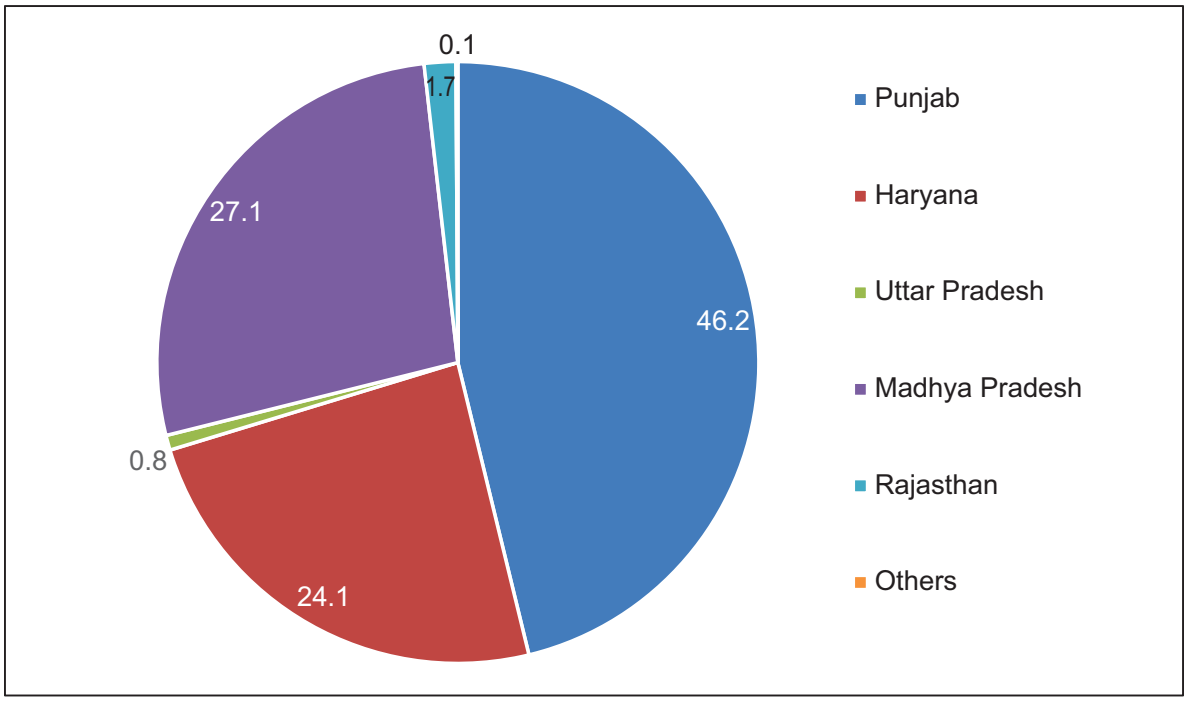
Figure 3: Procurement of Wheat in Major States

(In thousand metric tonnes)



Source: Department of Food & Public Distribution, Govt. of India

Figure 4: Percentage Share of Different States in Procurement of Wheat during Marketing Season 2023-24 (up to 14.07.2023)



Source: Department of Food and Public distribution, Govt. of India

Commercial Crops

Oilseeds

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 187.8 in August, 2023 showing no change over the previous month but a decrease by 9.41 percent over the corresponding month of the previous year.

The Wholesale Price Index (WPI) of all individual oilseeds showed a mixed trend. The WPI of rape & mustard seed (1.47 percent), cotton seed (0.73 percent), copra (coconut) (2.75 percent), gingelly seed (sesamum) (1.92 percent), niger seed (2.27 percent), sunflower (8.35 percent) increased over the previous month. However, the WPI of groundnut seed (0.44 percent), safflower (0.47 percent) and soybean (1.64 percent) decreased over the previous month.

Manufacture of Vegetable and Animal Oils and Fats

The Wholesale Price Index (WPI) of Vegetable and Animal oils and Fats as a group stood at 147.5 in August, 2023 which shows a decrease of 0.14 percent over the previous month. Moreover, it decreased by 20.87 percent over the corresponding month of the previous year. The WPI of mustard oil (2.13 percent), soybean oil (0.07 percent) and groundnut oil (3.13 percent) increased over the previous month. However, the WPI of sunflower oil (0.39 percent), copra oil (2.12 percent) and cotton seed oil (1.02 percent) decreased over the previous month.

