

A STUDY ON CONSUMPTION OF AGRICULTURAL INPUTS AND ANALYSIS OF MARKET SHARE OF AGRI INPUT COMPANIES FOR CEREAL CROPS IN JAMMU DISTRICT

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by
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Faculty of Agriculture
in partial fulfillment of the requirements
for the degree of

**MASTERS OF BUSINESS ADMINISTRATION
(AGRI-BUSINESS MANAGEMENT)**




Division of Agricultural Economics and ABM
Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu
Main Campus, Chatha, Jammu-180009
2023

CERTIFICATE-I

This is to certify that the project entitled “A Study on Consumption of Agricultural Inputs and Analysis of Market Share of Agri Input Companies for Cereal Crops in Jammu District” submitted in partial fulfillment of the requirements for the degree of **MBA (Agri-Business Management)** to the **Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu**, is original work and has similarities with published work not more than minor similarities as per UGC norms of 2018 adopted by the University. Further the level of minor similarities has been declared after checking the manuscript with **URKUND** software provided by the University.


The work has been carried out by **Mr. Shagun Thakur**, under my supervision and guidance. No part of the project has been submitted for any other degree or diploma. It is further certified that help and assistance received during the course of project investigation have been duly acknowledged.


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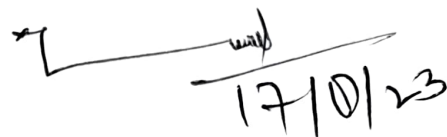
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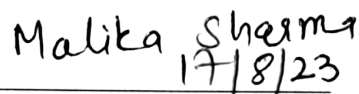
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ABSTRACT

Title of the Project	:	A study on Consumption of Agricultural Inputs and Analysis of Market Share of Agri Input Companies for Cereal Crops in Jammu District
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ABSTRACT


Inputs for agriculture include commodities like seeds, fertilizer, insecticides, and equipment that are necessary for increasing agricultural output and guaranteeing food security. They provide the framework for contemporary farming methods, allowing farmers to maximize yields and uphold sustainable agricultural practices. Hence a study titled, “**A study on Consumption of Agricultural Inputs and Analysis of Market Share of Agri Input Companies for Cereal Crops in Jammu District**” was carried out in which CAGR, Factor analysis, Garret’s ranking, tabular analysis, and various regression models were used and secondary data was collected from various published sources/agencies. A total of 60 farmers, 10 retailers, and 10 distributors were interviewed using a pre-tested schedule to conduct the study.

In the survey, it was found that there has been a rising tendency in the consumption of certified cereals quality seed, fertiliser, and pesticides in India and Jammu & Kashmir over the previous years. The majority of the money spent by farmers in the Jammu district goes towards fertiliser inputs for growing paddy and wheat. Jammu's farmers underutilize fertilisers for the majority of the time. The market for urea and DAP was dominated by IFFCO, and in case of MOP IPL owns the majority of the market share. The Bayer firm dominates the weedicide, fungicide, and insecticide markets. According to retailers and distributors, Yamuna seeds hold the bulk of the market share for wheat and paddy seeds, respectively. Product characteristics, Branding & Pricing, Packaging & Labelling, and Promotion & Advertisements were factors that affect farmers' brand preferences, on the basis of results. Farmers were most influenced by banners and posters used in promotional activities for the sale of agri-inputs, while retailers and distributors were most influenced by frequent visits from company representatives used in promotional activities for the sale of agri-inputs.

Keywords: Agri-input, consumption, fertilizer, seed, pesticide



Signature of Major Advisor



Signature of the Student

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INTRODUCTION

Agriculture, as the backbone of human civilization, plays a paramount role in providing food security, promoting economic growth, and safeguarding environmental sustainability. To provide the rising need for food, fuel, and fiber, farmers cultivate crops and rear livestock all over the world. Modern agriculture has become more productive and sustainable as a result of scientific and technological breakthroughs. Farmers can use precision farming methods to maximize their resources, reduce waste, and increase productivity. These methods include using drones, satellite imaging, and smart irrigation systems. In addition, using organic and regenerative farming methods enhances soil health, increases biodiversity, and decreases the usage of synthetic inputs. Agriculture supports livelihoods and contributes to both domestic and international trade, acting as the economic backbone of rural areas. The agriculture industry holds the key to tackling global issues including food security, climate change, and rural development through adopting innovation and sustainable practices. Food security around the world is still dependent on agriculture. More than 75% of the world's poor and malnourished people, according to the World Bank, relied on jobs associated with agriculture for their livelihoods (World Bank, 2021). According to the study done by Fan *et al.* (2019), agricultural innovations including better crop types and irrigation systems have significantly contributed to a reduction in hunger and malnutrition around the world. Particularly in developing nations, agriculture has been vital in promoting economic prosperity. Empirical research, such as that by Diao *et al.* (2017), has demonstrated that the agricultural sector serves as a catalyst for rural development, the eradication of poverty, and the creation of jobs. In fact, the World Bank predicted that in low-income countries, a 1% increase in agricultural production can result in a 0.4% rise in GDP growth (World Bank, 2021).

India's economy depends heavily on agriculture, which also helps with employment, rural development, and food security. The sector accounts for roughly 50% of the labour force and 15% of India's GDP, according to the most recent figures available (Ministry of Agriculture and Farmers' Welfare, Government of India, 2021). It supports the nation's expanding population and is a crucial source of income for rural

regions. In addition, agriculture has crucial for supplying domestic food needs and preserving food production self-sufficiency (Economic Survey 2020–21, Ministry of Finance, Government of India).

Agriculture inputs were essential for increasing agricultural output and guaranteeing food security. A study by Pampolino *et al.* (2012) found that using high-quality seeds, fertilizers, and insecticides considerably increases crop yields and decreases post-harvest losses. Additionally, effective irrigation systems and mechanization strategies described in research like Singh *et al.* (2017) help optimize water use and decrease labour requirements, contributing to sustainable agriculture. Based on scientific guidelines, efficient use of these inputs boosts agricultural development and helps farmers full fill the rising worldwide need for food. As the basis for agricultural production, seeds were essential to agriculture. For a good yield and production, quality seeds are essential. Particularly certified seeds go through extensive testing and adhere to strict requirements, guaranteeing their quality and genetic integrity. Smith *et al.*, 2019 study found that using certified seeds increased crop production significantly and improved crop uniformity, raising farm productivity as a whole. The crop-wise distribution of certified seeds in India was 246.00 lakh quintals in fiscal year 2020-2021 (India stat, 2022) and as per Agricultural Statistics at a Glance 2021 the distribution of wheat's certified/quality seeds was 134.96 lakh quintals in fiscal year 2020-2021 and the distribution of paddy's certified/quality seed was 91.69 lakh quintals in fiscal year 2020-2021 (Agricultural Statistics at a Glance 2021).

In order to increase agricultural productivity and satisfy the rising global demand for food, fertilizers are essential (Smith *et al.*, 2020). They give plants the necessary nutrients that they need for growth and development, such as nitrogen, phosphorus, and potassium (Fageria *et al.*, 2018). Additionally, fertilisers help increase soil fertility and nutrient uptake effectiveness, which optimise crop yields (Kumar *et al.*, 2021). The consumption of NPK fertilizer in the fiscal year 2020-2021 was 325.36 lakh tonnes (India stat, 2022). Their excessive and careless use, however, can result in environmental problems such as nutrient runoff and groundwater pollution (Sharpley *et al.*, 2019). In order to balance agricultural production and environmental sustainability, effective and sustainable fertiliser management practices were crucial (FAO, 2020). Chemicals known as pesticides are applied to crops to control pests and illnesses and increase crop output. The consumption of pesticides (technical grade) in

India was 61.70 thousand tonnes in the fiscal year 2019-2020 (India stat, 2022). To reduce the negative effects associated with pesticide use, it is crucial to implement sustainable pest management techniques (Brown *et al.*, 2021).

In 2022, a study that was published in the journal "Food and Agriculture Organisation of the United Nations" found that more than half of the world's population relied on rice as a staple food and a major source of calories and nourishment. According to estimations, the amount of rice consumed worldwide surpassed 500 million metric tonnes in 2021 (FAO, 2022). One of the world's top users of rice, rice is an essential component of the diet in India. According to a study titled "Rice Consumption Patterns in India: Evidence from National Sample Survey" that was published in the journal "Food Policy" in 2019 (Joshi *et al.*, 2019), rice made up roughly 35% of the total caloric intake in India's cities and 40% of it in the country's rural parts.

A major portion of the world's population received its nutrition and subsistence from cereals, which have been an essential component of the global food system. Cereals are a staple food crop in India and are the main source of calories and important nutrients for millions of people. According to a study by Viji, "Cereal-based diets contribute significantly to food security and are vital for combating malnutrition in developing countries, including India" (Viji, 2019). These findings highlighted the crucial role that cereals play in ensuring food security and enhancing lives on a global and domestic scale. One of the most commonly consumed staple crops worldwide, wheat serves as a major source of calories and nutrients for a large number of people. Data from the FAO show that as of 2020, the world consumed 762 million metric tonnes of wheat annually. Wheat is also widely consumed in India as a result of its status as a staple food. With domestic consumption of more than 100 million metric tonnes, India is one of the biggest consumers of wheat, according to the Agricultural and Processed Food Products Export Development Authority (APEDA, 2022).

Table 1.1. Area under cultivation of rice in India (million ha)

S. No	State	Area
1	West Bengal	5.6
2	UP	5.7
3	Punjab	2.97
4	Telangana	3.65
5	Odisha	3.94
6	Tamil Nadu	2.21
7	Chattisgarh	3.76
8	Andhra Pradesh	2.25
9	Bihar	3.1
10	Assam	2.36
11	Others	10.86
12	All India	46.38

Source: Agricultural Statistics at a Glance, (2022)

Table 1.2. The area under cultivation of wheat in India (million ha)

S. No	State	Area
1	UP	9.42
2	Madhya Pradesh	6.5
3	Punjab	3.52
4	Haryana	2.3
5	Rajasthan	2.58
6	Bihar	2.24
7	Gujrat	1.04
8	Maharashtra	1.17
9	Others	1.69
10	All India	30.47

Source: Agricultural Statistics at a Glance, (2022)

Table 1.3. The area under cultivation of wheat and rice in the Jammu division (ha)

S. No	Districts	Area under rice cultivation	Area under wheat cultivation
1	Jammu	58430	50467
2	Samba	19153	24172
3	Kathua	34066	48366
4	Udhampur	7206	33650
5	Reasi	964	15064
6	Rajouri	4813	45403
7	Poonch	2905	14325
8	Doda	2271	4191
9	Kishtwar	1188	2056
10	Ramban	3302	4794
	Total	134298	242488

Source: Directorate OF Economics & Statistics, J&K

1.1 Market share of Agri-input companies

Insecticides currently hold the majority of the market share for pesticides, accounting for 65% of all pesticide demand, followed by fungicides and herbicides. Foreign businesses heavily control the market in India. The world's largest manufacturer of agrochemicals is Bayer AG. Some of the well-known companies are Lallemand Inc., Arysta Life Science (Japan), Sinofert Holdings Limited (China), Yara International ASA, BASF, Bayer Crop Science, Makhteshim Agan Industries Ltd, Dow Agro Sciences, Monsanto, Syngenta, Aventis, Agrium, etc. Rashtriya Chemicals and Fertilisers Ltd., National Fertilisers Limited, and Indian Farmers Fertiliser Cooperative. Some of the major domestic businesses operating in the Indian subcontinent are Coromandel International Limited, Nagarjuna Fertilisers and Chemicals Limited, and Zuari Agro Chemicals. To increase distribution and reach in the nation, businesses here need to concentrate and strengthen their supply chain strategy (Singh, 2012). Based on revenue, Syngenta was recognized as the top crop protection firm in 2021, selling pesticides for over 13.3 billion US dollars. With pesticide sales totalling 11.4 billion dollars, Bayer Crop Science, a division of Bayer AG, came in second place. Over 20 billion euros were made by Bayer Crop Science in (2021), including sales of pesticides and seeds (Statista, 2022). One of India's top pesticide manufacturers was Bayer Crop Science Limited. It began operating in 2002 and had a broad product line suited for many different types of crops. Top competitors also included NACL Industries Limited, UPL Limited, Bharat Rasayan Limited, and Rallies India Limited, a subsidiary of the Tata Group. Rallies were among the top businesses in 2020 based on market value (Statista, 2022).

In India, there are few market leaders who have a majority market share name as Indian Farmers fertilizer limited (IFFCO) has a wide range of fertilizers including urea, DAP, NPK, and complex fertilizers. National Fertilizer Limited is also one of the major producers of urea, DAP, ammonium nitrate, and other complex fertilizers having manufacturing units across the country and a strong distribution network. Rashtriya Chemicals and fertilizers limited (RCF), Coromandel International Limited, and KRIBCO have a major share in the Indian fertilizer market. Based on market capitalization, Nutrient was the biggest fertilizer firm in the world as of July 2022 with 42.13 billion US dollars. With a market value of \$35.86 billion at the time, Wesfarmers came in second. An Australian corporation called Wesfarmers focuses on many

industry sectors like retail, chemicals, and fertilizers with a plant capacity of more than 20 million metric tonnes of potassium chloride, Nutrien was the largest producer of potash in the world. After CF Industries and Yara, the Canadian business is the third-largest producer of nitrogen fertilizer. Approximately 27.8 billion dollars in sales were created by Nutrien in 2021, a figure that has been rising over the past few years (Statista, 2022). As of June 2022, Coromandel International Limited was the largest fertilizer firm in India, with net sales exceeding 190 billion Indian rupees. With net sales of more than 160 billion Indian rupees, Chambal Fertilisers and Chemicals Limited came in second position. With net sales of around 158.5 billion Indian rupees, National Fertilisers Limited, one of the major Central Public Sector Enterprises in India, came in third place (Statista, 2022).

Geographically, the world seed market was divided into North America, Europe, Asia-Pacific, South America, and Africa. Together with Europe, North America accounts for the biggest market share and 55% of the worldwide seed market. With a CAGR of 7.9%, Asia-Pacific was predicted to expand the quickest between 2015 and 2020, followed by South America. China was right behind the United States as the second-largest seed market in the world. However, India also holds a sizeable 4% of the world's seed market (Statista, 2022). Through innovation and the adoption of scientific developments in variety development and high-quality seed production, the Indian seed business has developed over time. Due to the quick adoption of Bt cotton hybrids, single cross maize hybrids, and hybrid vegetables, the business expanded rapidly by 20.59% between 2010 and 2015, reaching ₹ 141.24 billion. Over the past several years, there has been an increase in demand for seeds due to growing farmer awareness of the advantages of utilizing quality/certified seeds. Farmers were now more willing than ever to pay more for premium seeds as a result of this (Indian Council of Food and Agriculture, 2020). In India, there were a few market leaders which are having majority market share in the Indian seed market named Bayer, Mahindra, Rallies, Adama, Mahyco seed company, Nuziveedu Seed Limited, Advanta Seeds and Ajeet Seeds Pvt. Ltd. having major market share in the Indian seed market.

In the market of insecticides, Insecticide India Limited leads in sales with a substantial market share of 14.98%. Following closely are Bayer at 14.11% and Gharda at 11.97%. Other companies hold a relatively minor portion of the market share. The cumulative sales of all insecticide varieties from participating retailers amounted to

approximately ₹ 5.754 lakhs. In the fungicide sector, Indo fil emerged as the frontrunner with a significant market presence of 17.38%. Trailing behind are UPL and Bayer, with market shares of 12.90% and 12.78% respectively. Companies like Rallis India, Syngenta, and Adama hold a modest portion of the market share. The collective sales of all fungicide varieties through participating retailers amounted to around ₹ 4.89 lakhs. In the market of weedicides, Monsanto commands the largest market share at 17.27%, succeeded by PI at 13.47%, FIL Industries Ltd. at 10.97%, Crystal at 10.43%, Rallis India at 8.64%, and JU at 8.13%. The collective sales of all weedicides offered by participating retailers amounted to approximately ₹ 8.262 lakhs (Amit, 2019).

THE PROJECT

2.1 Title and statement of the problem

The project work entitled “**A Study on Consumption of Agricultural Inputs and Analysis of Market Share of Agri Input Companies for Cereal Crops in Jammu District**” was carried out in the Jammu district of J&K UT for the year 2022-2023.

India's economy and society both rely heavily on agriculture. It provides the main means of support for a sizeable segment of the population, especially in rural areas. Agriculture is significant in India because of what it has been doing for rural development, employment creation, and foreign exchange profits from exports. It also supports a number of businesses, including manufacturing, textiles, and agro-processing. Agriculture also helps with sustainable development, the preservation of the nation's natural resources, and the preservation of its biodiversity. The Indian government has undertaken policies and measures to support agricultural growth and improve the well-being of farmers and rural communities in recognition of its significance.

2.2.1 Agri-inputs and their Role in Agribusiness

Agribusiness requires the use of agricultural inputs because they are critical to assuring the best crop productivity and yield. These inputs include machinery, irrigation systems, farm machinery, seeds, fertilizers, pesticides, and fertilizers. The genetic potential and quality of the plants are determined by the seeds, which are the basis of crop production. Fertilizers replenish the soil's vital nutrients, promoting plant development and output. Crops are shielded against weeds, diseases, and pests with the help of pesticides, preserving their quality and safety. Farm machinery and equipment help with a variety of farming processes, improving efficiency and requiring less labour. Additionally, irrigation systems guarantee effective water management, especially in regions with variable rainfall patterns. These inputs work together to improve crop quality, boost yields, and raise agribusiness profitability. They make it possible for farmers to use cutting-edge agricultural techniques, make the most use of

available resources, and reduce crop production-related hazards. For agribusiness to be sustainable, agricultural inputs must be available and used properly. Using high-quality inputs wisely can reduce crop losses, boost profitability, and advance the development of agriculture as a whole. Agribusiness growth and sustainability are supported by the role that agri-input companies play in ensuring farmers' consistent access to these inputs. Agri-input businesses frequently offer farmers technical support, instruction, and advisory services to aid in their decision-making around input selection, application strategies, and dose. By encouraging effective and sustainable farming methods, this aid reinforces the importance of agri-inputs in agribusiness.

2.2.2 Consumption of Agri-inputs in India

The most essential catalyst for other inputs to be economically viable is a seed, which is a fundamental input. Inputs for agriculture, therefore, give it first priority. According to India Stat 2023, there were 246.00 lakh/quintal of certified quality cereal seed distributed by crop in India in 2020–2021. The importance of chemical fertilizer has increased with the growth of scientific agriculture and the introduction of contemporary technologies. Fertiliser is another crucial agricultural input made up of the three main elements nitrogen, phosphorus, and potash, or NPK. In the years 2021–2022, 341.73 lakh tonnes of urea fertilizer were consumed, compared to 92.64 lakh tonnes of DAP and 23.93 lakh tonnes of MOP (India stat, 2023). India consumed 28969.60 thousand tonnes of NPK fertilizer in the 2019–2020 crop season (FAO stat, 2023). The other main chemical input used in agriculture is pesticides, which help to reduce losses in farm products caused by a variety of weeds, insects, pests, and diseases in terms of both quantity and quality. In India, 61.70 thousand tonnes of technical-grade pesticides were consumed in the 2019–2020 fiscal year (India stat, 2023).

2.2.3 Consumption of Fertilizer and Pesticides in Jammu and Kashmir

In the years 2021 and 2022, Jammu & Kashmir used 120.07 thousand tonnes of NPK fertilizer (Agricultural Statistics at a Glance, 2022). In Jammu and Kashmir, 4086 metric tonnes of technical grade pesticide were consumed (India stat, 2023).

2.3 Objectives of the Study

1. To observe the consumption pattern of agricultural inputs in Cereal crops
2. To find out the market share of various brands of agricultural inputs in Jammu district

3. To analyze the factor influencing the brand choice and promotional approaches used by the Agri-input companies

2.4 Scope of the study

- The research aims to furnish insights into the utilization patterns of agricultural inputs within the designated study region.
- This study will ascertain the market distribution among different agricultural input companies within the research area.
- This research endeavour will additionally aid in the identification of the determinants influencing the selection of brand identities for agricultural inputs by corporations for marketing their products.

2.5 Limitations of the Study

- The availability of secondary data was constrained by its limited accessibility, particularly in relation to specific cereal crops like paddy and wheat.
- The investigation into the consumption patterns of cereal crops necessitated the collection of primary data. It was observed that a significant portion of farmers had not kept meticulous records, resulting in the acquisition of data relying heavily on the recollections and insights of the farmers themselves.
- Due to the substantial variations observed in the demographic and psychographic characteristics of farmers, the research was exclusively carried out within the Jammu district. Consequently, the applicability of the findings to other markets might be limited. It is important to note that the study's conclusions were formulated while taking these constraints into account.

REVIEW OF LITERATURE

Scientific investigation was supported by thorough assessments of prior studies. Finding the many techniques and strategies for carrying out the inquiry was helpful. This literature reviews to aid in the interpretation of results. There have been previous investigations of or issues with specific areas in which there aren't many studies. The scope was fairly constrained. To provide analyses of relevant research studies. Therefore, a review of relevant literature that has a direct bearing on the topic has been attempted here.

- 3.1 To observe the consumption pattern of agricultural inputs in Cereal crops
- 3.2 To find out the market share of various brands of agricultural inputs in the Jammu district
- 3.3 To analyze the factors influencing the brand choice and promotional approaches used by the Agri input companies

3.1 To observe the consumption pattern of agricultural inputs in Cereal crops

Yeladahalli (1991) predicted that by the year 2005, the consumption of all plant protection chemicals will rise from a current level of 4,000 tonnes to roughly 10,000 tonnes. His study focused on the sectoral analysis of agricultural input marketing in Karnataka. The study has shown how the usage of pesticides and fungicides has significantly increased. Rodenticides and weedicides, however, only had minor consumption.