Fruits & Vegetable

The Wholesale Price Index (WPI) of Fruits & Vegetable as a group stood at 263.6 in August, 2023 showing a decrease of 6.82 percent over the previous month and an increase of 21.81 percent over the corresponding month of the previous year.

Potato

The Wholesale Price Index (WPI) of potato stood at 221.4 in August, 2023 showing an increase of 0.05 percent over the previous month. However, it decreased by 24.02 percent over the corresponding month of the previous year.

Onion

The Wholesale Price Index (WPI) of onion stood at 229.2 in August, 2023 showing an increase of 24.36 percent over the previous month and an increase of 31.42 percent over the corresponding month of the previous year.

Condiments & Spices

The Wholesale Price Index (WPI) of Condiments & Spices (Group) stood at 251.2 in August, 2023 showing an increase of 7.12 percent over the previous month and an increase of 34.33 percent over the corresponding month of the previous year. The Wholesale Price Index of black pepper increased by 12.74 percent over the previous month, WPI of chillies (dry) increased by 0.04 percent and that of turmeric increased by 23.21 percent over the previous month.

Tea

The Wholesale Price Index (WPI) of tea stood at 159.1 in August, 2023 showing a decrease of 4.62 percent over the previous month and a decrease of 7.98 percent over the corresponding month of the previous year.

Coffee

The Wholesale Price Index (WPI) of coffee stood at 149.8 in August, 2023 showing a decrease of 3.04 the previous month. Moreover, there is a decrease of 3.73 percent over the corresponding month of the previous year.

Sugarcane

The Wholesale Price Index (WPI) of sugarcane stood at 157.6 in August, 2023 showing no change over the previous month. However, there is an increase of 5.16 percent over the corresponding month of the previous year.

Raw Cotton

The Wholesale Price Index (WPI) of raw cotton stood at 162.2 in August, 2023 showing an increase of 2.85 percent over the previous month and a decrease of 26.14 percent over the corresponding month of the previous year.

Raw Jute

The Wholesale Price Index (WPI) of raw jute stood at 248.4 in August, 2023 showing a decrease of 0.48 percent over the previous month and a decrease of 7.73 percent over the corresponding month of the previous year.

Wholesale Price Index of commercial crops is given in Table 3. A graphical comparison of WPI for the period of August, 2023 and July, 2023 is given in figure 5 and the comparison of WPI during the August, 2023 with the corresponding month of last year has been given in figure 6.

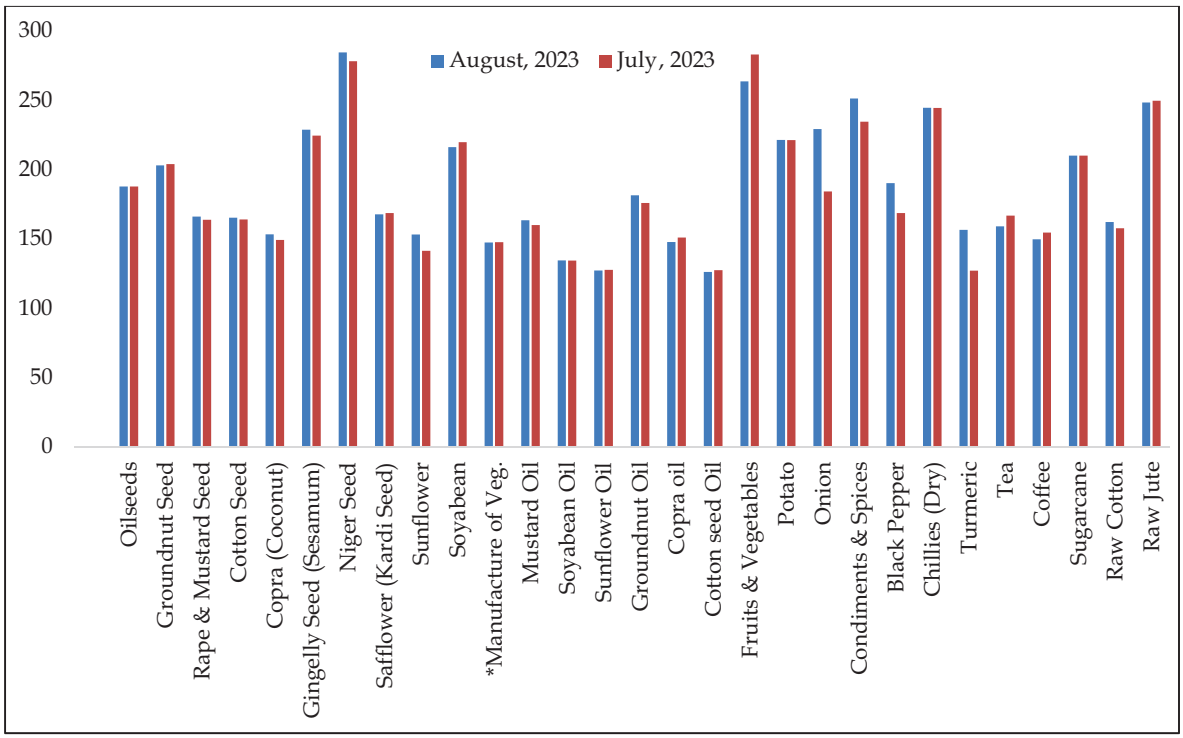
TABLE 3: WHOLESALE PRICE INDEX OF COMMERCIAL CROPS

(Base Year: 2011-12)

Commodity	August, 2023	July, 2023	August, 2022	Percentage variation over the	
				month	year
Oilseeds	187.8	187.8	207.3	0.00	-9.41
Groundnut Seed	203.0	203.9	175.3	-0.44	15.80
Rape & Mustard Seed	166.2	163.8	201.6	1.47	-17.56
Cotton Seed	165.3	164.1	181.9	0.73	-9.13
Copra (Coconut)	153.3	149.2	183.5	2.75	-16.46
Gingelly Seed (Sesamum)	228.8	224.5	181.6	1.92	25.99
Niger Seed	284.4	278.1	240.1	2.27	18.45
Safflower (Kardi Seed)	167.8	168.6	203.5	-0.47	-17.54
Sunflower	153.2	141.4	184.4	8.35	-16.92
Soyabean	216.2	219.8	258.3	-1.64	-16.30
Manufacture of Vegetable and Animal Oils and Fats	147.5	147.7	186.4	-0.14	-20.87
Mustard Oil	163.4	160.0	199.4	2.13	-18.05
Soybean Oil	134.5	134.4	175.9	0.07	-23.54
Sunflower Oil	127.3	127.8	170.1	-0.39	-25.16
Groundnut Oil	181.4	175.9	174.3	3.13	4.07
Copra oil	147.8	151.0	170.1	-2.12	-13.11
Cotton seed Oil	126.2	127.5	182.2	-1.02	-30.74
Fruits & Vegetables	263.6	282.9	216.4	-6.82	21.81
Potato	221.4	221.3	291.4	0.05	-24.02
Onion	229.2	184.3	174.4	24.36	31.42
Condiments & Spices	251.2	234.5	187.0	7.12	34.33
Black Pepper	190.2	168.7	165.6	12.74	14.86
Chillies (Dry)	244.5	244.4	235.0	0.04	4.04
Turmeric	156.6	127.1	115.2	23.21	35.94
Tea	159.1	166.8	172.9	-4.62	-7.98
Coffee	149.8	154.5	155.6	-3.04	-3.73
Sugarcane	210.1	210.1	199.8	0.00	5.16
Raw Cotton	162.2	157.7	219.6	2.85	-26.14
Raw Jute	248.4	249.6	269.2	-0.48	-7.73