The pattern of processed food consumption in Delhi was researched by Shaw *et al.* (1993). The popularity of processed products was higher than unprocessed products, according to the results. Brand name, government certification, and product pricing were the three main variables that affected consumers' purchasing decisions. He observed that time-strapped housewives benefited from processed food products because they simplified and sped up preparation. Due to their expensive price and consumers' ignorance of their use, particularly in semi-urban and rural areas, the consumption base for these items was poor domestically.

According to Kunnal *et al.* (1994), private seed companies held a 67 per cent share of the state's market for seeds for pulse crops and an 85 per cent stake for seeds for oil seed crops. The state seed corporation had a respectable 28.30% market share in the distribution of seeds for pulse crops, but it fell short when it came to oilseeds. Only 10% of the state's oil seed market is controlled by the Karnataka Oil Seed Grower's Cooperative Federation.

In the study, Bala *et al.* (2005) found that whereas fertiliser output grew at a rate of 10.6% throughout the study period, fertiliser consumption climbed at a rate of 11%. Subsidies were revealed as the most significant factor influencing fertiliser consumption, followed by the area under high-yielding cultivars and the total irrigated area. Farmers should be urged to use fertilisers judiciously, plant more land with high-yielding cultivars, and make the most of their irrigation options.

Pathania *et al.* (2020) conducted research indicating that the consumption of agricultural inputs, such as certified/quality seeds, fertiliser, pesticides, farm machinery, and electricity, has increased significantly over the course of the study period. It can also be argued that agricultural inputs have a great deal of potential to expand and maximise agricultural productivity in the nation.

The correlation between the use of agri inputs and sustainable agriculture practises was examined by Johnson *et al.* (2021). The authors review a number of research and discover that using sustainable farming methods like integrated pest control, organic farming, and precision agriculture can greatly minimise the need for agri inputs while maintaining or even increasing crop output. To achieve long-term environmental and economic sustainability, the review emphasises the importance of implementing such practices.

Brown *et al.* (2022) investigated the financial aspects of agricultural input consumption. The authors summarise numerous economic research and focus on the elements that affect farmers' decisions about inputs, such as input pricing, farm size, risk preferences, and governmental regulations. The assessment emphasises how crucial it is to create efficient agricultural policies and advance the well-being of farmers by comprehending the economic dynamics of input use.

Smith, J. *et al.* (2022) investigate the connection between crop productivity and agri-input usage. The use of high-quality agri inputs, such as fertilisers, pesticides, and

seeds, has a favourable impact on crop yields, according to the authors' analysis of numerous studies done in the last ten years. The review highlights the significance of balanced input utilisation, accounting for crop requirements, soil conditions, and climate.

Davis *et al.* (2023), the social aspects of agri input consumption are examined. The authors examine a number of research and pinpoint variables that affect farmers' knowledge and attitudes, access to inputs, social networks, and input utilisation habits. In order to improve farmers' livelihoods and well-being, the review highlights the significance of taking social factors into account when developing efficient agricultural extension programmes and policies.

The effects of agricultural input usage on the environment were researched by Johnson *et al.* in 2023. According to the authors' analysis of numerous studies, incorrect or excessive use of agricultural inputs like fertilisers and pesticides can result in soil deterioration, water contamination, and biodiversity loss. To reduce the damaging environmental effects of input consumption, the assessment emphasises the necessity for precision agriculture practices and sustainable farming methods.

3.2 To find out the market share of various brands of agricultural inputs in the Jammu district

Shankaramurthy (1986) examined the Karnataka State Cooperative Marketing Federation's sales of seeds, fertiliser, and plant protection chemicals in order to assess its success. According to the report, the Federation had a roughly 23% share of the fertiliser marketing market. However, the percentage for plant protection agents was very small (1.83%) and tiny (0.06%) for seed. The author proposed aggressive marketing tactics to get into the market for seeds and plant protection products.

According to Hentschel (1991), who conducted research on the European mushroom market, the output of mushrooms (90 per cent champignons) in the EU(12) climbed by an average of 5.6% year in the 1980s, with rates reaching as high as 8–9% in the Netherlands, Italy, the UK, and the Republic of Ireland. In Germany, where there is the biggest consumption of both fresh and processed mushrooms, the repercussions of this increased competition for market share are examined.

According to Kunnal and Murthy (1994), private seed companies held a 67 percent share of the state's market for seeds for pulse crops and an 85 per cent stake for

seeds for oil seed crops. In the distribution of seeds for pulse crops, the state seed corporation had a reasonably excellent 10 shares of 28.30 per cent, but in the case of oilseeds, it was not adequate. Only around 10% of the state's oil seed market is controlled by the Karnataka Oil Seed Grower's Cooperative Federation.

According to Shivakumar (1994), farmers primarily obtain pesticides from private vendors. The main sources of information about dealers were friends, neighbours, and relatives; in the case of brands, it was extension agents from the Department of Agriculture. Brand loyalty was greatly influenced by the brands' cost, quality, and advertising. Dealer loyalty was greatly influenced by the availability of loans, advertising, and the dealer's attractive prices for pesticides.

In her study of pesticide marketing in Karnataka, Udaya (2002) discovered that the industry was extremely competitive rather than concentrated, with the top 10 firms holding a market share of only 25.5 per cent.

A study on the empirical examination of pesticide marketing in Pakistan was done by Khooharo *et al.* (2008). The study looked into the patterns of pesticide imports, the incentives and marketing margins of different middlemen, the cost of common insecticides, and the total amount farmers spent on pesticides in Pakistan. In comparison to a simple linear regression model, estimates from the quadratic regression model showed a sharper growth tendency. As compared to international corporations (15%), local businesses provided dealers substantial profit margins of up to 30% as well as incentive programmes. MNCs provided farmers and traders with efficient training programmes to help them enhance their capacities.

According to a study by Ahlawat *et al.* (2021), insecticide products currently command the largest market share for pesticides, followed by fungicides and herbicides. Demand for insecticides is said to make up 65 per cent of the market. The primary reasons persuading farmers to buy pesticides are the influence of retail traders, business representatives, and on-farm demonstrations.

3.3 To analyze the factors influencing the brand choice and promotional approaches used by the Agri input companies

Quality, regular availability, affordability, accuracy in weighing and billing, variety of vegetables, and accessibility were listed by Ragavan (1994) as the variables

in the order of significance that had affected respondents' decisions to purchase vegetables from modern retail stores.

The importance of market segmentation for fertilizers, crops, soil, and other factors was emphasized by Biradar (1995) in his study on fertilizer marketing tactics. According to the author, retailers and dealers need to receive training on how to increase fertilizer sales. The other actions recommended include farmer training programs, a set of farming best practices, the opening of retail stores, intense farmer-focused market development initiatives, and portraying a positive image of the businesses by upholding high standards in business relations with farmers.

Wandel (1995) employed multivariate analysis to investigate the variables affecting Norwegian consumers' consumption of fruits and vegetables. Sex, age, income, and household composition were the characteristics that affected consumption. Additionally, it was noted that consumers who were health-conscious tended to consume more fruits and vegetables, whilst those who preferred quickly cooked food tended to consume fewer veggies.

Sharma (1997) came to the conclusion that consumers give greater weight to brand name and quality than to product price when making purchases. There was no disputing the higher price and superior quality of well-known brands.

In their research, *Biofertilizer Marketing: A Big Challenge*, Bhattacharrya and Paliwal (1998) examined the promotional strategies used for biofertilizer marketing. The author emphasized the necessity to provide credit, technical assistance, and biofertilizers to farmers at the district and taluk levels as well as to raise their awareness of the value of biofertilizers for the health of the soil and the development of crops. For boosting the sales of bio-fertilizer, the author proposed marketing strategies like radio, TV spots, press ads, hoardings, wall paints, roadside boards, cinema slides, film shows, puppet shows, bike rallies, street theatre, etc.

According to Padmanabhan (1998), the cost and effectiveness of agricultural inputs significantly affect consumers' brand loyalty. Because private dealers are the main source of plant protection, the client relied more on them. Additionally, the availability of credit facilities to customers at the dealer's point of sale has drawn them in and made them devoted to such dealers.

Regular consumers of organic food, also known as RCOF, were the focus of Cicia and Giudice's (2002) study, which took into account preference variability. To elicit preferences for significant qualitative and quantitative characteristics of extra virgin olive oil, a survey tool was created. In order to rank-order nine product profiles according to their personal preferences, each respondent had eight options. A product's qualities may include the cost, the country of origin, the certification type, and the way it looks. The results showed a strong preference for price and manufacturing origin heterogeneity. Additionally, it was discovered that price played a substantial impact in preference modelling as a quality proxy, although the visual appeal was not significant and the type of certification program had a fixed influence.

In their study on the use of pesticides in rainfed cotton, Birthal *et al.* (2003) found that farmers' education in pest control in particular and technology management, in general, would reduce the usage of pesticides. Farmers who were informed about pests, pest-predator interactions and behavior, and economic threshold levels of pests used pesticides more wisely.

In a study on shifting agri-input consumer behavior, Prasad and Rawal (2004) found that manufacturers of fast-moving consumer goods, durables, farm equipment, two-wheelers, and other products heavily promoted their wares due to changing rural lifestyles and rising disposable income. More than half of their overall revenue comes from rural markets. Today's rural consumer seeks value for their money. Young people are starting to acquire agricultural inputs as a result of increased media exposure and literacy levels. Understanding consumer behavior should be the primary goal of emerging marketing strategies, and value propositions should be developed accordingly.

According to Vincent (2006), quality is a significant aspect that influences consumer preference for branded goods. Branded goods were recognized as being of high quality. People don't mind spending more on branded goods since they feel like they are getting a good deal. A brand can be promoted and influenced significantly through the media. The family's purchasing habits are impacted by a child's demands. Children are very aware of branded goods and conscious of them. Customers would still prefer to buy a branded product even when unbranded products can occasionally provide the same satisfaction as branded products.

In Dindigul, Tamil Nadu, Venkateswaran *et al.* (2011) investigated the brand preferences of specific household brands. The study found that factors in the market, such as advertising, product quality, brand name, and image, are crucial in shaping consumers' propensity to favour a certain brand. Therefore, a market has to comprehend how consumers chose to buy a brand. Additionally, observed elements affect the consumer's decision to make a purchase.

Sunday and Christian (2013) studied that when a competitor brand is there, a consumer will pick that brand over the competing one, but if that brand is not available, they will accept alternatives. This behaviour is known as brand preference.

According to research by Terzi *et al.* (2021), farmers prefer agricultural credit cooperatives and dealers for the delivery of inputs, but they cooperate with traders to sell their produce. Additionally, it has been noted that there are not enough agricultural sales or development cooperatives in this region, which were set up to offer farmers cheap input.

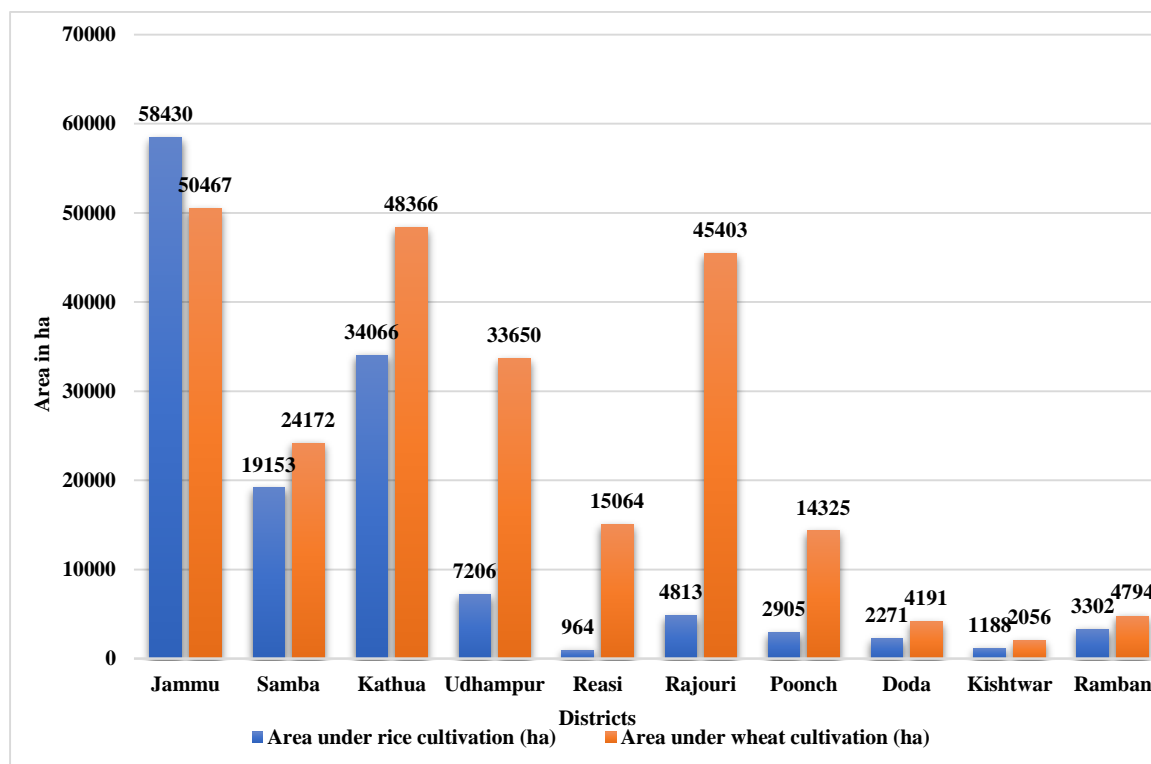
RESEARCH METHODOLOGY

4.1 Research methodology

A methodology is typically a set of instructions for conducting research that includes particular components such the location, task, tools, procedures, etc. In 2022–2023, the current study, named "A Study on the Consumption of Agricultural Inputs and Analysis of Market Share of Agri Input Companies for Cereal Crops in Jammu District" was conducted. This chapter has a description of the sample strategy and methods used during the inquiry.

4.2 Locale of the study

Based on the highest area under wheat and paddy cultivation in the Union territory of Jammu & Kashmir, the Jammu district study was selected purposively on the basis of the highest area under cultivation under wheat and paddy.

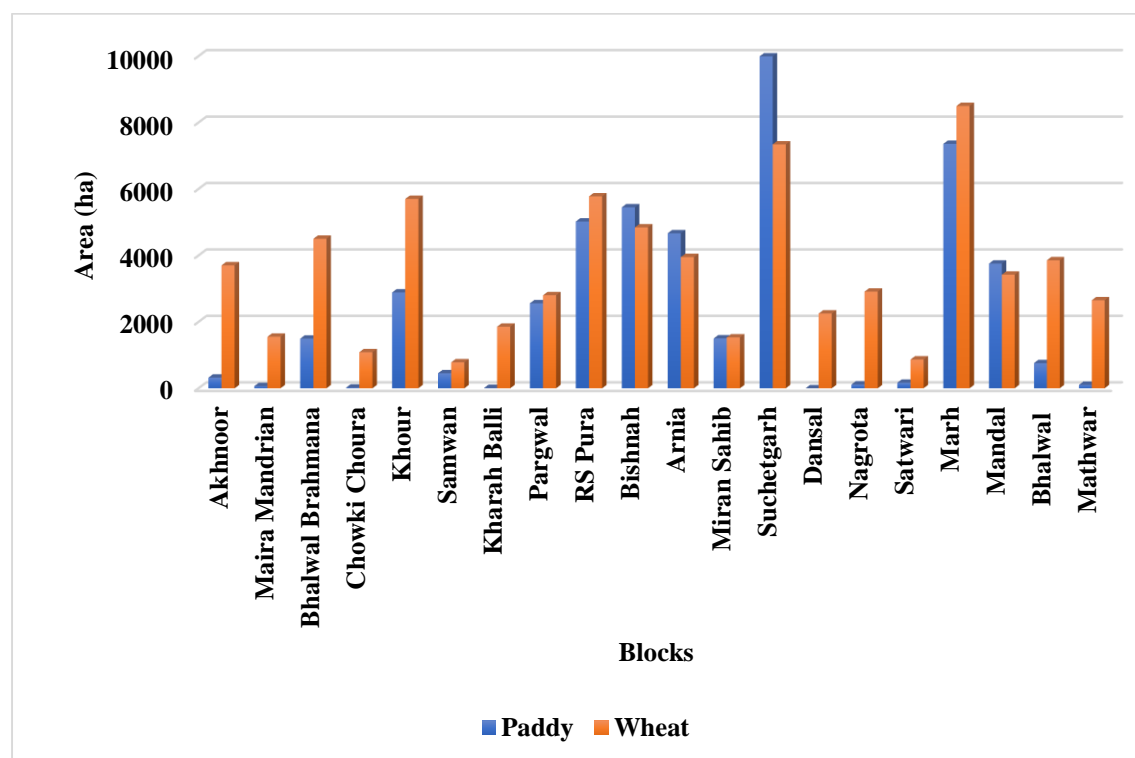


Source: Directorate OF Economics & Statistics, J&K

Figure 4.1 Area under cultivation of wheat and rice in the Jammu division (ha)

4.3 Sampling design

For this investigation, a multi-stage sampling technique was used. The Jammu district was chosen for the initial round of sampling because it has the most land planted in wheat and paddy. On the basis of the highest area under paddy and wheat cultivation, Marh and Suchetgarh blocks from the Jammu district were chosen for the second stage. In the third stage of sampling, 15 farmers from each village were randomly chosen, creating a sample of 60 farmers. Two villages from each block were randomly chosen to make a total of four villages. Ten distributors of fertiliser, pesticides, and seeds were chosen at random from the Jammu district in order to examine their market shares and marketing strategies. Five retailers from each of the two blocks of Marh and Suchetgarh were also chosen at random in order to examine the market shares and marketing strategies of these businesses.



Source: Department of Agriculture, J&K (2022)

Figure 4.2 Block-wise area under cultivation of wheat and paddy in Jammu district

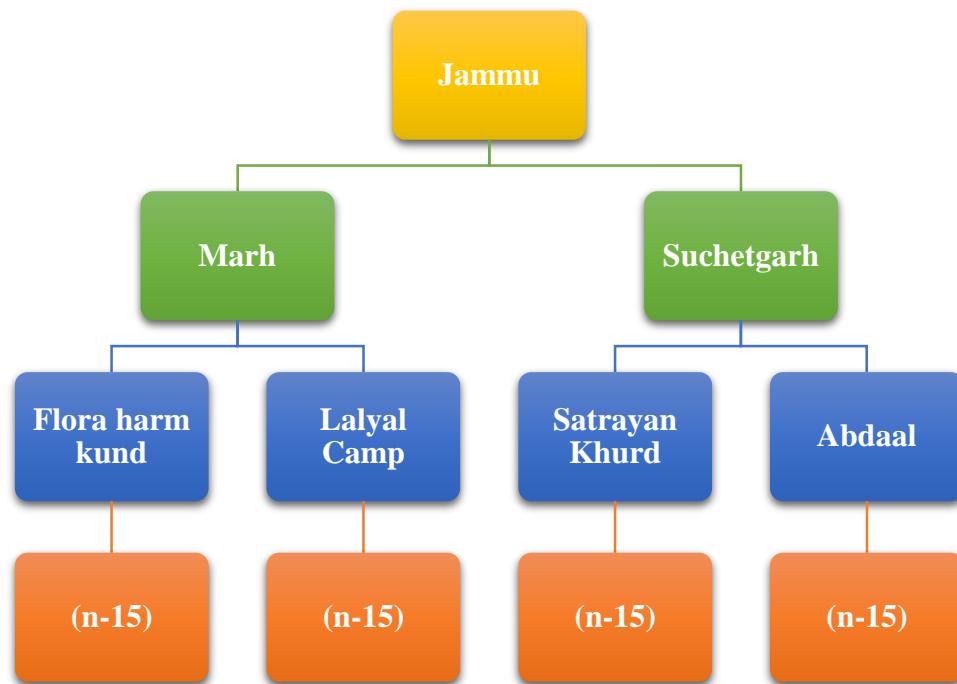


Figure 4.3 Sampling design

4.4 Collection of data

To achieve the study's goals, both primary and secondary data were gathered. With the aid of a designed and thoroughly tested schedule, the primary data was gathered using the survey method by interviewing paddy and wheat growers. The necessary secondary data was gathered from a variety of published sources and agencies, including FAO Stat, Digest of Statistics, Indiatat, Agricultural Statics at a Glance, and others.

4.5 Data analysis

It was based on the methodology for gathering data, and an appropriate economic and statistical tool was used to analyse the information in order to meet the goals of the study.

4.5.1 To observe the consumption pattern of agricultural inputs in Cereal crops

4.5.1.1 Compound annual growth rate (CAGR)

In order to determine the growth rate of the seeds, fertilisers, and pesticides, compound annual growth rate (CAGR) was utilised. Using the following formula.

$$\text{CAGR} = (\text{EV} / \text{SV})^{1 / n-1}$$

Where,

EV = End Value

SV = initial investment value

n = Number of investment times (months, years, etc.)

4.5.1.2 Tabular analysis

This method was utilised to determine the agri-input consumption in the paddy and wheat crops as well as to create a socio-demographic profile of farmers. Various statistical techniques were used to tabulate, compute, and analyse the data.

4.5.1.3 Model used for forecasting of consumption of agriculture inputs.

Equations	Regression model	Abbreviations
Linear	$y = \alpha + \beta x + \mu$	y = Seed/ Pesticide / Fertilizer consumption
Logarithmic	$y = \alpha + \beta \cdot (\ln(x)) + \mu$	
Quadratic	$y = \alpha + \beta_1 x^1 + \beta_2 x^2 + \mu$	x = The series values are modelled as a linear function of time. (Years)
Cubic	$y = \alpha + \beta_1 x^1 + \beta_2 x^2 + \beta_3 x^3 + \mu$	
Compound	$\ln(y) = \ln(\alpha) + (\ln(\beta))^x + \mu$	
Growth	$\ln(y) = \alpha + \beta^x + \mu$	$\beta = \text{coefficients of } x \text{ variables}$
Exponential	$\ln(y) = \ln(\alpha) + \beta^x + \mu$	$\alpha = \text{constant}$
		$\mu = \text{error term}$

The model was analysed using IBM SPSS 25 and the best model for estimation were selected based on R^2 , Significance and parameter estimation. The selected model was further used for forecasting the consumption of seed, pesticide, and fertilizer consumption till 2029-30.

4.5.2 To find out the market share of various brands of agricultural inputs in the Jammu district

4.5.2.1 Tabular analysis

The socio-demographics of retailers and distributors were also taken into consideration while using this method to analyse the market share of various agri input companies. Various statistical tools were used to tabulate, compute, and analyse the businesses that were present in the district.

4.5.3 To analyze the factors influencing the brand choice and promotional approaches used by the Agri input companies

4.5.3.1 Factor Analysis

The factors affecting farmers' brand preferences were identified using the factor analysis. The number of factors was extracted using factor analysis. After doing the Cronbach's alpha test for the factor analysis, the KMO and Bartlett's test was conducted.

A result greater than or equal to .50 is regarded acceptable (Nunnally, 1978). A two-stage factor analysis process is possible. Extraction was completed in the first stage, and the development of a rotated component matrix was completed in the second. The factor loading values in this matrix range from 0 to 1. High loading levels are represented by values close to 1; low loading values are represented by values close to 0. The factors with a loading weight of 0.60 and above were considered in the current contribution (Malhotra, N. 2016). To examine the factor for meaning analysis, the following equation was used.

$$F = W_1X_1 + W_2X_2 + \dots + W_k X_k$$

Where,

F= Estimate of factor

W_i= Weight/factor score coefficient

X_i= Standardized variable

K= No. of variables

4.5.4 Garret ranking technique:

Garret's ranking method was utilized to order the agri-input businesses' promotional strategies. The following formula was used to translate the respondents' orders of merit into ranks. As a result, using Garret's chart, these ranks were transformed into scores.

Garrett's formula for converting ranks into percent was given by

$$\text{Percent position} = 100 * (\text{R}_{ij} - 0.50) / N_j$$

Where,

R_{ij} = Rank given for ith factor by jth individual

N_j = Number of factors ranked by jth individual

Descriptive statistics, Pie charts, Bar charts, and other Statistical tools were adopted for analysis purposes.

RESULTS

The results pertaining to the present investigation, “**A Study on Consumption of Agricultural Inputs and Analysis of Market Share of Agri Input Companies for Cereal Crops in Jammu District**” have been presented in this chapter through appropriate tables and figures.

- 5.1** To observe the consumption pattern of agricultural inputs in Cereal crops
- 5.2** To find out the market share of various brands of agricultural inputs in the Jammu district
- 5.3** To analyze the factors influencing the brand choice and promotional approaches used by the Agri input companies

5.1 To observe the consumption pattern of agricultural inputs in Cereal crop**5.1.1 Crop-wise Distribution of Certified Cereals. Quality Seeds in India**

The distribution of certified cereal quality seeds across various crops in India is illustrated in Table 5.1. Notably, the data underscores a consistent upward trajectory in the adoption of quality/certified seeds throughout the duration of the study period. Over this span, the Compound Annual Growth Rate (CAGR) has been calculated at 5.71%. This growth signifies a remarkable ascent from 35.27 lakh/quintal in 1986–1987 to a substantial 246.00 lakh/quintal in the agricultural year 2020–21.

Delving further into the 35-year time frame, the most remarkable surge occurred in the year 2006–2007, showcasing an exceptional CAGR of 26.68%. This particular year stands out as a pinnacle of growth. On the contrary, the agricultural year 2018–2019 marked the period of least advancement, even exhibiting a negative growth rate with a CAGR of –13.08%.

To encapsulate, the data reveals a robust inclination towards the utilization of quality-certified seeds across diverse cereal crops in India. This trend has characterized by an impressive CAGR of 5.71% over the studied duration, culminating in a substantial increase from 35.27 lakh/quintal in 1986–1987 to 246.00 lakh/quintal in 2020–21. The most remarkable surge occurred in 2006–2007, reflecting a noteworthy

CAGR of 26.68%, whereas the least progressive phase was observed in 2018–2019, marked by a negative growth rate of –13.08%.

Table 5.1. Crop-wise Distribution of Certified Cereals Quality Seeds in India

Year	*Cereals/lakh quintal	CAGR %
1986-1987	35.27	
1987-1988	35.44	0.48
1988-1989	33.94	-4.23
1989-1990	34.82	2.59
1990-1991	34.70	-0.34
1991-1992	35.35	1.87
1992-1993	36.72	3.88
1993-1994	38.74	5.50
1994-1995	41.35	6.74
1995-1996	44.03	6.48
1996-1997	46.43	5.45
1997-1998	51.78	11.52
1998-1999	57.27	10.60
1999-2000	61.14	6.76
2000-2001	59.47	-2.73
2001-2002	65.56	10.24
2002-2003	66.97	2.15
2003-2004	70.82	5.75
2004-2005	81.41	14.95
2005-2006	86.73	6.53
2006-2007	109.87	26.68
2007-2008	123.80	12.68
2008-2009	147.43	19.09
2009-2010	165.15	12.02
2010-2011	182.62	10.58
2011-2012	189.69	3.87
2012-2013	204.37	7.74
2013-2014	183.03	-10.44
2014-2015	203.20	11.02
2015-2016	194.95	-4.06
2016-2017	229.11	17.52
2017-2018	238.00	3.88
2018-2019	206.87	-13.08
2019-2020	229.98	11.17
2020-2021	246.00	6.97
	Overall CAGR	5.71

*Source – Indiastat (2023)

5.1.2 Consumption status of Urea, DAP (Di-ammonium Phosphate) and MOP (Muriate of Potash) in India

The utilization trends of three key fertilizers-Urea, DAP (Di-ammonium Phosphate), and MOP (Muriate of Potash) in India is meticulously documented in Table 5.2. The data revealed a consistent upward trajectory in the usage of these fertilizers over the entire study period. Notably, Urea, the most widely used fertilizer, experienced a noteworthy surge from 202.78 lakh tonnes in the year 1999–2000 to an impressive 341.73 lakh tonnes in the year 2021–2022. This remarkable growth translates to a Compound Annual Growth Rate (CAGR) of 2.30% across the 23-year span. It has observed that the year 2006–2007 marked an exceptional upswing for Urea at CAGR of 11.30%, while 2002–2003 saw a more subdued expansion at a sluggish rate of -7.15% CAGR.

Turning our attention to DAP, the consumption figures surged from 69.37 lakh tonnes in 1999–2000 to a substantial 92.64 lakh tonnes in 2021–2022, indicating a CAGR of 1.27% throughout the 23-year duration. Notably, the most substantial expansion for DAP was observed during 2008–2009, with an impressive CAGR of 31.09%. The year 2021–2022 displayed a striking disparity, with a negative CAGR of -22.27%, suggesting a significant decline in consumption.

Similarly, MOP, a crucial fertilizer for enhancing soil potassium levels, displayed a gradual but consistent rise in utilization. Over the 23-year time frame, MOP usage grew from 20.49 lakh tonnes in 1999–2000 to 23.93 lakh tonnes in 2021–2022, reflecting a CAGR of 0.68%. Impressively, the most substantial growth for MOP occurred during 2008–2009, registering a remarkable CAGR of 46.45%. However, the dynamics shifted notably in the year 2021–2022, as MOP saw a negative CAGR of -30.27%, signifying a significant contraction in consumption during that specific period.

In summary, the data underscores a consistent overall growth in the consumption of Urea, DAP, and MOP fertilizers in India, although with fluctuations in growth rates over the years. The varied growth rates revealed distinct phases of expansion and moderation, with some years even experienced negative growth, highlighted the influence of diverse factors on fertilizer consumption patterns.

Table 5.2. Consumption status of Urea, DAP and MOP in India (in lakh tonnes)

Year	*Urea	CAGR %	*DAP	CAGR %	*MOP	CAGR %
1999-2000	202.78		69.37		20.49	
2000-2001	191.86	-5.39	58.84	-15.18	18.29	-10.74
2001-2002	199.17	3.81	61.81	5.05	19.93	8.97
2002-2003	184.93	-7.15	54.73	-11.45	19.12	-4.06
2003-2004	197.67	6.89	56.24	2.76	18.41	-3.71
2004-2005	206.65	4.54	62.56	11.24	24.06	30.69
2005-2006	220.00	6.46	65.00	3.90	27.00	12.22
2006-2007	244.85	11.30	69.24	6.52	23.93	-11.37
2007-2008	261.67	6.87	75.55	9.11	27.92	16.67
2008-2009	266.47	1.83	99.04	31.09	40.89	46.45
2009-2010	264.48	-0.75	103.92	4.93	46.74	14.31
2010-2011	282.23	6.71	112.87	8.61	38.91	-16.75
2011-2012	294.77	4.44	111.95	-0.82	29.22	-24.90
2012-2013	300.02	1.78	91.54	-18.23	22.11	-24.33
2013-2014	306.00	1.99	73.57	-19.63	22.80	3.12
2014-2015	306.10	0.03	76.26	3.66	28.53	25.13
2015-2016	306.35	0.08	91.07	19.42	24.67	-13.53
2016-2017	296.14	-3.33	89.64	-1.57	28.63	16.05
2017-2018	298.94	0.95	92.94	3.68	31.58	10.30
2018-2019	313.98	5.03	92.08	-0.93	29.53	-6.49
2019-2020	336.96	7.32	101.01	9.70	27.80	-5.86
2020-2021	350.51	4.02	119.18	17.99	34.32	23.45
2021-2022	341.73	-2.50	92.64	-22.27	23.93	-30.27
	Overall CAGR	2.30	Overall CAGR	1.27	Overall CAGR	0.68

*Source- Indiastat (2023)

5.1.3 Consumption status of NPK fertilizer in India

The utilization patterns of NPK (Nitrogen, Phosphorus, and Potassium) fertilizer in India, as presented in Table 5.3, depicted a consistent upward trajectory in its application throughout the study duration. Over the span of 34 years, the consumption of NPK fertilizer experienced a substantial surge, escalating from 9617.60 thousand tonnes during the period of 1986–1987 to a noteworthy 28969.60 thousand tonnes in the span of 2019–2020. This growth is underpinned by a Compound Annual Growth Rate (CAGR) of 3.30%. Of particular significance is the year 1988–1989, which stands out as a pinnacle of expansion, exhibited an impressive CAGR of 29.03%.

In contrast, the year 1987–1988, reflected the least growth or rather a contraction, characterized by a negative CAGR of -13.26%.

This data underscored a steady and significant upward trend in the adoption of NPK fertilizer over the decades, highlighted its increasing importance in agricultural practices in India. The pronounced surge in 1988–1989 suggested a period of increased agricultural activity or a shift in farming practices that led to a substantial surge in NPK fertilizer consumption. Conversely, the negative growth witnessed in 1987–1988 could potentially be attributed to various factors, such as unfavourable weather conditions, market dynamics, or shifts in agricultural policies, all of which could have contributed to the decline in fertilizer utilization during that particular year.

Overall, the data provided insights into the dynamic relationship between NPK fertilizer consumption and broader agricultural trends in India, revealed both notable growth periods and occasional setbacks that had shaped the country's agricultural landscape over the examined 34-year timeframe.

Table 5.3. Consumption status of NPK fertilizer in India (in 000' tonnes)

Year	*NPK	CAGR %
1986-1987	9617.60	
1987-1988	8342.70	-13.26
1988-1989	10765.00	29.03
1989-1990	11314.30	5.10
1990-1991	12018.00	6.22
1991-1992	12728.09	5.91
1992-1993	12154.41	-4.51
1993-1994	12385.27	1.90
1994-1995	13563.67	9.51
1995-1996	13876.24	2.30
1996-1997	14338.04	3.33
1997-1998	16187.99	12.90
1998-1999	16797.50	3.77
1999-2000	18056.73	7.50
2000-2001	16702.30	-7.50
2001-2002	17344.31	3.84
2002-2003	16095.99	-7.20

2003-2004	16807.21	4.42
2004-2005	18406.67	9.52
2005-2006	20347.38	10.54
2006-2007	21642.12	6.36
2007-2008	22571.11	4.29
2008-2009	24228.44	7.34
2009-2010	26445.53	9.15
2010-2011	28110.24	6.29
2011-2012	28373.69	0.94
2012-2013	25536.10	-10.00
2013-2014	24482.50	-4.13
2014-2015	25581.40	4.49
2015-2016	26752.60	4.58
2016-2017	25949.10	-3.00
2017-2018	26590.90	2.47
2018-2019	27375.20	2.95
2019-2020	28969.60	5.82
	Overall CAGR	3.30

*Source- FAO Stat, 2023

5.1.4 Consumption of technical grade pesticide in India

The data presented in Table 5.4 highlighted the consumption pattern of technical-grade pesticides in India. Over the span of 35 years, a consistent upward trajectory in pesticide consumption was evident. This growth was quantified by a Compound Annual Growth Rate (CAGR) of 0.49%. This metric serves as a reflection of the annual average rate at which the consumption of technical-grade insecticides increased.

To provide a clearer picture, the consumption of technical-grade insecticides commenced at 52.00 thousand tonnes during the period of 1985-1986 and steadily rose to reach 61.70 thousand tonnes in the year 2019-2020. It was noteworthy that during this duration, various fluctuations in growth rates were observed. Among these fluctuations, the most remarkable occurred in the year 1987-1988, witnessing an exceptional surge with a CAGR of 33.8%. On the contrary, the year 2003-2004 exhibited the lowest growth rate, even dipping into negative territory with a CAGR of -15.1%.

Table 5.4. Consumption of technical grade pesticide in India

Years	*(In '000 Tonne)	CAGR %
1985-1986	52.00	
1986-1987	50.00	-3.85
1987-1988	66.90	33.80
1988-1989	75.89	13.44
1989-1990	72.00	-5.13
1990-1991	75.00	4.17
1991-1992	72.13	-3.83
1992-1993	70.79	-1.86
1993-1994	63.65	-10.09
1994-1995	61.36	-3.60
1995-1996	61.26	-0.16
1996-1997	56.11	-8.41
1997-1998	52.24	-6.90
1998-1999	49.16	-5.90
1999-2000	46.20	-6.02
2000-2001	43.58	-5.67
2001-2002	47.02	7.89
2002-2003	48.35	2.83
2003-2004	41.02	-15.16
2004-2005	40.67	-0.85
2005-2006	39.77	-2.21
2006-2007	43.41	9.15
2007-2008	41.64	-4.08
2008-2009	43.86	5.33
2009-2010	41.82	-4.65
2010-2011	55.54	32.81
2011-2012	52.98	-4.61
2012-2013	45.62	-13.89
2013-2014	60.28	32.14
2014-2015	56.27	-6.65

2015-2016	56.72	0.80
2016-2017	58.63	3.37
2017-2018	63.41	8.15
2018-2019	59.67	-5.90
2019-2020	61.70	3.40
	Overall CAGR	0.49

*Source- India stat, 2023

5.1.5 Consumption of NPK fertilizer in Jammu & Kashmir

The utilization of NPK (Nitrogen, Phosphorus, and Potassium) fertilizer in the region of Jammu & Kashmir has been meticulously documented in Table 5.5. Notably, there has been an upward trend in the application of NPK fertilizer throughout the duration of the study. Commenced at a quantity of 75.23 thousand tonnes in the initial period of 2004–2005, the usage of NPK fertilizer has witnessed an increment, reached an impressive 120.07 thousand tonnes by the conclusion of the 18-year analysis period. This translates to a Compound Annual Growth Rate (CAGR) of 2.63%, which signifies a consistent and positive escalation over time.

Noteworthy among the years under scrutiny has the notable contrast between the periods of 2020–2021 and 2021–2022. In the former period (2020–2021), there was a remarkable surge in NPK fertilizer consumption, as evidenced by an extraordinary CAGR of 128.94%. This substantial growth can be attributed to various factors such as changes in agricultural practices, technological advancements, and economic dynamics. Conversely, the subsequent year (2021–2022) displayed a contrasting trend. The employment of NPK fertilizer during this timeframe witnessed a noteworthy decrease, leading to a negative CAGR of -33.48%.

Table 5.5. Consumption of NPK fertilizer in Jammu & Kashmir (000' tonnes)

Year	*NPK	CAGR %
2004-2005	75.23	
2005-2006	92.26	22.64
2006-2007	86.03	-6.75
2007-2008	78.24	-9.05
2008-2009	105.1	34.33
2009-2010	111.67	6.25
2010-2011	121.27	8.60

2011-2012	100.07	-17.48
2012-2013	109.68	9.60
2013-2014	103.41	-5.72
2014-2015	110.07	6.44
2015-2016	122.25	11.07
2016-2017	116.66	-4.57
2017-2018	134.68	15.45
2018-2019	108.47	-19.46
2019-2020	78.84	-27.32
2020-2021	180.5	128.94
2021-2022	120.07	-33.48
	Overall CAGR	2.63

*Source- Agricultural stat at a glance, 2022

5.1.6 Consumption of technical grade pesticides in Jammu & Kashmir

The utilization of technical-grade pesticides in the region of Jammu & Kashmir is meticulously detailed in Table 5.6. The data presented in this table unmistakably illustrated a consistent upward trajectory in pesticide consumption throughout the duration of the study period. Notably, the quantity of pesticide consumed surged from 1921 metric tonnes during both the years 2014–2015 and 2021–2022, to a notably higher 4086 metric tonnes during 2021–2022. This remarkable increase reflected a Compound Annual Growth Rate (CAGR) of 9.89% over the span of eight years, underscoring the intensifying reliance on these pesticides. Of particular significance were the years 2020–2021 and 2019-2020, which stand out due to their distinctive growth rates. The year 2020–2021 experienced an extraordinary CAGR of 52.50%, signified a period of exceptionally rapid expansion in pesticide consumption. On the other hand, the year 2019-2020 witnessed a CAGR of -10.61%, indicated a contraction in consumption during that particular span.

Table 5.6. Consumption of technical grade pesticides in Jammu & Kashmir

Years	*(Quantity in MT Tech. Grade)	CAGR %
2014- 2015	1921	
2015- 2016	2252	17.23
2016- 2017	2188	-2.84
2017- 2018	2430	11.06
2018- 2019	2459	1.19
2019-2020	2198	-10.61

2020-2021	3352	52.50
2021-2022	4086	21.90
	Total	9.89

*Source- India stat, 2023

5.1.7 Model Summary and Parameter Estimates for Seed

Table 5.7 presents the results of the analysis conducted on the Seed dataset using a total of 7 different equations to model the relationship. The aim was to determine the most appropriate mathematical model for the dataset. The evaluation involved examining various model summaries and parameter estimates. The coefficient of determination (R-squared) was utilized to gauge the goodness of fit for each model. The R-squared values quantify the proportion of the variance in the dependent variable that can be explained by the independent variables in the model. The results indicated that the Linear model achieved an R-squared value of 0.893, implying that approximately 89.3% of the variance in the dependent variable was explained by the linear relationship between the variables. The Logarithmic model yielded an R-squared of 0.595, signifying that around 59.5% of the variance was explained by the logarithmic relationship. Furthermore, the Quadratic model exhibited a high R-squared value of 0.954, suggested that approximately 95.4% of the variance could be explained by the quadratic relationship. The Cubic model outperformed the others with an R-squared of 0.969 and indicated that approximately 96.9% of the variance was accounted for by the cubic relationship.

In addition, the Compound, Growth, and Exponential models all demonstrated an R-squared of 0.958, implying that around 95.8% of the variance was explained by their respective relationships. Based on the R-squared values, it was observed that the Cubic model achieved the highest R-squared, indicating the highest degree of variance explanation among all the models evaluated. Therefore, the Cubic model was considered the most suitable choice for representing the relationship within the Seed dataset. This decision was grounded in the model's ability to best capture the underlying patterns in the data, leading to the highest level of explanatory power among the tested equations.