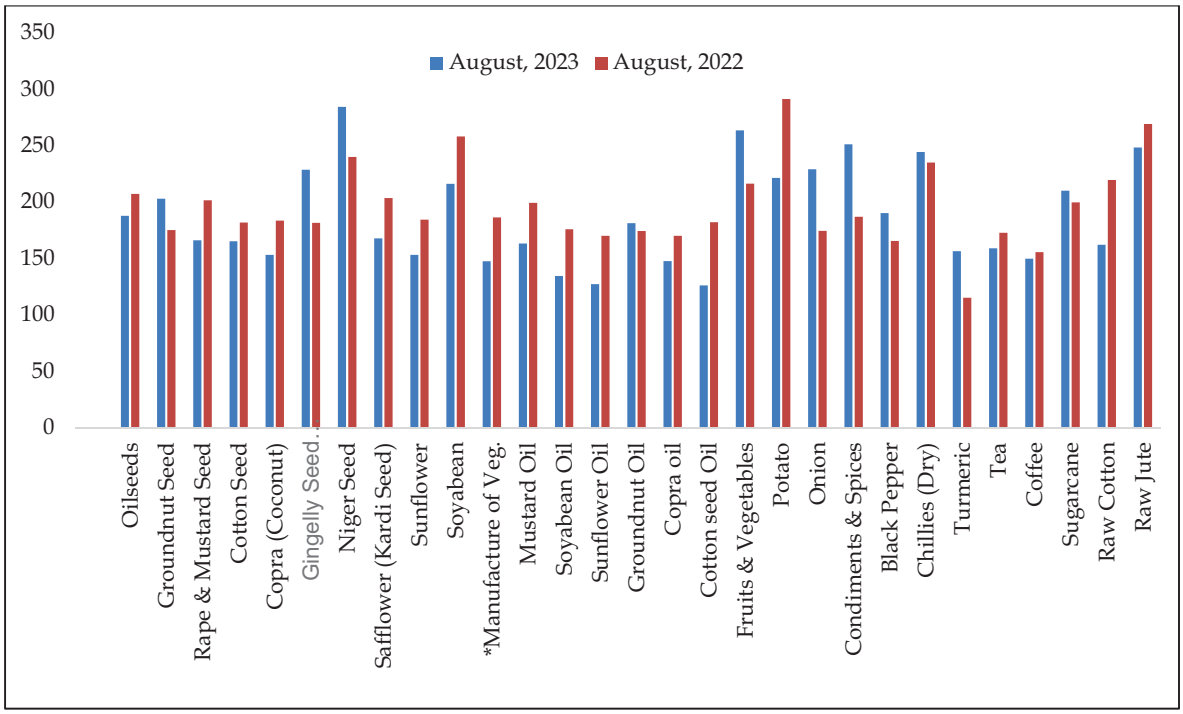
Source: Office of the Economic Advisor, DPIIT, Ministry of Commerce, Govt. of India.

Figure 5: WPI of Commercial Crops during August, 2023 and July, 2023



*Manufacture of Vegetable, Animal Oils and Fats.
Source: Office of the Economic Advisor, DPIIT, Ministry of Commerce, Govt. of India.

Figure 6: WPI of Commercial Crops during August, 2023 and August, 2022



*Manufacture of Vegetable, Animal Oils and Fats.
Source: Office of the Economic Advisor, DPIIT, Ministry of Commerce, Govt. of India.

Statistical Tables

1. Wages

STATE-WISE PREVAILING AVERAGE DAILY WAGES

(Value in Rs)

Sr. No.	State	Month & Year	Normal Working Hours	Field Labour								Other Agri. Labour		Tractor Driver		* Field Labour		Non-Agri. Occupation		
				Ploughing		Sowing		Weeding		Reaping & Harvesting								Carpenter	Blacksmith	Mason
				M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	M	M
1	Andhra Pradesh	April, 23	8	593	-	513	363	440	317	534	404	516	374	668	-			676	581	707
2	Assam	April, 23	8	464	436	455	411	450	412	462	411	451	422	530	-			546	490	530
3	Bihar	April, 23	8	396	332	360	318	368	321	384	-	378	344	471	-			565	537	552
4	Chhattisgarh	April, 23	8	342	240	240	210	223	196	232	203	252	212	404	-			423	331	421
5	Goa	April, 23	8	800	800	583	442	684	500	710	528	680	498	1293	-			1079	800	967
6	Gujarat	April, 23	8	308	NR	257	247	250	248	257	251	173	173	392	-			502	502	502
7	Haryana	April, 23	8	619	-	550	473	520	463	524	476	509	461	617	-			719	669	778
8	Himachal Pradesh	April, 23	8	575	-	497	480	486	482	490	500	462	438	644	-			660	647	648
9	Jharkhand	April, 23	8	310	284	304	273	305	267	313	333	300	263	397		Not Required		456	444	477
10	Karnataka	April, 23	8	627	-	392	282	370	276	395	296	439	308	601	-			560	519	695
11	Kerala	April, 23	8	984	NR	NR	577	NR	562	827	639	773	657		NR			985	941	1005
12	Madhya Pradesh	May, 23	8	350	263	294	254	268	242	303	272	336	299	410	-			481	461	492
13	Maharashtra (P*)	June, 22	8	406	283	381	256	356	244	490	NR	378	244	607	-			500	450	472
14	Odisha	Feb, 23	8	421	402	372	318	366	316	374	248	392	328	534	-			591	545	594
15	Punjab	April, 23	8	506	410	480	428	465	428	534	NR	482	405	497	-			605	587	601
16	Rajasthan	April, 23	8	453	336	436	312	399	329	423	339	417	282	543	-			565	503	602
17	Tamil Nadu	April, 23	8	675	-	653	327	632	326	734	326	666	345	865	-			797	707	853
18	Telangana	April, 23	8	Not Required								434	343		NR	452	232	461	444	NR
19	Tripura	April, 23	8	419	NR	369	319	364	313	357	300	303	251	491	NR	Not Required		458	378	361
20	Uttar Pradesh	April, 23	8	344	-	337	320	329	311	345	319	332	318		NR			554	-	587
21	Uttarakhand	April, 23	8	701	NR	434	396	455	419	460	420	492	432					717	NR	725
22	West Bengal	April, 23	8	481	288	350	312	339	302	357	323	340	316	548	-			529	487	536

Source: State Governments

Note: 1 Other agricultural labour include field waterping, carrying load, well diggers, cleaning silt from waterways and embankment, etc.

2. *States of Telangana do not give operation–wise details as they furnish data for the group

3. P* - Provisional as the State has not furnished data for its all districts.

4. NR: Not Reported

2. Prices

WHOLESALE PRICES OF CERTAIN AGRICULTURAL COMMODITIES AND ANIMAL HUSBANDRY PRODUCTS AT SELECTED CENTRES IN INDIA

(All Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Aug-23	Jul-23	Aug-22
Wheat	PBW 343	Quintal	Punjab	Amritsar	NA	2025	2220
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	2353	2306	2154
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	2404	2398	2154
Jowar	-	Quintal	Maharashtra	Mumbai	4875	4575	3463
Gram	No III	Quintal	Madhya Pradesh	Sehore	5353	4780	4411
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1878	1939	2299
Gram Split	-	Quintal	Bihar	Patna	6725	6708	6480
Gram Split	-	Quintal	Maharashtra	Mumbai	6350	6150	6025
Arhar Split	-	Quintal	Bihar	Patna	12513	12333	9680
Arhar Split	-	Quintal	Maharashtra	Mumbai	12875	12500	9500
Arhar Split	-	Quintal	Delhi	Delhi	12704	11375	9638
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	12725	12375	9450
Gur	-	Quintal	Maharashtra	Mumbai	4800	4825	4850
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4700	4700	5000
Gur	Balti	Quintal	Uttar Pradesh	Hapur	3725	3438	3036
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	5444	5438	6575
Mustard Seed	Black	Quintal	West Bengal	Raniganj	6600	6575	6488
Mustard Seed	-	Quintal	West Bengal	Kolkata	5938	5888	7188
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	5463	5363	7313
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	5281	5249	7338
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	2775	2725	3200
Cotton Seed	MCU 5	Quintal	Tamil Nadu	Coimbatore	3750	3750	3625
Castor Seed	-	Quintal	Telangana	Hyderabad	NA	NA	NA
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	13450	13250	10105
Copra	FAQ	Quintal	Kerala	Alleppey	8350	7750	8275
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	7125	7000	6375
Groundnut	-	Quintal	Maharashtra	Mumbai	11800	11200	10475
Mustard Oil	-	15 Kg.	Uttar Pradesh	Kanpur	1820	1838	2438
Mustard Oil	Ordinary	15 Kg.	West Bengal	Kolkata	1839	1829	2341
Groundnut Oil	-	15 Kg.	Maharashtra	Mumbai	2760	2696	2508
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2950	2850	2850
Linseed Oil	-	15 Kg.	Uttar Pradesh	Kanpur	2185	2196	2320
Castor Oil	-	15 Kg.	Telangana	Hyderabad	2513	2344	2700
Sesamum Oil	-	15 Kg.	Delhi	Delhi	2765	2540	2525
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	4450	4363	3475
Coconut Oil	-	15 Kg.	Kerala	Cochin	1883	1834	2063
Mustard Cake	-	Quintal	Uttar Pradesh	Kanpur	2894	2836	3169
Groundnut	-	Quintal	Telangana	Hyderabad	NA	NA	NA
Cotton/Kapas	NH 44	Quintal	Andhra Pradesh	Nandyal	6675	6491	10425