Table 5.7. Model Summary and Parameter Estimates for Seed

Model Summary and Parameter Estimates									
Dependent Variable: SEED									
Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.893	268.200	1	32	.000	-14.511	6.923		
Logarithmic	.595	47.048	1	32	.000	-63.670	65.373		
Quadratic	.954	322.132	2	31	.000	28.728	-.283	.206	
Cubic	.969	313.938	3	30	.000	56.551	-9.184	.833	-.012
Compound	.958	722.219	1	32	.000	24.343	1.073		
Growth	.958	722.219	1	32	.000	3.192	.071		
Exponential	.958	722.219	1	32	.000	24.343	.071		

The equation for the cubic model

$$Y (\text{SEED}) = 56.55149624805966 + -9.184047712893817 * x + 0.8325518386002268 * x*x + -0.01193617511335728 * x*x*x$$

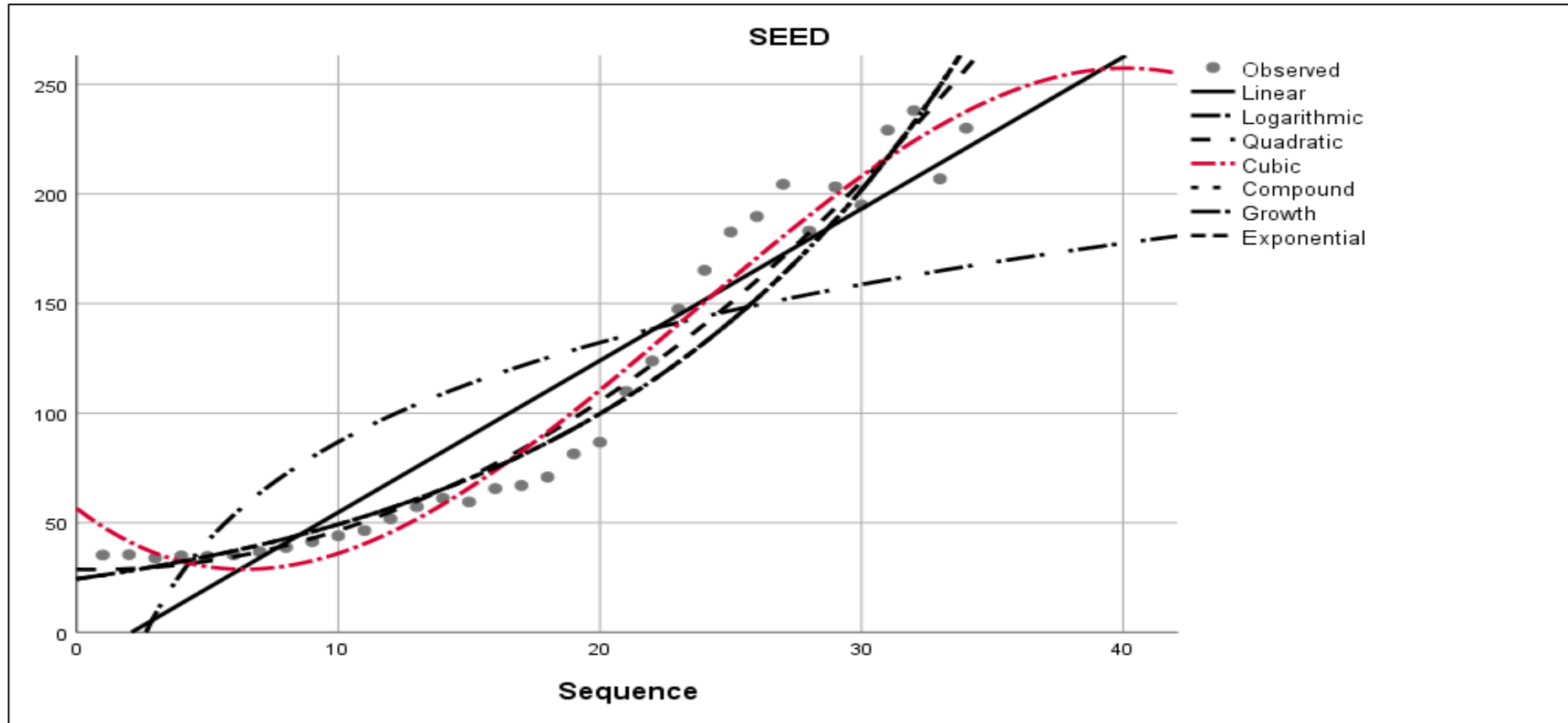


Figure 5.1 Model Summary and Parameter Estimates for Seed

5.1.8 Model Summary and Parameter Estimates for Pesticide

The model summary and parameter estimate for pesticides in Table 5.8 were constructed employing a set of seven distinct equations. These equations were utilized to assess the relationship between the pesticide variable and other relevant factors. The coefficient of determination (R squared) was employed as a measure to evaluate the goodness of fit for each equation. The R squared values for different equation types were as follows: linear ($R^2 = 0.132$), logarithmic ($R^2 = 0.207$), quadratic ($R^2 = 0.582$), cubic ($R^2 = 0.665$), compound ($R^2 = 0.109$), growth ($R^2 = 0.109$), and exponential ($R^2 = 0.109$). Upon examining these R-squared values, it becomes evident that the cubic equation demonstrated the highest value of 0.665, indicating a stronger fit between the model and the data compared to the other equation types. This suggests that the cubic model provided the best representation of the pesticide data, capturing the underlying patterns and variability more effectively. In summary, the study explored various equation types to establish a relationship between pesticide and associated factors. The R squared values were utilized to gauge the goodness of fit for each equation, and based on these values, the cubic equation emerged as the most suitable model due to its highest R squared value of 0.665, signifying its superior fit to the data compared to other equation forms.

Table 5.8. Model Summary and Parameter Estimates for Pesticide

Model Summary and Parameter Estimates									
Dependent Variable: Pesticide									
Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.132	4.867	1	32	.035	62.048	-.395		
Logarithmic	.207	8.333	1	32	.007	70.027	-5.715		
Quadratic	.582	21.566	2	31	.000	79.516	-3.306	.083	
Cubic	.665	19.839	3	30	.000	69.814	-.203	-.135	.004
Compound	.109	3.903	1	32	.057	60.626	.994		
Growth	.109	3.903	1	32	.057	4.105	-.006		
Exponential	.109	3.903	1	32	.057	60.626	-.006		

The equation for the cubic model

$$Y (\text{Pesticide}) = 69.81419376401605 + -0.2025627492219642 * x + -0.1353313488548264 * x*x + 0.004162140405024569 * x*x*x$$

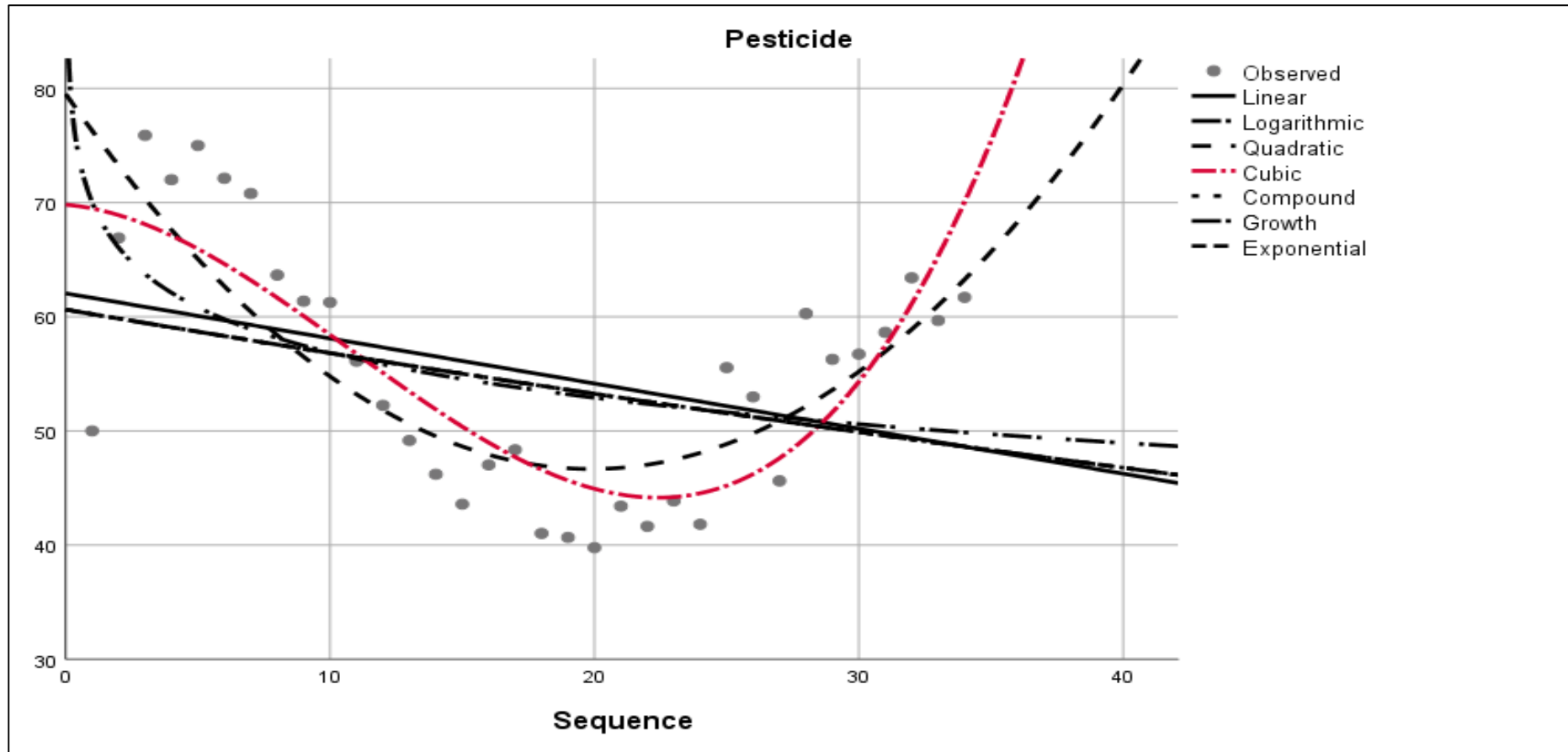


Figure 5.2 Model Summary and Parameter Estimates for Pesticide

5.1.9 Model Summary and Parameter Estimates for Fertilizers

The Table 5.9, outlined a comprehensive analysis of the Fertilizer dataset, employing a total of seven distinct equations to model. This examination encompassed the presentation of model summaries and parameter estimates. The evaluation of the models was primarily centered around the R-squared values, which served as indicators of how well the respective models fit the data. The R-squared values associated with each model were followed to be: 0.938 for the Linear model, 0.783 for the Logarithmic model, 0.938 for the Quadratic model, 0.948 for the Cubic model, 0.935 for both the Compound and Growth models, and 0.935 for the Exponential model. Given that the primary objective has to identify the model that best captures the relationship within the Fertilizer dataset, the focus shifted to the model with the highest R-squared value. In this context, the Cubic model emerged as the most appropriate option due to its R-squared value of 0.948, which indicated an exceptional degree of fit between the model and the actual data points. In essence, the analysis of the Fertilizer dataset involved a meticulous comparison of multiple models, each characterized by a unique mathematical equation. The R-squared values played a crucial role in this evaluation, guiding the selection of the model that optimally described the dataset's underlying patterns. In this particular case, the Cubic model stands out as the most fitted choice, accurately represented the intricate relationships present within the dataset and demonstrated its efficacy through its high R-squared value.

Table 5.9. Model Summary and Parameter Estimates for Fertilizers

Model Summary and Parameter Estimates									
Dependent Variable: Fertilizer									
Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.938	484.480	1	32	.000	8260.079	621.202		
Logarithmic	.783	115.585	1	32	.000	2023.354	6566.476		
Quadratic	.938	236.120	2	31	.000	7969.701	669.599	-1.383	
Cubic	.948	181.745	3	30	.000	9900.888	51.801	42.112	-.828
Compound	.935	463.988	1	32	.000	9828.816	1.035		
Growth	.935	463.988	1	32	.000	9.193	.035		
Exponential	.935	463.988	1	32	.000	9828.816	.035		

The equation for the cubic model

$$Y = 9900.88768371562 + 51.80091194906125 * x + 42.11245012842048 * x*x + -0.828480118250002 * x*x*x$$

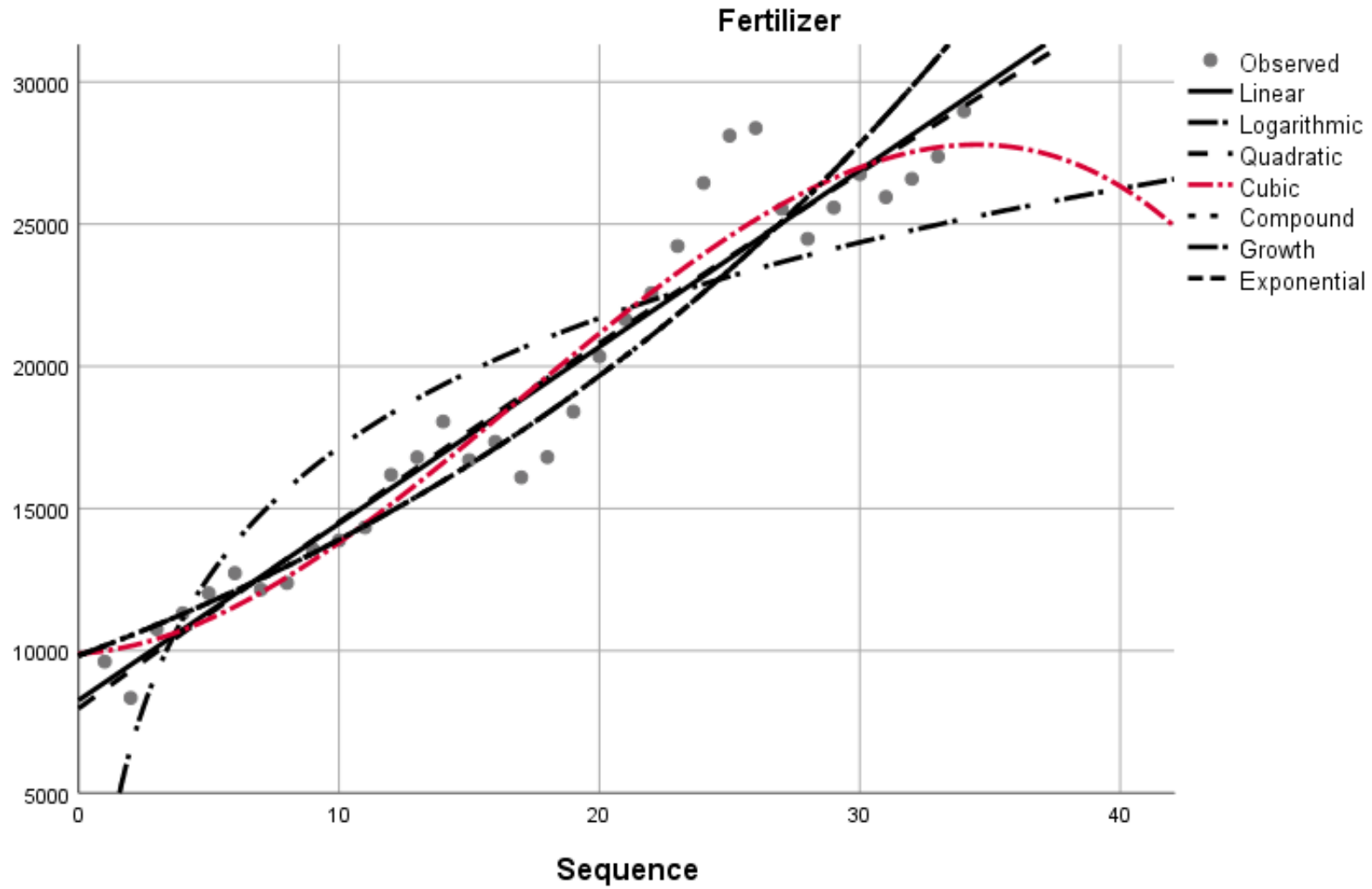


Figure 5.3 Model Summary and Parameter Estimates for Fertilizers

5.1.10 Forecasting of distribution of certified cereal quality Seed, Consumption Pesticide and Fertilizer in India

Forecasting the distribution of certified cereal quality seeds, pesticide consumption, and fertilizer usage in India is shown in table 5.10. A comprehensive analysis was conducted utilizing secondary data spanning from the years 1986-1987 to 2019-2020, encompassing a substantial time frame of 34 years. The primary objective was to project future trends in these key agricultural metrics for a period of 10 years, specifically from 2020-2021 to 2029-2030. To achieve this, the most suitable forecasting model, the Cubic model, was employed for each of the aforementioned variables. The application of the Cubic model allowed for a robust estimation of the future trends in certified cereal quality seed distribution, pesticide consumption, and fertilizer utilization. These projections had yielded noteworthy insights for the years 2025-26 and 2029-2030. According to the forecasts, in the agricultural year 2025-26, the anticipated distribution of certified cereal quality seeds is expected to reach an estimated 257.36 lakh quintals. Simultaneously, the projected pesticide consumption is forecasted to be around 111.56 thousand tonnes. Additionally, the anticipated usage of NPK fertilizer during this period is expected to amount to 26330.12 thousand tonnes. Further into the future, in the agricultural year 2029-2030, the forecasted figures indicate a cereal certified quality seed distribution of approximately 247.50 lakh quintals. The projected pesticide consumption is estimated to be around 153.45 thousand tonnes, while the expected usage of fertilizer, specifically NPK fertilizer, is projected to be 23136.58 thousand tonnes. These meticulously calculated forecasts are a testament to the efficacy of the employed Cubic model in predicting the trajectory of certified cereal quality seed distribution, pesticide consumption, and fertilizer usage in India.

Table 5.10. Forecasting distribution of certified cereal quality Seeds, Consumption of Pesticide & Fertilizer in India

Years	Seed Cereals/lakh quintal	Pesticide 000'tonnes	Fertilizer NPK 000' tonnes
2020-21	243.22	75.40	27780.59
2021-22	248.02	81.32	27689.89
2022-23	251.90	87.88	27504.46
2023-24	254.80	95.08	27219.34
2024-25	256.64	102.97	26829.55
2025-26	257.36	111.56	26330.12
2026-27	256.87	120.88	25716.08
2027-28	255.12	130.95	24982.45
2028-29	252.02	141.80	24124.28
2029-30	247.50	153.45	23136.58

5.1.11 Socio-demographic profile of farmers

The participants' socio-demographic characteristics, as depicted in Table 5.11 and Figure 5.4, provided valuable insights. Notably, a significant portion of the farmers, accounted for 41.67%, fell within the age bracket of 50 to 60 years. This suggested a representation of middle-aged individuals within the farming community. Moreover, the data indicated that a considerable majority, constituted 65.00%, of these farmers belong to households with 0–5 family members, highlighted the prevalence of relatively smaller family units among this group. In terms of farming experience, approximately 30% of the surveyed farmers had accumulated a tenure of 30-40 years in the agricultural domain. This extended period of engagement underscored the depth of expertise that a considerable segment of the participants possessed. An interesting observation emerged regarding family structure, as 55% of the farmers were identified as members of nuclear families. This could potentially indicate a prevailing trend towards smaller family setups and a shift away from extended family arrangements within the farming population. When considering educational attainment, the data revealed that 31.67% of the farmers have reached the metric level of education. This aspect sheds light on the

educational background of the participants and suggested a mix of educational levels within the farming community.

Table 5.11. Socio-demographic profile of farmers

Age of Respondents						
Age group	Suchetgarh (n-30)	%	Marh (n-30)	%	Jammu (n-60)	%
20-30	0	0.00	3	10.00	3	5.00
30-40	1	3.33	2	6.67	3	5.00
40-50	3	10.00	6	20.00	9	15.00
50-60	17	56.67	8	26.67	25	41.67
more than 60	9	30.00	11	36.67	20	33.33
Total	30	100.00	30	100.00	60	100.00
No of a family member						
Members	Suchetgarh (n-30)	%	Marh (n-30)	%	Jammu (n-60)	%
0-5 members	22	73.33	17	56.67	39	65.00
5-10 members	7	23.33	10	33.33	17	28.33
10-15 members	1	3.33	3	10.00	4	6.67
Total	30	100.00	30	100.00	60	100.00
Year of Farming experience						
Years	Suchetgarh (n-30)	%	Marh (n-30)	%	Jammu (n-60)	%
Less than 10	0	0.00	2	6.67	2	3.33
10-20 years	3	10.00	5	16.67	8	13.33
20-30 years	8	26.67	8	26.67	16	26.67
30-40 years	11	36.67	7	23.33	18	30.00
more than 40 years	8	26.67	8	26.67	16	26.67
Total	30	100.00	30	100.00	60	100.00
Family Composition						
Composition	Suchetgarh (n-30)	%	Marh (n-30)	%	Jammu (n-60)	%
Nuclear	19	63.33	14	46.67	33	55
Joint	11	36.67	16	53.33	27	45
Total	30	100.00	30	100.00	60	100
Education						
Education status	Suchetgarh (n-30)	%	Marh (n-30)	%	Jammu (n-60)	%
No education	1	3.33	7	23.33	8	13.33
Primary	3	10.00	0	0.00	3	5.00
Middle	14	46.67	15	50.00	29	48.33
Matric	11	36.67	8	26.67	19	31.67
10+2	1	3.33	0	0	1	1.67
Total	30	100.00	30	100.00	60	100.00