WHOLESALE PRICES OF CERTAIN AGRICULTURAL COMMODITIES AND ANIMAL HUSBANDRY PRODUCTS AT SELECTED CENTRES IN INDIA - *Contd.*

Commodity	Variety	Unit	State	Centre	Aug-23	Jul-23	Aug-22
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	6075	6050	9500
Jute Raw	TD 5	Quintal	West Bengal	Kolkata	5613	5919	6088
Jute Raw	W 5	Quintal	West Bengal	Kolkata	5613	5919	6088
Oranges	Big	100 No	Tamil Nadu	Chennai	2375	2075	2625
Oranges	Nagpuri	100 No	West Bengal	Kolkata	NA	NA	NA
Banana	-	100 No.	Delhi	Delhi	521	438	467
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	588	593	541
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	60000	60000	65100
Almonds	-	Quintal	Maharashtra	Mumbai	75000	75000	55500
Walnuts	-	Quintal	Maharashtra	Mumbai	100000	100000	115750
Kishmish	-	Quintal	Maharashtra	Mumbai	20000	20000	16075
Peas Green	-	Quintal	Maharashtra	Mumbai	7800	7800	7425
Tomato	Ripe	Quintal	Uttar Pradesh	Kanpur	6325	6850	2138
Ladyfinger	-	Quintal	Tamil Nadu	Chennai	2375	3175	1475
Cauliflower	-	100 No.	Tamil Nadu	Chennai	1825	2700	1750
Potato	Red	Quintal	Bihar	Patna	1418	1365	1670
Potato	Desi	Quintal	West Bengal	Kolkata	1640	1708	2278
Potato	Sort I	Quintal	Tamil Nadu	Mettuppalaya	4145	5135	5222
Onion	Pole	Quintal	Maharashtra	Nashik	1800	988	1075
Turmeric	Nadan	Quintal	Kerala	Cochin	11625	11000	10625
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	18000	13875	12400
Chillies	-	Quintal	Bihar	Patna	22175	22463	19905
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	59150	50425	48150
Ginger	Dry	Quintal	Kerala	Cochin	29875	27000	15875
Cardamom	Major	Quintal	Delhi	Delhi	57913	57625	57600
Cardamom	Small	Quintal	West Bengal	Kolkata	198750	181250	147500
Milk	Buffalo	100 Liters	West Bengal	Kolkata	7625	7500	6500
Ghee Deshi	Deshi No 1	Quintal	Delhi	Delhi	62016	62023	60030
Ghee Deshi	-	Quintal	Maharashtra	Mumbai	84500	80500	50500
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	47738	47000	47750
Fish	Rohu	Quintal	Delhi	Delhi	11775	12025	13000
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	65750	70500	73000
Eggs	Madras	1000 No.	West Bengal	Kolkata	5088	5307	4866
Tea	-	Quintal	Bihar	Patna	25400	25700	27400
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	10029	10405	10293
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	44000	45000	48250
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	28000	28000	23250
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	9663	9663	8725
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	4731	4688	4325
Tobacco	Bidi Tobacco	Quintal	West Bengal	Kolkata	13200	13325	13225
Rubber	-	Quintal	Kerala	Kottayam	12325	12775	14900