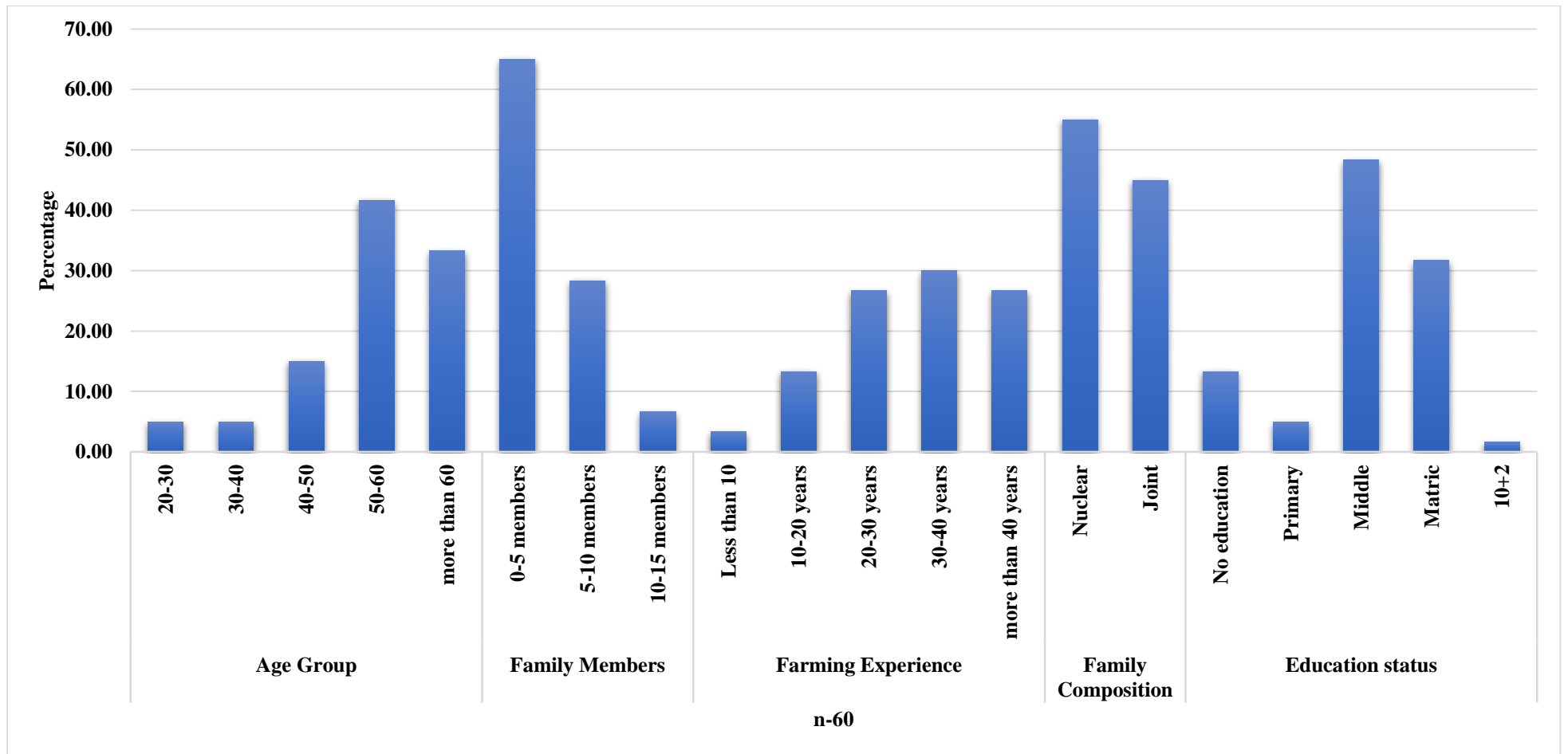


Figure 5.4 Socio-Demographic profile of the farmers of Jammu district

5.1.12 Consumption of Agri inputs in the cultivation of Wheat

The utilization of agricultural inputs for wheat cultivation is detailed in Table 5.12. The analysis revealed noteworthy pattern in input consumption across different blocks in Jammu district. Specifically, the seed consumption for wheat cultivation differed across blocks, with Suchetgarh block utilized 90.66 kg/ha and Marh block employed 105 kg/ha. The district-wise average seed consumption settled at 97.92 kg/ha, with a corresponding seed cost of Rs 2154.13/ha. Moving on to organic inputs, farmyard manure (FYM) was utilized at varying rates across blocks. In Suchetgarh block, FYM consumption stood at 13.35 quintal/ha, while Marh block used 14.69 quintal/ha. The district-wise average FYM consumption was 14.02 quintal/ha. The cost of FYM was recorded at Rs 1465.04 per hectare. However, it's worth noting that only 60% of farmers incorporated FYM into their farming practices. Turning to fertilizers, the consumption of urea fertilizer exhibited slight variations between blocks. Suchetgarh block recorded a consumption of 103.05 kg/ha, while Marh block utilized 107.61 kg/ha. The overall average consumption of urea settled at 105.33 kg/ha, incurring an average cost of Rs 652.02/ha. Similarly, the consumption of DAP fertilizer varied slightly, with Suchetgarh and Marh blocks using 99.08 kg/ha and 101.99 kg/ha. The district-wise average consumption was 100.53 kg/ha, at an average cost of Rs 2645.36/ha. Furthermore, the use of MOP fertilizer was relatively limited, with consumption in Suchetgarh and Marh blocks at 51.19 kg/ha and 50.46 kg/ha, respectively. The average consumption for the Jammu district was 50.83 kg/ha, albeit with a low adoption rate of only 16.66% among farmers. The average cost of MOP was Rs 1075.44/ha. In terms of herbicides, both pre-emergence and post-emergence were employed uniformly across blocks. The consumption of pre-emergence herbicides was consistently 4.24 litres/ha for both Suchetgarh and Marh blocks. This trend persisted across the district, with an average consumption of 4.24 litres/ha. The cost of pre-emergence herbicides was Rs 1908.00/ha. Post-emergence herbicide consumption mirrored this pattern, remained at 0.40 litres/ha for both blocks and across the district as a whole. The cost of post-emergence herbicides was Rs 1250.00/ha, though its adoption rate was higher, standing at 31.66% among farmers. These inputs collectively contributed to the overall wheat yield. The Suchetgarh block attained a yield of 28.80 quintal/ha, while Marh block achieved 23.81 quintal/ha. The average wheat yield for the entire Jammu district was 26.98 quintal/ha. This yielded a substantial income, with the yield valued at Rs 66014.84 per hectare.

Table 5.12. Consumption of Agri inputs in the cultivation of Wheat

Inputs	Units	Suchetgarh (n=30)		Marh (n=30)		Over all Jammu (n=60)	
		Consumer percentage	Average Consumption/Yield	Consumer percentage	Average Consumption/Yield	Consumer percentage	Average Consumption
Seed	Kg/ha	100.00	90.66	100.00	105.17	100.00	97.92
	Rs/ha		1994.52		2313.74		2154.13
FYM	Quintal/ha	83.33	13.35	36.67	14.69	60.00	14.02
	Rs/ha		1393.59		1536.49		1465.04
Urea	Kg/ha	100.00	103.05	100.00	107.61	100.00	105.33
	Rs/ha		635.92		668.13		652.02
DAP	Kg/ha	100.00	99.08	100.00	101.99	100.00	100.53
	Rs/ha		2685.56		2605.16		2645.36
MOP	Kg/ha	20.00	51.19	13.33	50.46	16.66	50.83
	Rs/ha		1040.78		1110.09		1075.44
Pre emergence	Litre/ha	100.00	4.24	100.00	4.24	100.00	4.24
	Rs/ha		1908.00		1908.00		1908.00
Post-emergence	Litre/ha	40.00	0.40	23.33	0.40	31.66	0.40
	Rs/ha		1250.00		1250.00		1250.00
Yield	Quintal/ha	100.00	28.80	100.00	23.81	100.00	26.98
	Rs/ha		72488.54		54714.60		66014.84

5.1.13 Consumption of Agri inputs in the cultivation of Paddy

The utilization of agricultural inputs in paddy cultivation is comprehensively outlined in Table 5.13. In the Suchetgarh block, the seed consumption stood at 27.68 kg/ha, while in the Marh block, it was marginally higher at 34.16 kg/ha. The overall average seed consumption for paddy across the Jammu district settled at 30.92 kg/ha. The corresponding cost of seed was determined to be Rs 3246.60. Moving on to organic inputs, the consumption of Farm Yard Manure (FYM) was found at 12.55 quintal/ha in the Suchetgarh block, and in the Marh block, it was slightly elevated at 15.38 quintal/ha. The mean FYM usage across the district averaged at 13.97 quintal/ha, with an associated cost of Rs 1454.22. Interestingly, only 68.33% of farmers were observed to applying FYM as an input. Shifting focus to chemical fertilizers, Urea usage in the Suchetgarh block was measured at 102.23 kg/ha, while in the Marh block, it reached 110.29 kg/ha. Calculating across the Jammu district, the average Urea consumption stabilized at 106.26 kg/ha, with an expenditure of Rs 692.90. Similarly, the consumption of Diammonium Phosphate (DAP) in the Suchetgarh block amounted to 64.56 kg/ha, whereas in the Marh block, it spiked to 112.81 kg/ha. On an average at district level, DAP usage was found to be 88.69 kg/ha, with an associated cost of Rs 2417.60. As far as micronutrient application, the consumption of Zinc (Zn) fertilizer in the Suchetgarh block stood at 4.00 kg/ha, while in the Marh block, its usage was absent among respondents. The average Zn consumption for the district was noted at 4.00 kg/ha, with a cost of Rs 720.00/ha. Only 6.67% of farmers opted for Zn application. Turning attention to crop protection measures, pre-emergence herbicide usage in the Suchetgarh block amounted to 2.84 liters/ha, while in the Marh block, it slightly decreased to 2.69 liters/ha. District-wise, the average pre-emergence herbicide consumption settled at 2.76 liters/ha, with a cost of Rs 967.30/ha. Similarly, post-emergence herbicide application in the Suchetgarh block stood at 0.25 liters/ha, mirrored the same in the Marh block. The district's average post-emergence herbicide consumption also stood at 0.25 liters/ha, costing Rs 1000.00/ha. It has found that 31.67% of farmers incorporated post-emergence herbicides in their practices. Shifting the focus to yields, the paddy yield in the Suchetgarh block reached 26.52 quintal/ha, whereas in the Marh block, it marginally decreased to 26.18 quintal/ha. Evaluating the district's average, the yield for paddy was determined to be 26.37 quintal/ha, with a value of Rs 100425.22.

Table 5.13. Consumption of Agri inputs in the cultivation of Paddy

Inputs	Units	Suchetgarh (n=30)		Marh (n=30)		Over all Jammu (n=60)	
		Consumer percentage	Average Consumption/Yield	Consumer percentage	Average Consumption/Yield	Consumer percentage	Average Consumption
Seed	Kg/ha	100	27.68	100	34.16	100	30.92
	Rs/ha		2906.40		3586.80		3246.60
FYM	Quintal/ha	70	12.55	66.67	15.38	68.33	13.97
	Rs/ha		1324.26		1584.18		1454.22
Urea	Kg/ha	100	102.23	100	110.29	100	106.26
	Rs/ha		701.60		684.20		692.90
DAP	Kg/ha	100	64.56	100	112.81	100	88.69
	Rs/ha		1802.11		3033.10		2417.60
Zn	Kg/ha	13.33	4.00	0	0.00	6.67	4.00
	Rs/ha		720.00		0.00		720.00
Pre emergence	Litre/ha	100	2.84	100	2.69	100	2.76
	Rs/ha		993.44		941.15		967.30
Post-emergence	Litre/ha	40	0.25	23.33	0.25	31.67	0.25
	Rs/ha		1000.00		1000.00		1000.00
Yield	Quintal/ha	100	26.52	100	26.18	100	26.37
	Rs/ha		106924.76		91897.70		100425.22

5.1.14 Ratio Analysis of Consumption of input in cereals

The ratio analysis of input consumption in cereal crops, as presented in Table 5.14, revealed intriguing insights. Specifically, for wheat cultivation, when a farmer invested 1.00 portion of their resources in Farm Yard Manure (FYM), they allocated 1.47 portions to acquire quality seeds, indicated the pivotal role of seed selection in optimizing wheat yields. Further, the expenditure pattern extended to 2.52 portions for fertilizers and 2.39 portions for pesticides, underscoring the significance of balanced nutrient management and pest control strategies for a thriving wheat crop.

Turning to the consumption of Paddy cultivation, a similar investment of 1.00 portion in FYM leads to a distribution of resources, with 2.33 portions dedicated to securing the appropriate seed varieties. This accentuated the emphasis on meticulous seed choices to enhance paddy productivity. Parallel to wheat, the allocation shifted to 2.56 portions for fertilizers, emphasized the role of nutrient enrichment in achieving optimal paddy growth. Interestingly, the allocation of 1.09 portions for pesticides highlighted the need for judicious pest management practices in paddy cultivation, further emphasized the intricate balance required to achieve successful crop outcomes.

In essence, the pattern of input allocation across wheat and paddy crops underscores the multifaceted nature of successful cereal cultivation, where strategic resource distribution played a vital role in ensuring robust yields and sustainable agricultural practices.

Table 5.14. Ratio Analysis of Consumption of input in cereals

Wheat						
	Suchetgarh (n=30)	Ratio	Marh (n=30)	Ratio	Jammu (n=60)	Ratio
Inputs	Cost/ha/rs		Cost/ha/rs		Cost/ha/rs	
Seed	1994.52	1.43	2313.74	1.51	2154.13	1.47
Fertilizer	3666.05	2.63	3750.61	2.44	3696.85	2.52
FYM	1393.59	1.00	1536.49	1.00	1465.04	1.00
Pesticides	3568.05	2.56	3382.69	2.20	3500.54	2.39
Paddy						
Seed	2906.40	2.19	3586.80	2.26	3246.60	2.23
Fertilizer	3726.31	2.81	3717.30	2.35	3722.42	2.56
FYM	1324.26	1	1584.18	1	1454.22	1
Pesticides	1710.79	1.29	1434.76	0.91	1591.40	1.09

5.1.15 Comparison between actual use of fertilizer and recommended dose of fertilizer in Jammu

The insightful comparison between the actual utilization of fertilizers and the recommended dosage for optimal cultivation practices in Jammu is represented in Table 5.15. When considering wheat cultivation, it becomes evident that there existed a notable deficiency in the application of urea, with an underutilization of 69.67 kg/ha. Conversely, for Diammonium Phosphate (DAP), there was a slight surplus use of 0.53 kg/ha, indicated a tendency to exceed the recommended dose. Moreover, in the case of Muriate of Potash (MOP), there has an observed excess application of 8.83 kg/ha, potentially leading to concerns about overuse. The essential micronutrient Zinc (Zn) was omitted from the fertilization regimen for wheat, highlighted a significant gap in the adoption of comprehensive nutrient management practices.

Shifting the focus to paddy cultivation, a similar analysis unfolds. In the realm of urea application, there was a deficiency amounting to 33.74 kg/ha, underscoring an underutilization in contrast to recommended norms. Interestingly, DAP showcased a minor overuse of 1.31 kg/ha, potentially suggested a tendency to exceed the optimal recommended quantity. Strikingly, MOP remained absent from the fertilization regimen, raising questions about the rationale behind this omission. For Zinc (Zn) application, there was an observed underutilization of 16 kg/ha, indicated room for improvement in ensuring this vital micronutrient was appropriately incorporated.

The actual fertilizer usage and recommended guidelines in Jammu's wheat and paddy cultivation brings to light the intricate balance required for effective and sustainable crop nourishment. It highlighted both areas of deficiency and instances of excess, underscored the significance of precision in fertilization practices to ensure optimal yield outcomes and responsible agricultural stewardship.

Table 5.15. Comparison between actual use of fertilizer and recommended dose of fertilizer in Jammu

Fertilizers	Actual Use kg/ha	Recommended dose kg/ha
Wheat		
Urea	105.33	175
DAP	100.53	100
MOP	50.83	42
Zn	0.00	20
Paddy		
Urea	106.26	140
DAP	88.69	90
MOP	0.00	33
Zn	4	20

Recommended dose was given by SKUAST-J

5.2 To find out the market share of various brands of agricultural inputs in the Jammu district

5.2.1 Socio-demographic Profile of Retailers

The sociodemographic characteristics of retailers is presented in Table 5.16 and Figure 5.5. The data revealed several key insights about the retailers in the study. Notably, 40 per cent of the retailers belonged to the age bracket of 30 to 40 years. This age group constituted a significant portion of the retailer population. In terms of educational qualifications, 40 percent of the retailers had achieved a high level of education. This indicates a notable proportion of retailers possessing a substantial educational background, which could potentially impact their business practices and interactions with customers. Gender distribution among the retailers showed that a considerable majority, accounting for 90 per cent, were male. This observation highlights a gender disparity within the retail landscape, with male retailers being predominant in the sampled population. Turning to the nature of products dealt with, all retailers, constituting 100 per cent, were engaged in the distribution of seed, fertilizer, and pesticide inputs. This universal involvement underscores the significance of these agricultural inputs within the retail sector. Moreover, a significant portion of retailers, specifically 90 per cent, were involved in the trading of farm equipment. This finding suggests that farm equipment holds a prominent position in the product portfolio of a substantial number of retailers.

Table 5.16. Socio-demographic profile of retailers

Demographics	Category	Number(n-10)	Per cent
Age Group	20-30 Years	2	20
	30-40 Years	4	40
	40-50 Years	1	10
	50+ Years	3	30
	Total	10	100
Education	High	4	40
	Diploma	3	30
	Graduation	3	30
	Others	0	0
	Total	10	100
Gender	Male	9	90
	Female	1	10
	Others	0	0
	Total	10	100
Agri-inputs dealing with	Seed	10	100
	Fertilizers	10	100
	Pesticides	10	100
	Farm equipment	9	90

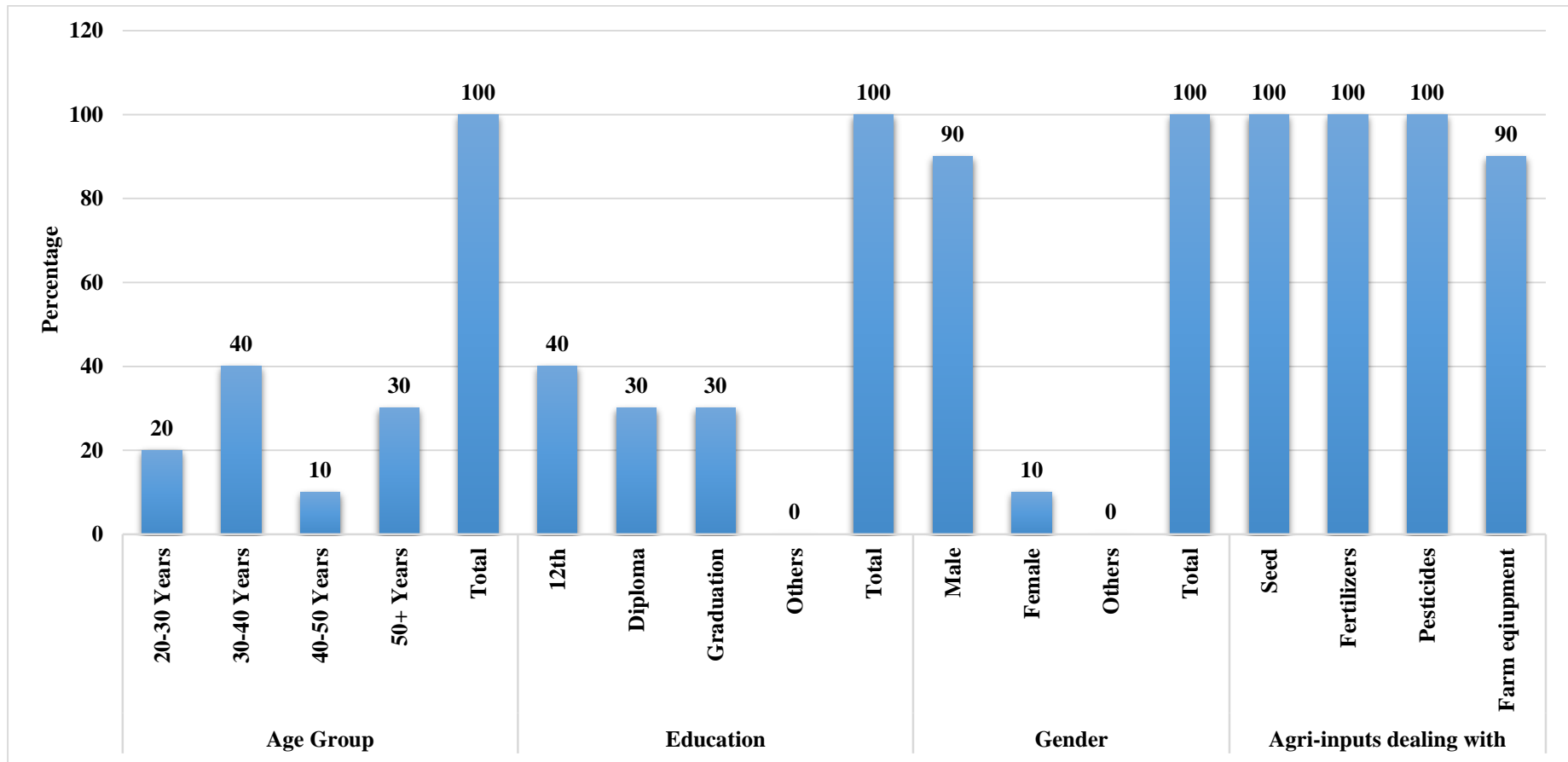


Figure 5.5 Socio-demographic profile of retailers

5.2.2 Average sales of fertilizers by retailers during the year 2022-2023 (in lakhs)

The distribution of average fertilizer sales among retailers in the given year is encapsulated in Table 5.17. The data highlighted the prevalence of key players in the market, with significant implications for the industry landscape. Notably, the market share for urea indicated that IFFCO has established a dominant position, commanding an impressive 37.91 per cent share. Pursuing closely was IPL (India Potash Ltd.), securing the second-highest position with a commendable market share of 30.77 per cent. This distribution underscores IFFCO's stronghold and IPL's noteworthy presence within the urea sector. Similarly, within the domain of DAP distribution, IFFCO emerged as a pivotal player yet again, captured a substantial market share of 36.95 per cent. IPL, positioned at the second rank with a market share of 33.06 per cent. This showcased IFFCO's consistent performance and IPL's significant contribution to the DAP market, solidified their positions as influential entities in this realm. Turning attention to MOP distribution, IPL emerged as the frontrunner, seized the majority of the market share at an impressive 55.85 per cent. Chambal, on the other hand, secured the second rank with a notable market share of 44.15 per cent. This data signified IPL's commanding presence in the MOP market and Chambal's noteworthy performance, established a competitive landscape in this particular fertilizer sector.

Table 5.17. Average sales of fertilizers by retailers during the year 2022-2023 (in lakhs)

Urea						
S. no.	Brand name	Company name	Total (Bags)	Total (KG)	in Lakhs	% Share
1	Urea	IFFCO	4090	184050	10.88	37.91
2	Urea	IPL	3320	149400	8.83	30.77
3	Uttam neem urea	Chambal	2300	103500	6.12	21.32
4	Urea	NFL	1080	48600	2.87	10.01
			Total Sales Overall		28.70	100.00
DAP						
S. no.	Brand name	Company name	Total (Bags)	Total (KG)	in lakhs	% share
1	DAP	IFFCO	2280	114000	30.78	36.95
2	DAP	IPL	2040	102000	27.54	33.06
3	Uttam DAP	Chambal	1850	92500	24.98	29.98

			Total Sales Overall		83.30	100.00
MOP						
S. no.	Brand name	Company name	Total (Bags)	Total (KG)	in lakhs	% Share
1	MOP	IPL	525	26250	8.93	55.85
2	Uttam MOP	Chambal	415	20750	7.06	44.15
			Total Sales Overall		15.98	100.00

5.2.3 Average sales of weedicides by retailers during the year 2022-2023 (in lakhs)

The sales data for weedicides, is presented in Table 5.18, highlighted the yearly average sales by retailers, measured in lakhs. The market dominance in this segment was held by the Bayer firm, which boasts a significant market share of 11.26 percent. Following closely were Rallies India and FIL Industries, contributing 7.65% and 7.52 percent to the market share, respectively. There were also other players in the market, with smaller market share percentages, including UPL, Crystal, and ADAMA. The cumulative sales figures for all weedicides offered by the retailers were found to amount to 23.81 lakhs. This data underscored the competitive landscape of the weedicides market, with Bayer's Roundup brand leading the way, while other companies like Rallies India and FIL Industries also played substantial roles in shaping the industry's dynamics.

Table 5.18. Average sales of weedicides by retailers during the year 2022-2023 (in lakhs)

S. no.	Brand name	Company name	Technical Name	in lakhs	% Share
1	Round Up	Bayer	Glyphosate 41 % SL	2.68	11.26
2	Tata metri	Rallis India ltd.	Metribuzin 70% WP	1.82	7.65
3	Agni plus	FIL industries ltd.	2,4-D Ethyl ester 38% E.C.	1.79	7.52
4	Cut out-38	Crystal	2,4D Ethyl Ester 38% EC	1.77	7.41
5	Axial	Syngenta	Pinoxaden 5.1 %	1.75	7.33
6	Shikart xtra	Mahindra	Pendimethalin 38.7% CS	1.70	7.12
7	Sartaj	Rallis India ltd.	Clodinafop Propargyl 15% WP	1.53	6.43
8	Paranex	Adama	Paraquat Dichloride 24% SI	1.53	6.41
9	Saral-75	Modesto	Salfosulfuron 75% Wg	1.53	6.41

10	Nomni Gold	PI	Bispyribac-Sodium 10% SC	1.43	6.01
11	All Clear	HPM	Paraquat Dichloride 24% SL	1.30	5.44
12	Total	UPL	Sulfosulfuron 75% + Metsulfuron 5% WG	1.15	4.81
13	Help	Akhil India pvt ltd.	Butachlor 5% Gr	1.08	4.54
14	Uprise	Akhil India pvt ltd.	Pretilachlor 50% EC	0.99	4.16
15	7 Penda	7 fold	Pendimethalin 30 Ec	0.94	3.95
16	Pendi plus	JU	Pendimethalin 30% EC	0.85	3.57
Total				23.81	100.00

5.2.4 Average sales of Fungicides by retailers during the year 2022-2023 (in lakhs)

The sales data for fungicides, presented in Table 5.19, provided insights into the market performance of various brands among retailers on an annual basis. Bayer emerged as the dominant player, captured a significant market share of 10.19% with its product Antracol. Following closely, Mahindra Agri Business and UPL secured market shares of 9.21% and 8.76%, respectively. However, other contenders in the market, such as Indofil, Crystal, and Adama, held comparatively smaller market shares. The collective sales of fungicides through respondents' retail outlets amounted to 7.71 lakhs. This data underscored Bayer's strong presence in the market due to the popularity of its brand Antracol, which contributed substantially to the overall sales figure. On the other hand, Mahindra Agri Business and UPL also managed to secure good market shares, indicated healthy competition among these major players. However, it has evident that the market was characterized by a relatively lower market share for brands like Indofil, Crystal, and Adama.

Table 5.19. Average sales of Fungicides by retailers during the year 2022-2023 (in lakhs)

S.no	Brand name	Company name	Technical Name	In lakhs	% Share
1	Antracol	Bayer	Propineb 70% WP	0.79	10.19
2	Jacket	Mahindra Agri Business	Propiconazole 25% EC	0.71	9.21
3	Saaf	UPL	12% Carbendazim + 63% WP mancozeb	0.68	8.76
4	Ampect Xtra	Syngenta	Azoxystrobin 18.2% + Cyproconazole 7.3 %	0.66	8.50

5	Custodia	Adama	Azoxystrobin 11% + Tebuconazole 18.3%	0.62	8.05
6	Folicur	Bayer	Tebuconazole 25.9% EC	0.60	7.83
7	Master	Rallis India ltd.	Mancozeb 64% WP + Metalaxyl 8%	0.51	6.62
8	Mirador	Adama	Azoxystrobin 23% SC	0.51	6.55
9	Juba gold	Atul	Azoxystrobin 11% + Tebuconazole 18.3% SC	0.46	5.96
10	M-45	Indofil	Mancozeb 75% Wp	0.45	5.81
11	Panther	HPM	Captan 70% + Hexaconazole 5% WP	0.40	5.22
12	Tilt	Crystal	Propiconazole 25 % EC	0.40	5.13
13	Propizon	Modesto	Propiconazole 25% EC	0.39	5.00
14	Sonnet	7 fold	Sulfer 80 Wdg	0.31	4.02
15	Azole	JU	Azoxystrobin 18.2% + Difenoconazole 11.4% SC	0.24	3.15
Total				7.71	100.00

5.2.5 Average sales of insecticides by retailers during the year 2022-2023 (in lakhs)

The sales data for insecticides, displayed in Table 5.20, provides insights into the yearly average sales achieved by retailers in lakhs. The analysis highlighted Bayer as the front runner in this market, holding a dominant position with their Fame brand accounted for 12.69 percent of the market share. Following closely were PI and Bayer again, but with a different brand, captured market shares of 8.25 percent and 7.92 percent, respectively. The landscape also included other players like Syngenta, Mahindra, and Adama, although with smaller market shares. In terms of financial investment, the cumulative expenditure on all the insecticides retailed by the respondents tallied up to 8.04 lakhs. This signifies the substantial scale of transactions within the insecticide market. Overall, the data underscored the significant presence of Bayer, particularly with its Fame brand.

Table 5.20. Average sales of insecticides by retailers during the year 2022-2023 (in lakhs)

S.no	Brand name	Company name	Technical Name	In lakhs	% Share
1	Fame	Bayer	Flubendiamide 480SC (39.35% w/w)	1.02	12.69
2	Rocket	PI	Profenofos 40% + Cypermethrin 4%	0.66	8.25

3	Larvin	Bayer	Thiodicarb 75% Wp	0.64	7.92
4	Coragen	FMC	Chlorantraniliprole 18.5% SC	0.62	7.76
5	Attila	Mahindra Agri Business	Thiomethoxam 25% WG	0.62	7.65
6	Minecto xtra	Syngenta	Cyantraniliprole 16.9% + Lufenuron 16.9%	0.50	6.24
7	Agadi super	ADAMA	Fipronil 80% WDG	0.47	5.90
8	Cyper-10	Shivalik crop science Pvt. Ltd	Cypermethrin 10% SC	0.43	5.32
9	Anant	Rallis India ltd.	Thiamethoxam 25 % WG	0.39	4.84
10	Lethal TC	Insecticide India Limited	Chlorpyrifos 20% EC	0.35	4.39
11	Cyclone	FIL industries ltd.	Chlorpyrifos 50 +Cypermethrin 5 EC	0.35	4.39
12	Sac-505	Shivalik crop science Pvt. Ltd	Chlorpyrifos 50% + Cypermethrin 5% EC	0.35	4.29
13	All doll 1.5	Akhil India pvt ltd.	Chlorpyrifos 1.5%DP	0.32	3.95
14	Killer	Modesto	Cypermethrin 25% SC	0.31	3.89
15	Cyper Hit-10	HPM	Cypermethrin 10% EC	0.29	3.60
16	Spark Plus	7 Fold	Profenofos 40 Cypermethrin 4 Ec	0.28	3.47
17	Sharp	Insecticide India Limited	Acetamiprid 20% SP	0.25	3.06
18	Mantra FS	JU	thiamethoxam 30% fs	0.19	2.39
Total				8.04	100.00

5.2.6 Average sales of paddy seed by retailers during the year 2022-2023 (in lakhs)

The sales data pertaining to paddy seeds, as presented in Table 5.21, illustrated the annual average sales in lakhs by various retailers. The dominant force in the paddy seed industry was the Diamond Company, notably exemplified by their prominent brand, Basmati 370, which commanded a significant 31.66 percent share of the sales. It has found that Akhil India and Bayer, as key players, collectively contribute to the dynamics of the paddy seed market. This data underscored the substantial presence of Diamond Company and the particular prominence of the Basmati 370 brand within the broader context of paddy seed sales.

Table 5.21. Average sales of paddy seed by retailers during the year 2022-2023 (in lakhs)

S. no	Brand name	Company name	total in lakhs	% Share
1	Basmati 370	Diamond	7.26	31.66
2	Basmati 370	Savannah	5.58	24.33
3	Basmati 370	Akhil India	4.52	19.73
4	Arize 6444 Gold	Bayer	3.73	16.27
5	VNR 2323	VNR seeds	1.42	6.18
6	PR-126	Yamuna seeds	0.42	1.83
Total			22.93	100.00

5.2.7 Average sales of wheat seeds by retailers during the year 2022-2023 (in lakhs)

In accordance with the data presented in Table 5.22, the market landscape revealed that the brand HD 2967, under the purview of the Yamuna company, had garnered a market share of 32.35 per cent. In contrast, a distinct trend has observed among other industry players, such as VNR and Akhil India, who had chosen to consolidate their market shares in the market of wheat seeds. This strategic consolidation strategy potentially signified a collaborative effort to compete effectively within the market segment. The figures delineated in Table 5.22 distinctly underscore the presence of the HD 2967 brand within the market, showcased its considerable popularity and acceptance among consumers.

Table 5.22. Average sales of wheat seeds by retailers during the year 2022-2023 (in lakhs)

S.no	Brand name	Company name	in lakhs	% Share
1	HD 2967	Yamuna	6.47	32.35
2	HD 2967	Akhil	5.31	26.58
3	DRW 187	Yamuna	2.46	12.31
4	VNR 601	VNR seeds	2.42	12.10
5	HD 2967	BSK seeds	2.14	10.71
6	Vijeta	Sona	1.19	5.95
Total			19.99	100.00

5.2.8 Socio-demographic Profile of Distributors

The sociodemographic characteristics of distributors were presented in Table 5.23, while Figure 5.6 visually encapsulates the distribution. Remarkably, the data revealed that a significant 40% of these distributors belong to the 50 and above age group. The distribution has exclusively male-dominated, comprised 100% men. In terms of educational qualifications, half of the distributors possess diplomas, reflecting a moderate level of formal education among this group. 40% of the wholesalers were engaged in the trade of farm equipment, highlighted their role in providing essential machinery for agricultural activities. 100% of the distributors, are involved in the provisioning of vital agricultural inputs such as seeds, fertilizers, and pesticides.

Table 5.23. Socio-demographic Profile of Distributors

Demographics	Category	Number(n-10)	Percent
Age Group	20-30 Years	0	0
	30-40 Years	3	30
	40-50 Years	3	30
	50+ Years	4	40
	Total	10	100
Education	12th	2	20
	Diploma	5	50
	Graduation	3	30
	Others	0	0
	Total	10	100
Gender	Male	10	100
	Female	0	0
	Others	0	0
	Total	10	100
Agri-inputs dealing with	Seed	10	100
	Fertilizers	10	100
	Pesticides	10	100
	Farm Equipment	4	40

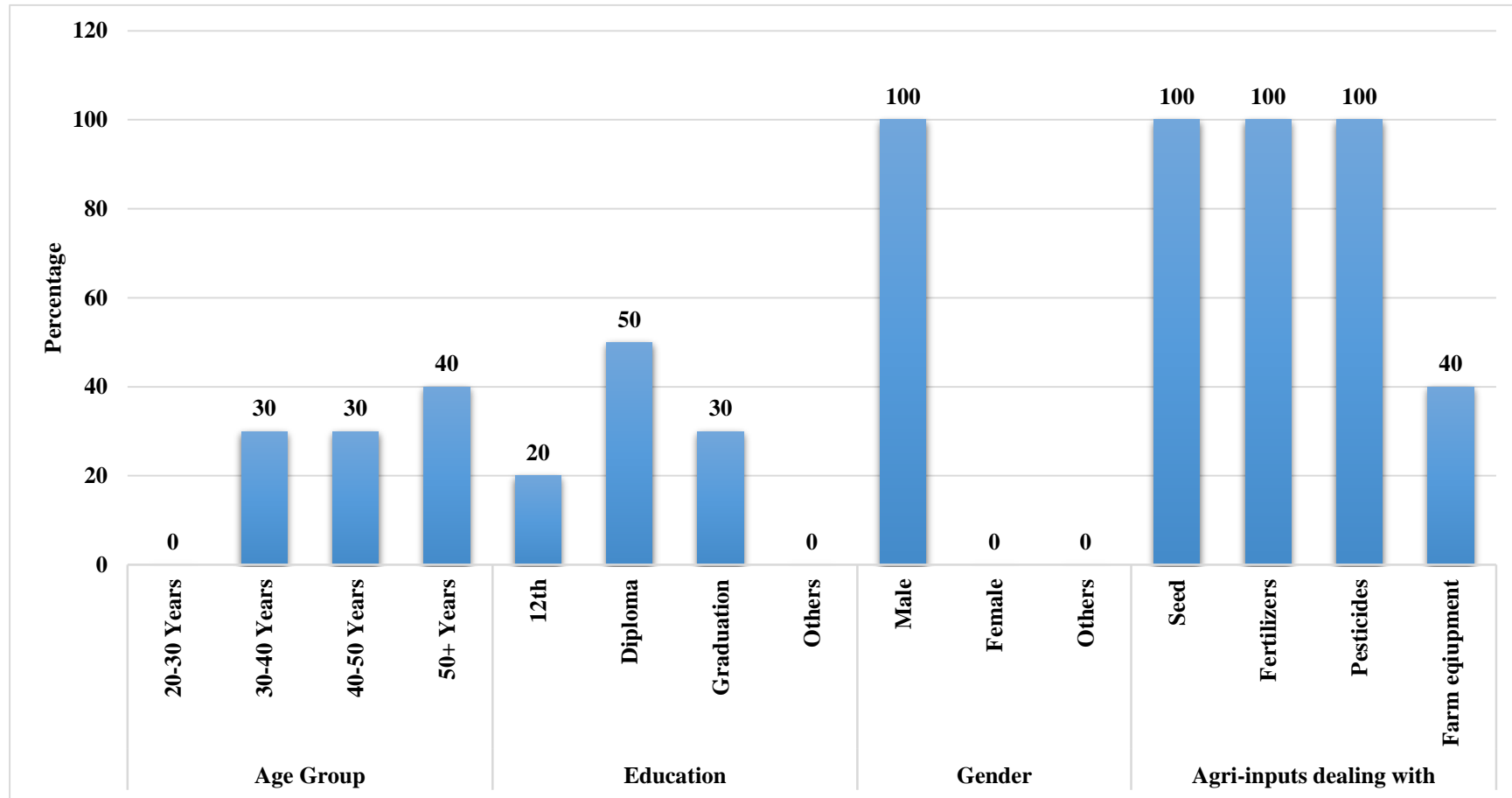


Figure 5.6 Socio-demographic Profile of Distributors

5.2.9 Average sales of fertilizers by distributors during the year 2022-2023 (in lakhs)

The data presented in Table 5.24 highlighted the average annual sales of fertilizers by distributors, expressed in lakhs. The table underscores the dominant positions held by various companies in the market share of different types of fertilizers. When it comes to urea, IFFCO emerged as the leader, maintained an impressive market share of 31.34 per cent. Following closely was IPL (India Potash Ltd.), securing the second-largest market share at 27.35 per cent. This demonstrated IFFCO's strong foothold in the urea market, with IPL also being a significant contender. Shifting the focus to MOP (Muriate of Potash), the dynamics changed. In this category, IPL took the lead with a market share of 52.19 per cent. In contrast, Chambal has a second place with a market share of 47.81 per cent. IPL's significant dominance in the MOP market underscores its strength and influence in this particular fertilizer segment. Moving on to DAP (Di-ammonium Phosphate), the pattern continued. IFFCO remains a frontrunner, holding the majority of the market share at 36.13 per cent and followed by the Chambal at second position with a market share of 32.01 per cent. Once again, IFFCO's market share reiterated its prominence in the DAP sector, with Chambal secured a respectable second place.

**Table 5.24. Average sales of fertilizers by distributors during the year 2022-2023
(in lakhs)**

Urea							
S. no	Brand name	Company name	Total (Bags)	Total (KG)	Total Sales	in Lakhs	%Share
1	Urea	IFFCO	55000	2475000	13750000	137.50	31.34
2	Urea	IPL	48000	2160000	12000000	120.00	27.35
3	Uttam neem urea	Chambal	42500	1912500	10625000	106.25	24.22
4	Urea	NFL	30000	1350000	7500000	75.00	17.09
Total Sales Overall					43875000	438.75	100
DAP							
S. no	Brand name	Company name	Total (Bags)	Total (KG)	Total Sales	in Lakhs	% Share
1	DAP	IFFCO	11400	570000	15105000	151.05	36.13
2	DAP	IPL	10050	502500	13316250	133.16	31.85
3	Uttam DAP	Chambal	10100	505000	13382500	133.83	32.01
Total Sales Overall					41803750	418.04	100
MOP							
S. no	Brand name	Company name	Total (Bags)	Total (KG)	Total sales	in lakhs	% Share
1	MOP	IPL	1610	80500	2704800	27.05	52.19
2	Uttam MOP	Chambal	1475	73750	2478000	24.78	47.81
Total Sales Overall					5182800	51.83	100

5.2.10 Average sales of weedicides by distributors during the year 2022-2023 (in lakhs)

The sales data for weedicides, as presented in Table 5.25, highlighted interesting insights into market trends. Bayer, renowned for its Roundup brand, commands a substantial portion of the market, with an impressive market share of 11.60 per cent. Following closely were Rallies India and FIL Industries, with market shares of 7.88 per cent and 7.67 per cent, respectively. This trio of companies stands out as the dominant players in the weedicides market. In contrast, other competitors such as UPL, Crystal, and ADAMA hold considerably smaller market shares, underscoring the concentrated nature of the industry. It was evident that a multitude of businesses operated in this space, but the major share of the market was clearly held by Bayer and its Roundup brand, alongside the presence of Rallies India and FIL Industries. Remarkably, the cumulative sales of weedicides from participating distributors amounted to a substantial

figure of 266.49 lakhs, emphasized the significance of the market as well as the demand for these products. This data signifies the scope and scale of the weedicides industry and provided valuable insights for market analysis.

**Table 5.25. Average sales of weedicides by distributors during the year 2022-2023
(in lakhs)**

S. no.	Brand name	Company name	Technical Name	Sales in lakhs	% share
1	Round Up	Bayer	Glyphosate 41 % SL	30.91	11.60
2	Tata metri	Rallis India ltd.	Metribuzin 70% WP	21.01	7.88
3	Agni plus	FIL industries ltd.	2,4-D Ethyl ester 38% E.C.	20.45	7.67
4	Axial	Syngenta	Pinoxaden 5.1 %	19.95	7.49
5	Shikart xtra	Mahindra	Pendimethalin 38.7% CS	19.38	7.27
6	Cut out-38	Crystal	2,4D Ethyl Ester 38% EC	18.18	6.82
7	Agil	Adama	Paraquat Dichloride 24% Sl	17.73	6.65
8	Sartaj	Rallis India ltd.	Clodinafop Propargyl 15% WP	17.52	6.57
9	Saral-75	Modesto	Salfosulfuron 75% Wg	17.44	6.54
10	Nomni Gold	PI	Bispyribac-Sodium 10% SC	15.54	5.83
11	Total	UPL	Sulfosulfuron 75% + Metsulfuron 5% WG	13.06	4.90
12	All Clear	HPM	Paraquat Dichloride 24% SL	12.89	4.84
13	Help	Akhil India pvt ltd.	Butachlor 5% Gr	12.34	4.63
14	7 Penda	7 fold	Pendimethalin 30 Ec	10.56	3.96
15	Pendi plus	JU	Pendimethalin 30% EC	9.97	3.74
16	Uprise	Akhil India pvt ltd.	Pretilachlor 50% EC	9.59	3.60
			Total	266.49	100.00

5.2.11 Average sales of fungicides by distributors during the year 2022-2023 (in lakhs)

Table 5.26 presents the annual average sales of fungicides by various distributors, measured in lakhs. The data underscored the dominant market presence of Bayer, whose product line, particularly the brand Antracol, commanded a significant market share of 11.51 per cent. Following closely were UPL and Rallies India, which contributed 7.43 per cent and 5.6 per cent of the market share, respectively. Other participants in this market, such as Indofil, Crystal, and Adama, hold smaller market shares. The collective sales figures from the respondent wholesalers indicated a robust performance in the fungicide sector. A total worth of 85.57 lakhs was recorded, showcasing the commercial viability and demand for these products. This data signified the prominent role of Bayer, the rising influence of UPL and Rallies India, and the presence of other players, all of which contributed to the dynamics of the fungicide market.