WHOLESALE PRICES OF CERTAIN AGRICULTURAL COMMODITIES AND ANIMAL HUSBANDRY PRODUCTS AT SELECTED CENTRES IN INDIA - *Concld.*

Commodity	Variety	Unit	State	Centre	Aug-23	Jul-23	Aug-22
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	91000	94000	90500
Paddy	2716	Quintal	Andhra Pradesh	Vijayawada	2330	2308	2200
Paddy	Basmati	Quintal	Punjab	Amritsar	NA	NA	NA
Paddy	No III	Quintal	Uttar Pradesh	Kanpur	2025	2114	1561
Paddy	Common	Quintal	West Bengal	Kolkata	2183	2112	1940

Source: DPIIT, Ministry of Commerce and Industry, Govt. of India.

Crop Production

SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING THE MONTH OF SEPTEMBER, 2023

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Paddy, Jowar,Maize, Tobacco, Groundnut, Mesta And Linseed.	Paddy, Bajra, Ragi, Ground, Sesamum and Ginger.
Assam	Paddy, Gram, Pulses, Potato and Linseed.	Paddy and Mesta.
Bihar	Wheat, Barley, Gram, Rapeseed & Mustard, Linseed and Potato.	Paddy, Jowar, Bajra, Maize, Ragi and Sesamum.
Gujarat	Paddy, Gram, Pulses and Potato.	Paddy, Jowar, Groundnut, Bajra and Cotton.
Himachal Pradesh	Wheat, Barley, Gram, Rapeseed & Mustard.	Paddy, Bajra, Maize, Small Millets, Pulses, Potato and chillies.
Jammu & Kashmir	Wheat, Barley, Rapeseed & Mustard and Onion.	Paddy, Bajra, Maize, Small Millets, Pulses, Potato and chillies.
Karnataka	Jowar, Potato, Tobacco, Linseed, Sweet Potato and Onion.	Kharif Jowar, Ragi, Small Milets, Chillies and Groundnut.
Kerala	Paddy, Pulses and Sesamum.	Paddy, Sweet Potato and lemongrass
Madhya Pradesh	Wheat, Barley, Gram, Jowar, Rabi Pulses, Potato, Chillies, Rapeseed & Mustard and Onion.	Paddy, Ragi, Kharif Pulses, Potato, Ginger Chillies and Groundnut
Maharashtra	Wheat, Gram, Jowar, Barley and Pulses.	Kharif Paddy, Jowar, Bajra, Maize, Groundnut and Seasamum.
Manipur	Wheat, Potato and Rapeseed & Mustard.	Surgacane and late Paddy.
Orissa	Wheat, Jowar, Gram, Rapeseed & Mustard and Linseed.	Paddy, Kharif, Jowar and Sesamum.
Punjab	Wheat and Gram.	Paddy, Cotton, Pulses and Early Sugarcane.
Rajsthan	Wheat, Barley, Rapeseed & Mustard and Linseed.	Jowar, Bajra,Maize, Cotton and Sannhemp
Tamil Nadu	Paddy, Jowar, Groundnut, Smal Millets, Tobacco And Cotton.	Kharif Paddy, Jowar,Maize, Cotton, Tapioca, Mesta and Ginger.
Tripura	Pulses and Potato.	Til.
Uttar Pradesh	Wheat, Barely, Gram, Linseed and Rapeseed & Mustard.	Paddy, Jowar, Bajra, Sesamum and Groundnut.
West Bengal	Wheat, Barley, Rapeseed & Mustard, Tobacco, Chillies, Til, Potato and pulses.	Paddy, Jute and Red Chillies.
Delhi	Wheat, Barley and Pulses.	Paddy, Jowar, Bajra, Maize and Sugarcane.

Note to Contributors

The Journal brought out by the Economics, Statistics and Evaluation Division, Ministry of Agriculture & Farmers Welfare aims at presenting an integrated picture of the food and agricultural situation in India on month to month basis. The views expressed are not necessarily those of the Government of India.

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