Table 5.26. Average sales of fungicides by distributors during the year 2022-2023 (in lakhs)

S. no.	Brand name	Company name	Technical Name	Sales in lakhs	% Share
1	Antracol	Bayer	Propineb 70% WP	9.85	11.51
2	Jacket	Mahindra Agri Business	Propiconazole 25% EC	7.86	9.18
3	Saaf	UPL	12% carbendazim + 63% WP mancozeb	7.43	8.68
4	Ampect Xtra	Syngenta	Azoxystrobin 18.2% + Cyperconazole 7.3 %	7.21	8.42
5	Custodia	Adama	Azoxystrobin 11% + Tebuconazole 18.3%	6.82	7.97
6	Folicur	Bayer	Tebuconazole 25.9% EC	6.63	7.75
7	Master	Rallis India ltd.	Mancozeb 64% WP + Metalaxyl 8%	5.61	6.56
8	Mirador	Adama	Azoxystrobin 23% SC	5.56	6.49
9	Juba gold	Atul	Azoxystrobin 11% + Tebuconazole 18.3% SC	5.05	5.90
10	M-45	Indofil	Mancozeb 75% Wp	4.93	5.76
11	Panther	HPM	Captan 70% + Hexaconazole 5% WP	4.42	5.17
12	Tilt	Crystal	Propiconazole 25 % EC	4.35	5.08
13	Propizon	Modesto	Propiconazole 25% EC	4.24	4.95

14	Sonnet	7 fold	Sulfer 80 Wdg	3.41	3.99
15	Azole	JU	Azoxystrobin 18.2% + Difenoconazole 11.4% SC	2.23	2.61
	Total			85.57	100.00

5.2.12 Average sales of insecticides by distributors during the year 2022-2023 (in lakhs)

The table 5.27 presents valuable insights into the annual sales of insecticides by various distributors, measured in lakhs. It becomes evident that two significant players in the market, Mahindra and FMC, had secured noteworthy positions with market shares of 7.90% and 8.01%, respectively. These percentages position them as the second and third leading contributors in the market, with Bayer Corporation and its Fame brand ranging at the top with a substantial 10.20% market share. This data underscored Bayer Corporation's dominant presence in the insecticide market. It was worth noting that the remaining competitors such as Syngenta, PI, and Adama hold comparably smaller market shares. Their contributions to the total market were relatively modest in comparison to the top contenders. The cumulative sales figures of these distributors, responsible for supplying a range of insecticides, culminate to 77.89 lakhs.

Table 5.27. Average sales of insecticides by distributors during the year 2022-2023 (in lakhs)

S. no.	Brand name	Company name	Technical Name	Sales in lakhs	% Share
1	Fame	Bayer	Flubendiamide 480SC (39.35% w/w)	10.20	13.10
2	Larvin	Bayer	Thiodicarb 75% Wp	6.37	8.18
3	Coragen	FMC	Chlorantraniliprole 18.5% SC	6.24	8.01
4	Attila	Mahindra Agri Business	Thiomethoxam 25% WG	6.15	7.90
5	Rocket	PI	Profenofos 40% + Cypermethrin 4%	5.93	7.61
6	Minecto xtra	Syngenta	Cyantraniliprole 16.9% + Lufenuron 16.9%	5.02	6.45
7	Agadi super	ADAMA	Fipronil 80% WDG	4.21	5.41

8	Cyper-10	Shivalik crop science Pvt. Ltd	Cypermethrin 10% SC	4.18	5.37
9	Anant	Rallis India ltd.	Thiamethoxam 25 % WG	3.89	4.99
10	Cyclone	FIL industries ltd.	Chlorpyriphos 50 +Cypermethrin 5 EC	3.53	4.53
11	Sac-505	Shivalik crop science Pvt. Ltd	Chlorpyriphos 50% + Cypermethrin 5% EC	3.45	4.43
12	Lethal TC	Insecticide India Limited	Chlorpyrifos 20% EC	3.28	4.21
13	All doll 1.5	Akhil India pvt ltd.	Chlorpyriphos 1.5%DP	3.18	4.08
14	Killer	Modesto	Cypermethrin 25% SC	3.13	4.02
15	Spark Plus	7 Fold	Profenofos 40 + Cypermethrin 4 Ec	2.79	3.58
16	Cyper Hit-25	HPM	Cypermethrin 10% EC	2.46	3.15
17	Sharp	Insecticide India Limited	Acetamiprid 20% SP	2.26	2.90
18	Mantra FS	JU	Thiamethoxam 30% fs	1.62	2.08
Total				77.89	100.00

5.2.13 Average sales of paddy seeds by distributors during the year 2022-2023 (in lakhs)

Table 5.28 presents the annual average sales figures, measured in lakhs, of paddy seeds by various distributors. The data represented the performance of the Diamond Company, a prominent player in the paddy seed industry. This company specializes in selling the renowned Basmati 370 brand and commanded a significant market share of 25.52 per cent. It has been found that this market share was not solely attributed to Diamond Company's sales of Basmati 370, but also encompassed their collaborative market presence with Akhil India and Bayer. To elaborate further, the Diamond Company's success was underscored by its ability to secure a substantial portion of the paddy seed market. Among its offerings, the Basmati 370 brand stands out as a key contributor to its market share. However, it was important to note that the reported market share of 25.52 per cent was not solely due to the sales of Basmati 370 alone. Instead, this figure accounts for the combined market influence of Diamond Company, along with the collaborative efforts of Akhil India and Bayer. This strategic alliance among these entities has led to their collective dominance in the paddy seed industry.

Table 5.28. Average sales of paddy seeds by distributors during the year 2022-2023 (in lakhs)

S. no.	Brand name	Company name	in lakhs	% share
1	Basmati 370	Diamond	19.26	25.52
2	Basmati 370	Savannah	17.46	23.14
3	Basmati 370	Akhil India	16.62	22.02
4	Arize 6444 Gold	Bayer	13.72	18.19
5	VNR 2323	VNR seeds	5.72	7.58
6	PR-126	Yamuna seeds	2.68	3.55
	Total		75.46	100.00

5.2.14 Average sales of wheat seeds by distributors during the year 2022-2023 (in lakhs)

The wheat seed market was notably led by the Yamuna company's prominent brand, HD 2967, which has secured a substantial market share of 26.31 per cent, as indicated in Table 5.29. This commanding presence underscored Yamuna's dominance in the industry and its position as a key player. The combined market share of other competitors, including VNR and Akhil India, also contributed significantly to the overall market landscape. This data highlighted the impressive performance of HD 2967 from the Yamuna company, showcased their effective strategies and product quality that resonate with consumers. The considerable market share implies a high level of customer trust and loyalty towards the HD 2967 brand, potentially resulting from its consistent performance and perceived value. While HD 2967 holds a dominant share, the presence of other brands emphasized a diverse market with various choices for consumers. This diversity can foster innovation and further enhanced the overall quality of wheat seeds available to farmers and growers.

**Table 5.29. Average sales of wheat seeds by distributors during the year 2022-2023
(in lakhs)**

S. no.	Brand name	Company name	in lakhs	% share
1	HD 2967	Yamuna	15.69	26.31
2	HD 2967	Akhil	14.43	24.20
3	VNR 601	VNR	10.40	17.44
4	DRW 187	Yamuna	9.84	16.51
5	HD 2967	BSK seeds	4.68	7.86
6	Vijeta	Sona	4.58	7.68
	Total		59.62	100.00

5.3 To analyze the factors influencing the brand choice and promotional approaches used by the Agri input companies

5.3.1 To analyze the factors influencing the brand choice of Agri-input by farmers

Factor analysis was conducted to identify the underlying factors within the dataset. The focus of the study was on a group of 60 selected respondents who were actively engaged in farming. These individuals played a pivotal role in the factor analysis process. This approach allowed us to uncover the latent factors that might be influencing the responses provided by the farmers. The data was situated to identify patterns, relationships, and associations among the variables. The chosen respondents, all of whom were farmers, contributed significantly to the factor analysis by offering their insights, experiences, and perspectives. These individuals were essential in shaping the outcome of the analysis, as their input directly impacted the identification and interpretation of the underlying factors. Their unique experiences and viewpoints provided a rich foundation for the extraction of meaningful factors. Ultimately, this factor analysis process, guided by the valuable input of the 60 participating farmers, allowed us to gain a comprehensive understanding of the key factors that drive certain patterns within the farming context.

5.3.2 Reliability Statistics with Cronbach's Alpha

The reliability of the measurements was assessed using Cronbach's Alpha, as depicted in Table 5.30. The results were quite clear, indicating a high Cronbach's Alpha

coefficient of 0.956. This value significantly exceeded the minimum acceptable threshold for alpha, signifying robust internal consistency within the scale. Importantly, all the items initially included in the scale were retained without any removal. Reliability, as outlined by Golafshani (2003), refers to the extent to which a measurement instrument consistently produces dependable outcomes when the scale is repeatedly administered. This evaluation of reliability held a crucial role in the development of a measurement scale, ensuring the accuracy and consistency of the collected data. The significance of Cronbach's alpha value lies in its ability to assess the reliability of the scale's factors. A Cronbach's alpha equal to or greater than 0.50 was conventionally regarded as acceptable according to Nunnally (1978), implied that the measurements demonstrate satisfactory internal consistency. It was important to note that higher alpha values were indicative of stronger reliability.

Table 5.30. Reliability Statistics with Cronbach's Alpha

Cronbach's Alpha	N of Items
0.956	24

5.3.3 Kaiser-Meyer-Olkin Measure of Sampling Adequacy & Bartlett's Test of Sphericity test

Table 5.31 presents two crucial statistical assessments, namely the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. These evaluations played a pivotal role in determining the viability and appropriateness of conducting factor analysis on the provided dataset. The KMO Measure of Sampling Adequacy was a vital yardstick that gauges the suitability of employing factor analysis. It discerned whether the dataset's characteristics were conducive to this analytical technique. A KMO value falling within the range of 0.60 to 1.0 signified that the conditions for factor analysis were favorable. In the current context, the computed KMO value stands at 0.836. This value confidently suggested that the sample size under scrutiny was sufficiently robust, lending credence to the suitability of utilizing factor analysis for the data at hand. Conversely, Bartlett's Test of Sphericity scrutinized a hypothesis which posits that variables within the population were not interrelated. In simpler terms, it questions whether the variables were uncorrelated with each other, apart from self-correlations. The significance level associated with Bartlett's test was

notably low at 0.00. This outcome holds profound implications it implies that the variables do indeed exhibit correlations among themselves. As a result, the application of factor analysis emerges as pertinent. To recapitulate, the statistics presented in Table 5.31 collectively depict that the dataset is well-suited for factor analysis. The KMO Measure of Sampling Adequacy, with its high value of 0.836, the sample size as adequate for meaningful analysis. Simultaneously, the highly significant outcome of Bartlett's Test of Sphericity ($p = 0.00$) underscores the presence of inter-variable correlations, reinforcing the appropriateness of employing factor analysis to unravel the underlying patterns and relationships within the data, as outlined by Raghuvanshi (2016).

Table 5.31. Kaiser-Meyer-Olkin Measure of Sampling Adequacy & Bartlett's Test of Sphericity test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.836
Bartlett's Test of Sphericity	Approx. Chi-Square	1714.515
	Df	276
	Sig.	0.000

5.3.4 Descriptive statistics for rotated component matrix

The findings from the rotated component matrix, as presented in Table 5.32, provide valuable insights into the relationships between variables in the context of principal component analysis with Varimax rotation using the Kaiser Normalization method. This analysis facilitates a deeper understanding of the relationship between factors and variables by showcasing factor loadings, which essentially represent the correlations between these factors and variables. The significance of factor loadings cannot be overstated, as they offer a quantifiable measure of the strength of the relationship between a factor and a variable. A higher absolute value of a coefficient signifies a stronger linkage between the factor and the variable it's associated with. This, in turn, aids in comprehending the nature of these factors. Importantly, the process of rotation serves to redistribute the variance attributed to individual factors, potentially leading to the identification of distinct factors that might not have been evident in the initial analysis. Among various rotation methods, the Varimax rotation stands out as a

widely used approach. Its orthogonal nature ensures that a single variable isn't heavily loaded onto multiple factors, thereby making the interpretation of factors more intuitive and insightful (Malhotra, 2016). A practical guideline to consider is that factor loadings greater than 0.60 are typically considered significant for establishing meaningful associations between factors and variables. The transformed, rotated component matrix, highlighted by the factor loadings, is presented in Table 5.32. This table effectively communicates that the factor analysis has led to the segregation of variables with factor loadings surpassed the 0.60 threshold. This segregation offered a clear perspective on the variables that exhibited substantial connections with the underlying factors. In light of the larger picture, out of the 24 items or variables under consideration, a decision was made to exclude four items. This decision stemmed from a factor analysis, where these items demonstrated low factor loadings.

Table 5.32. Descriptive statistics for rotated component matrix

Rotated Component Matrix				
Variables	Component			
	1	2	3	4
I prefer to buy only certified Agri-input brands among all other brands	0.824			
Ease of availability has a significant role in choosing a brand	0.760			
Shelf life of a product	0.742			
Product efficiency plays an important role in choosing a brand	0.728			
Ease of application influences the selection of brand	0.681			
Environmental effect on storage	0.678			
Eco-friendly product plays an important role in the selection of an Input	0.607			
Advertisement influences my purchase decision of the Agri-input brand				
Magazine, brochures, and information sources affect my purchase decision of Agri input brand				
Country of origin influences the selection of brand				
I believe that my preferred brand gives the best quality as compared to other brands		0.887		
Price makes a significant influence on my brand preference		0.857		
The brand has a significant influence on my purchase decision		0.820		
I use a particular Agri input brand always		0.799		
Brand image plays an important role in the selection of a brand		0.729		
Price is one of the reasons for choosing a brand		0.710		
Resistant to climatic conditions has significant role in choosing a brand		0.634		
I prefer to buy brand which has different pack sizes			0.899	
I prefer to buy brand whose packaging is easy to handle			0.898	
I prefer to buy brand on the basis of detailed labelling			0.876	
Brand providing more subsidy is chosen more by the consumer				
Reviews for specific Agri- input brand influences my brand choice				0.887
Recommendations from other farmers				0.867
Recommendation from Retailers				0.795
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.				

5.3.5 Factors were named according to the type of statement

The factors presented in Figure 5.7 have been categorized based on the nature of the statements they encompass. This categorization has resulted in the identification of four distinct factors. To elaborate on this, the first factor has been denoted as "Product Attributes," comprising a comprehensive set of seven items. Moving on, the second factor is termed "Branding and Pricing," encompassing seven distinct items. The third factor, designated as "Packaging and Labeling," encapsulates three key items. Finally, the fourth factor, labeled as "Promotion and Advertisement," encompasses a grouping of three items.

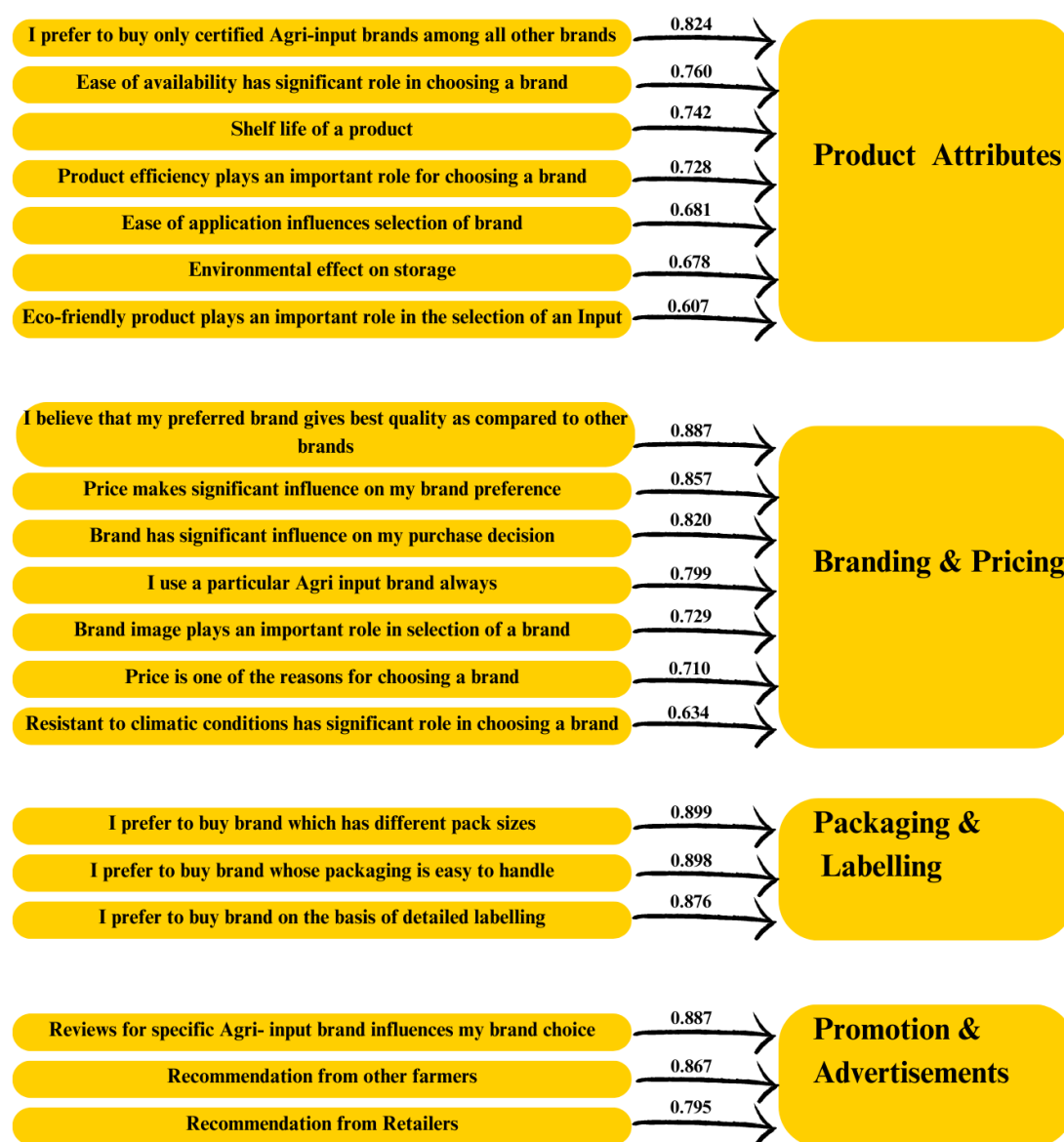


Figure 5.7 Factors were named according to the type of statement

5.3.6 Factor-wise KMO test, percent variance explained, factor loading, attributes, and Cronbach alpha values

Table 5.33 presents a comprehensive analysis of the factors under consideration, highlighted by key statistical metrics and insights. The factors identified/extracted were Product Attributes, Branding and Pricing, Packaging and Labelling, and Promotions and Advertisements. The analysis utilized various techniques, including the Factor-wise KMO test, Percent Variance Explained, Factor Loading, Attributes, and Cronbach Alpha values.

Starting with the first factor, which pertains to Product Attributes, the obtained results reflect a clear picture. The calculated KMO value of 0.898 signifies a substantial level of suitability for factor analysis. This is supported by the Percent Variance Explained value of 77.125, indicating that the majority of variability within this factor is effectively accounted for. Seven distinct attributes were identified and associated with this factor, with each attribute's Factor Loading outlined in the table. A high Cronbach Alpha value of 0.949, derived from factor analysis, underscores the internal consistency of this factor.

The second factor, was named Branding and Pricing. The KMO value of 0.867 underscores the factor's appropriateness for analysis, aligning with the good range. The Percent Variance Explained value, recorded at 74.392, illustrates a substantial of the underlying variability within this factor. Parallel to the first factor, seven attributes were identified here as well, with their respective Factor Loadings provided in the table. The Cronbach Alpha value of 0.940 attests to the internal reliability of this factor in factor analysis.

The third factor, which revolves around Packaging and Labelling, likewise reveals significant insights. A KMO value of 0.753, deemed appropriate for analysis, paves the way for a meaningful investigation. Impressively, the Percent Variance Explained value stands at 85.715, indicating a comprehensive understanding of the variance within this factor. Three distinct attributes were associated with this factor, accompanied by their respective Factor Loadings highlighted in the table. A Cronbach Alpha value of 0.917 indicates confidence in the internal consistency of this factor as validated through confirmatory factor analysis. Lastly, the fourth factor, Promotions and Advertisements, presents noteworthy outcomes. Despite a slightly lower KMO

value of 0.671, still falling within the good range, the Percent Variance Explained values impressively records a value of 79.282, portraying a robust grasp of variance. This factor comprises three distinctive attributes, each with their Factor Loadings presented in the table. The Cronbach Alpha value of 0.869 accentuates the reliability of this factor's internal structure as ascertained through factor analysis.

Table 5.33. Factor-wise KMO test, percent variance explained, factor loading, attributes, and Cronbach alpha values

Factors	KMO	% of Var. Explained	Factor Loading	Attributes	Cronbach Alpha
Product Attributes	0.898	77.125	0.824	I prefer to buy only certified Agri-input brands among all other brands	0.949
			0.760	Ease of availability has a significant role in choosing a brand	
			0.742	Shelf life of a product	
			0.728	Product efficiency plays an important role in choosing a brand	
			0.681	Ease of application influences the selection of brand	
			0.678	Environmental effect on storage	
			0.607	Eco-friendly product plays an important role in the selection of an Input	
Branding & Pricing	0.867	74.392	0.887	I believe that my preferred brand gives the best quality as compared to other brands	0.940
			0.857	Price makes a significant influence on my brand preference	
			0.820	Brand has a significant influence on my purchase decision	
			0.799	I use a particular Agri input brand always	
			0.729	Brand image plays an important role in the selection of a brand	
			0.710	Price is one of the reasons for choosing a brand	
			0.634	Resistant to climatic conditions has a significant role in choosing a brand	
Packaging & Labelling	0.753	85.715	0.899	I prefer to buy a brand which has different pack sizes	0.917
			0.898	I prefer to buy a brand whose packaging is easy to handle	
			0.876	I prefer to buy brands on the basis of detailed labeling	
Promotion & Advertisement	0.671	79.282	0.887	Reviews for specific Agri- input brand influences my brand choice	0.869
			0.867	Recommendations from other farmers	
			0.795	Recommendation from Retailers	

5.3.7 Influence of promotional activities on Farmer's purchase behavior in Agri-Inputs marketing

The impact of promotional activities on farmers' decision to purchase agricultural inputs is presented in Table 5.34. In order to assess the significance of these activities, a sample of 60 farmers was considered. Among the assortment of attributes, it was determined that Banner/Posters held the foremost influence, garnering a mean score of 81.5. Following closely, Wall painting and Handouts/Pamphlets secured the second and third positions with mean scores of 76.5 and 67, respectively. Notably, the attribute exerting the least influence was Radio, recording a mean score of 16.

Table 5.34. Influence of promotional activities on Farmer's purchase behavior in Agri-Inputs marketing

S. no.	Attributes	Total Score	Mean Score	Ranking
1	Frequent visits of company representative	1665	27.75	XII
2	On-farm demonstration	2205	36.75	X
3	Farmer meetings	3180	53	VI
4	Kisan mela/Agri fairs	3000	50	VII
5	Kissan call center	1950	32.5	XI
6	Wall paintings	4590	76.5	II
7	Banners/Posters	4890	81.5	I
8	Handout/Pamphlets	4020	67	III
9	Radio	960	16	XIII
10	Local papers	3360	56	V
11	Tv ads	2580	43	IX
12	Social media (Facebook, YouTube)	3660	61	IV
13	Agri Tv channels (DD kisan)	2940	49	VIII

5.3.8 Influence of promotional activities on Retailers/distributor Purchase Behaviour in Agri-input Marketing

The impact of promotional activities on the buying decisions of retailers and distributors regarding agricultural inputs is outlined in Table 5.35. In order to assess the effects of these promotional activities on farmers' purchasing behavior of agri-inputs, a sample comprising 10 retailers and 10 distributors was selected. Within the spectrum of attributes examined, the attribute that held the greatest influence was the consistent visits made by company representatives, earning a prominent mean score of 84. Conversely, the promotional attribute that exhibited the least sway was Radio, registering a considerably lower mean score of 16.

Table 5.35. Influence of promotional activities on Retailers/distributor Purchase Behaviour in Agri-input Marketing

S. no.	Attributes	Total score	Mean score	Ranking
1	Frequent visits of company representative	1680	84	I
2	On-farm demonstration	1040	52	VII
3	Farmer meetings	920	46	VIII
4	Kisan mela/Agri fairs	1120	56	VI
5	Kissan call center	640	32	XI
6	Wall paintings	1362	68.1	III
7	Banners/Posters	1410	70.5	II
8	Handout/Pamphlets	750	37.5	X
9	Radio	320	16	XIII
10	Local papers	1160	58	V
11	Tv ads	590	29.5	XII
12	Social media (Facebook, YouTube)	1168	58.4	IV
13	Agri Tv channels (DD kisan)	840	42	IX

DISCUSSION

The results obtained during the present investigation entitled “**A Study on Consumption of Agricultural Inputs and Analysis of Market Share of Agri Input Companies for Cereal Crops in Jammu District**” in the preceding chapter have been discussed under the following heads:

- 6.1 To observe the consumption pattern of agricultural inputs in Cereal crops
- 6.2 To find out the market share of various brands of agricultural inputs in the Jammu district
- 6.3 To analyze the factors influencing the brand choice and promotional approaches used by the Agri input companies

6.1 To observe the consumption pattern of agricultural inputs in Cereal crops

The research revealed the distribution of certified high-quality cereal seeds in India, data from the years 2020-2021, which revealed a distribution of 246.00 lakh/quintals. Comparing this to the statistics from 2015-2016, where the distribution stood at 194.95 lakh/quintals, a remarkable consistency in results emerged, akin to findings in Pathania *et al.* (2020) study, which mirrored the crop-wise distribution of certified cereal seeds at 194.95 lakh/quintals.

Similarly, the study the utilization of NPK fertilizer and technical-grade pesticides in India. In the year 2019-2020, NPK fertilizer consumption reached 28969.60 thousand/tonnes, a figure akin to 26590.90 thousand/tonnes noted in 2017-2018, which aligned with Pathania *et al.* (2020) findings. The research uncovered a deviation of 3.25 thousand/tonnes in pesticide consumption for the year 2017-2018 compared to Pathania *et al.*'s outcomes.

Highlighting agricultural inputs, the study portrayed an escalating trend in the usage of Urea, DAP, and MOP fertilizers over the study period. NPK fertilizer consumption displayed a consistent upward trajectory throughout the 18-year analysis in Jammu & Kashmir. Similarly, technical-grade pesticide usage displayed a rising pattern over the study period.

Forecasts were also part of the study, predicting that certified cereal-quality seed distribution would reach 247.50 lakh/quintals by the year 2029-2030. NPK fertilizer consumption was projected to reach 23136.58 thousand tonnes, while technical grade pesticide consumption was estimated to be 153.45 thousand tonnes, based on a cubic model.

When agricultural inputs for paddy cultivation in Jammu district, the study found that farmers expended Rs 3246.60/ha on seeds, Rs 3830.5/ha on fertilizer, Rs 1454.22/ha on FYM, and Rs 1967.30/ha on pesticides. These figures echoed findings from Rather's (2014) study on "Economic Analysis of Paddy Cultivation in Jammu & Kashmir State," which reported expenses of Rs 2105/ha on seeds, Rs 5000/ha on fertilizer, Rs 3237.5/ha on FYM, and Rs 1010/ha on pesticides. A comparative analysis exposed disparity: the current study revealed higher seed expenditure by Rs 1141.6/ha, decreased fertilizer costs by Rs 1169.5/ha, reduced FYM expenses by Rs 1792.28/ha, and greater pesticide spending by Rs 957.3/ha.

The exploration extended to wheat cultivation in Jammu district, where seed expenditure amounted to Rs 2154.13/ha, FYM at Rs 1465.04/ha, and fertilizers at Rs 4372.82/ha (with a cumulative Rs 5837.86/ha for FYM and fertilizers). Pesticide costs for wheat were Rs 3158/ha. Comparable results emerged in Singh *et al.* (2017) study on "Economic Analysis of Costs and Returns of Wheat in Jammu District of J&K State," which recorded Rs 2743.97/ha on seeds, Rs 4587.92/ha on FYM and fertilizers, and Rs 1137.76/ha on pesticides. Notably, contrasts surfaced: the present study unveiled lower seed costs by Rs 589.84/ha, augmented FYM and fertilizer expenses by Rs 1249.94/ha, and elevated pesticide outlays by Rs 2020.24/ha.

Conclusively, the research underscored a predominant investment in fertilizer over other inputs by Jammu district farmers in paddy and wheat cultivation. Moreover, a propensity towards underutilizing urea and Zn fertilizer was observed in the study area.

6.2 To find out the market share of various brands of agricultural inputs in the Jammu district

The investigation delved into the distribution of market shares within the sectors of urea, DAP, MOP, paddy, wheat, weedicide, fungicide, and insecticides. The results

unveiled that IFFCO had established itself as the dominant player in the urea and DAP markets. In contrast, the majority of the share in the MOP market was firmly held by IPL. When it came to the paddy sector, Diamond Company emerged as the predominant contender, while in the wheat domain, Yamuna Seeds had secured the lion's share.

Shifting the focus to the realm of pesticides, Bayer emerged as a formidable force, captured a substantial 11.26% of the weedicide market. Impressively, Bayer replicated this success in the fungicide segment, amassing a significant share of 10.19%. In the case of insecticides, Bayer once again demonstrated its prowess, commanding a major stake of 12.69%, based on input from retailers.

Interestingly, these outcomes paralleled the findings of a research study conducted by Amit (2019), titled "Analysis of Market Share and Promotional Approaches of Pesticide Companies for Vegetable Crops in Jammu District." This study mirrored the dominance of Bayer in the weedicide market, where it secured a robust 17.27% share. Similarly, Indo Fil emerged as the leader in the fungicide sector, boasting a noteworthy 17.38% share. Bayer's dominance persisted in the insecticide category as well, with a significant majority share of 14.11%, as reported by retailers.

In essence, these results paint a consistent picture of certain key players strategically dominating their respective markets, showcasing their influence and effectiveness across multiple sectors. The undeniable market stronghold of companies like IFFCO, IPL, Diamond Company, Yamuna Seeds, and Bayer highlights their successful strategies in capturing the attention and preference of both consumers and retailers alike.

6.3 To analyze the factors influencing the brand choice and promotional approaches used by the Agri input companies

The conducted study has revealed that four pivotal factors greatly impact the decision-making process for choosing agricultural inputs in the Jammu district. These factors include product attributes, branding and pricing, packaging and labeling, as well as promotion and advertisements. This correlation is reinforced by a similar study conducted by Amit (2019), which investigated the analysis of market share and promotional strategies employed by pesticide companies specifically for vegetable crops within the Jammu district.

The findings from both studies converge to highlight the influential role of certain factors in shaping brand preferences among farmers. In particular, the resonance between the two studies becomes apparent in several areas. Firstly, the influence of recommendations from other farmers and retailers, as well as reviews for specific agricultural input brands, significantly aligns with the promotion and advertisement factor identified in the research. The weight attributed to these sources of guidance reinforces the credibility and impact of word-of-mouth and informed opinions in the decision-making process.

Similarly, the significance of brand popularity and competitive pricing echoes the observations made under the branding and pricing factor. This validates the notion that pricing, along with brand image, holds substantial sway over the selection of a particular agricultural input brand. The idea that price and brand image play pivotal roles in influencing preferences is corroborated by the research findings.

Furthermore, the concept of timely availability resonates well with the attributes of the product factor. The ease of access to these agricultural inputs emerges as a decisive factor, affirming the role of availability in brand selection.

In terms of promotional strategies, the study underscores the profound impact of banners and posters. This observation strongly corresponds with the promotional activities factor, highlighting that banners and posters exert the most significant influence on farmers' purchasing decisions. This alignment between the two studies further underscores the potency of visual advertisements in shaping preferences.

Moreover, the research indicates that the retail trade's influence on promotional activities resonates deeply with the findings in Amit (2019) study. The prominence of the retail trade's role in influencing promotional efforts on farmers' purchases indicates a consistent trend in the region.

Notably, the research study indicates that frequent visits by company representatives hold substantial sway over promotional activities for distributors and retailers. This underscores the significance of personal engagement and relationships in bolstering promotional activities in the agricultural input sector.

SUMMARY AND CONCLUSIONS

The project entitled “**A Study on Consumption of Agricultural Inputs and Analysis of Market Share of Agri Input Companies for Cereal Crops in Jammu District**” was conducted in Jammu District during the year 2022-2023. A total sample of 60 respondents (30 each from a total of two villages) farmers of Paddy and Wheat were taken for the study of consumption of agricultural inputs in cereal crops and for to find out the market share total of 10 retailers were taken 5 from each block of the study area and a total of 10 distributors was taken from Jammu district to conduct the study.

The data were subjected to analysis for examining the objectives of the investigation namely to observe the consumption pattern of agricultural inputs in Cereal crops, to find out the market share of various brands of agricultural inputs in Jammu district and to analyze the factor influencing the brand choice and promotional approaches used by the Agri-input companies. The findings of the present study have been briefly summarized in this chapter.

7.1 To observe the consumption pattern of agricultural inputs in Cereal crops

According to the study, consumption of urea, DAP, and MOP increased from 1999 to 2000 to 2021 to 2022, respectively, with respective CAGRs of 2.30%, 1.27%, and 0.68%. Consumption of NPK fertiliser increased from 1986 to 1987 to 2019 to 2020 with a CAGR of 3.30%, and consumption of technical grade pesticide increased from 1985 to 1986 to 2019 to 2020 with a CAGR of 0.49%. NPK usage increased in Jammu and Kashmir from 2004–05 to 2021–2022 with a CAGR of 2.63%, and pesticide consumption climbed from 2014–15 to 2021–2022 with a CAGR of 9.89%. Through the use of secondary data and the Cubic model, the consumption of seeds, pesticides, and fertiliser has been predicted. A maximum of 41.67% of farmers were in the 50 to 60 age range, the bulk of them had 0 to 5 family members, 30.00% had 30 to 40 years of farming experience, 55% had nuclear families, and 48.33% had a middle-level education. The majority of the money that farmers in the Jammu district spend on inputs

for the growing of wheat and paddy goes towards fertiliser. Jammu's farmers underutilize fertilisers for the majority of the time.

7.2 To find out the market share of various brands of agricultural inputs in the Jammu district

The market for urea and DAP is dominated by IFFCO, as MOP IPL owns the majority of the market share. The Bayer firm dominates the weedicide, fungicide, and insecticide markets. According to the retailers and distributors, Diamond Company and Yamuna Seeds have the majority of the market share for rice and wheat seeds, respectively.

7.3 To analyze the factors influencing the brand choice and promotional approaches used by the Agri input companies

Product characteristics, Branding & Pricing, Packaging & Labelling, and Promotion & Advertisements are elements that affect farmers' brand preferences, according to the SPSS study. Farmers are most influenced by banners and posters used in promotional activities for the sale of agri-inputs, while retailers and distributors are most influenced by frequent visits from company representatives used in promotional activities for the sale of agri-inputs.

Conclusion

The present study was carried out with the main aim to study A Study on Consumption of Agricultural Inputs and Analysis of market share of Agri-input Companies for cereal crops in Jammu district. According to the findings of the research,

- It has been noticed from the study that input use has expanded to a large extent during the study period and shows an increasing trend in the consumption of most of the agricultural inputs like certified/quality seeds, fertilizers and pesticides. Furthermore, it can be suggested from the study that agricultural inputs have a huge potential to scale up and maximise agricultural productivity in the country.
- Majority of the farmers from Jammu district are not using FYM, MOP, Zn and post-emergence pesticides as input in their crops. Also, they are underusing

fertilizers as per recommendations. The Jammu district farmers are spending the majority of their money on fertilizer.

- IFFCO is having the major share in Urea & DAP market, for the MOP IPL holds the majority of the share. Bayer company holds the majority of share in weedicides, fungicides and insecticides. For the paddy seed Diamond company and for the wheat Yamuna seeds have the majority of share as per the retailers and distributors.
- Branding & Pricing, Packaging and Labelling, and Promotion & Advertisements are factors that influence the brand choice of farmers.

Recommendations

- In India agri-input market was growing with a good CAGR and in future, the agri-input market will grow to a great extent. So, India has to improve their infrastructure and marketing channels.
- Jammu district of J&K has potential opportunities for Agri-input companies to increase their market share by promoting their brands aggressively among farmers.
- Farmers need to be educated through publicity or propaganda for the optimal use of Agri-inputs because the farmers of Jammu district are underutilizing fertilizers than the recommended dosage.
- Diploma in Agri input handling should be made a mandatory course by the government for retail traders to undertake agri inputs business.
- Branding & Pricing, Packaging and Labelling, and Promotion & Advertisements were factors that influence the brand choice of farmers. So, the company should focus on these four factors to grow in Jammu agri-input market.

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**Sher- e- Kashmir University of Agricultural Sciences and Technology,
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Division of Agricultural Economics and ABM

Survey Schedule for Data Collection of MBA (ABM) Research Problem

**A STUDY ON COMSUMPTION OF AGRICULTURAL INPUTS AND ANALYSIS OF
MARKET SHARE OF AGRI INPUT COMPANIES FOR CEREAL CROPS IN JAMMU
DISTRICT**

SCHEDULE FOR FARMER

Sr. No: _____ Village: _____ Block: _____ Date: _____

**I. SOCIO-DEMOGRAPHIC PROFILE OF THE RESPONDENT AND BASE LINE
DATA**

1. Name of the farmer :
2. Father's name :
3. Age (years) :
4. Marital Status : Married/ Un-married/Single
5. No of family members :

6. Education/Qualification :
7. Sex : Male/Female
8. Telephone/ Mobile no. :
9. Occupation :
 - a. Main :
 - b. Subsidiary :

10. Family composition:

Age	Male	Female	Higher Education	Income/Year	Source of income
0-15					
15-30					
30-45					
45-60					
Above 60					

11. Landholding of respondents

S. No.	Land Holding (Hectare)	Response
1.	Marginal farmers (1 – 2.5 Hectare)	
2.	Small farmers (2.5 – 5 Hectare)	
3.	Medium farmers (5 – 10 Hectare)	
4.	Large farmers (More than 10 Hectare)	

12. Years of experience in the farming of respondent farmers

S. No.	Experience (In Years)	Response
1.	Less than 10	
2.	10-20	
3.	21-30	
4.	More than 30	

13. Name and quantity of seeds given per crop per season by the sample respondents

S. No.	Crop	Seed rate per hac.	Price per kg

14. Name and Number of Fertilizers given per crop per season by the sample respondents

S. No.	Crop	No. of Sprays /Applications	Price per unit

15. Name and Number of pesticides sprays given per crop per season by the sample respondents

S. No.	Crop	No. of Sprays/Applications	Price perunit

16. Rank the following Promotional activities used by companies (1-13)

S.no.	Attributes	Ranking
1.	Frequent visit of company representative	
2.	On farm demonstration	
3.	Farmer meetings	
4.	Kisan mela /Agri fairs	
5.	Kisan call center	
6.	Wall paintings	
7.	Banners/ Posters	
8.	Handouts/ Pamphlets	
9.	Radio	
10.	Local papers	
11.	Tv ads	
12.	Social media (Facebook, YouTube)	
13.	Agri Tv channels (DD Kisan)	

17. Why farmers are choosing the brand

S.No	Statement	Highly Disagree	Disagree	Neutral	Agree	Highly Agree
1	Shelf life of a product					
2	Brand providing more subsidy is chosen more by the consumer					
3	Advertisement influences my purchase decision of the Agri-input brand					
4	Country of origin influences the selection of brand					
5	Ease of availability has a significant role in choosing a brand					
6	I prefer to buy only certified Agri-input brands among all other brands					
7	Ease of application influences the selection of brand					
8	I prefer to buy a brand whose packaging is easy to handle					
9	I prefer to buy brands on the basis of detailed labeling					

10	Magazine, brochures, and information sources affect my purchase decision of Agri input brand					
11	I prefer to buy a brand that has different pack sizes					
12	Brand image plays an important role in the selection of a brand					
13	Price is one of the reasons for choosing a brand					
14	The brand has a significant influence on my purchase decision					
15	Price makes a significant influence on my brand preference					
16	I believe that my preferred brand gives the best quality as compared to other brands					
17	I use a particular Agri input brand always					
18	Product efficiency plays an important role in choosing a brand					
19	Resistant to climatic conditions has a significant role in choosing a brand					
20	Eco-friendly product plays an important role in the selection of an Input					
21	Environmental effect on storage					
22	Recommendations from other farmers					
23	Reviews for specific Agri-input brand influences my brand choice					
24	Recommendation from Retailers					

SCHEDULE FOR RETAILER/DISTRIBUTORS

Sr. No: _____ Village: _____ Block: _____ Date: _____

**II. SOCIO-DEMOGRAPHIC PROFILE OF THE RESPONDENT
AND BASE LINEDATA**

1. Name of the Retailer :
2. Father's name :
3. Age (years) :
4. Marital Status : Married/ Un-married/ Single
5. Sex : Male/Female
6. Telephone/ Mobile no. :
7. Occupation :
 - i) Main :
 - ii) Subsidiary :
8. What is the highest grade in School/College you have completed?
9. No of family members :
10. Family composition:

Age	Male	Female	Highest Education	Income/Year	Source of income
0-15					
15-30					
30-45					
45-60					
Above 60					

11. Type of Agri-inputs you are dealing with

- i) Pesticide ()
- ii) Seeds ()
- iii) Fertilizers ()
- iv) Farm Equipment ()

12. The market share of different brands Seed Companies in Jammu district-

S.No.	Brand Name	Companies	Average sales/Retailer/Year (Rs Lakhs)	Percentage Share

13. Market share of different brands of fertilizer in Jammu district-

S.No.	Brand name	Companies	Average sales/ retailer/year (Rs. Lakhs)	Percentage share

14. Markets share of different brands of Pesticides in Jammu district-

S.No.	Brand name	Companies	Average sales/ retailer/year (Rs. Lakhs)	Percentage share

15. Rank the following Promotional activities used by companies (1-13)

S.No.	Attributes	Ranking
1.	Frequent visit of company representative	
2.	On farm demonstration	
3.	Farmer meetings	
4.	Kisan mela /Agri fairs	
5.	Kisan call center	
6.	Wall paintings	
7.	Banners/ Posters	
8.	Handouts/ Pamphlets	
9.	Radio	
10.	Local papers	
11.	Tv ads	
12.	Social media (Facebook, YouTube)	
13.	Agri Tv channels (DD Kisan)	
Response		

APPENDIX

Appendices 3- Block wise area of cultivation under paddy and wheat crops

S. No	Block	Paddy	Wheat
1	Akhnoor	320	3700
2	Maira Mandrian	64	1552
3	Bhalwal Brahmana	1493	4500
4	Chowki Choura	20	1084
5	Khour	2885	5700
6	Samwan	451	780
7	Kharah Balli	8	1852
8	Pargwal	2559	2800
9	RS Pura	5020	5777
10	Bishnah	5447	4842
11	Arnia	4665	3950
12	Miran Sahib	1500	1530
13	Suchetgarh	9989	7340
14	Dansal	0	2250
15	Nagrota	113	2908
16	Satwari	167	866
17	Marh	7357	8498
18	Mandal	3754	3420
19	Bhalwal	757	3852
20	Mathwar	102	2650
	Total	46671	69851

Source- Department of Agriculture, J&K (2022)

CERTIFICATE-IV

Certified that all necessary corrections as suggested by the external examiner and advisory committee have been duly incorporated in the project entitled "A study on Consumption of Agricultural Inputs and Analysis of Market Share of Agri Input Companies for Cereal Crops in Jammu District", submitted by Mr. Shagun Thakur, Registration No. J-21-M-92-ABM.



Dr. Anil Bhat
Major Advisor

Place: **Jammu**

Date: 12/10/2023



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