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Socio-economic determinants and constraints in buying insecticides: Empirical study of farmers in Kurnool district of Andhra Pradesh

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Abstract

Agriculture continues to be a key sector in the Indian economy, with insecticides playing a crucial role in protecting crops and enhancing productivity. This empirical study, conducted in Kurnool district of Andhra Pradesh with a sample of 200 farmers, unearths the socio-economic determinants and the constraints farmers face in buying insecticides. Using a descriptive cross-sectional design and multistage random sampling method, data were collected through structured interviews from a representative sample of 200 farmers. The findings revealed that the major five constraints faced by farmers include high prices of insecticides, poor product quality, lack of discounts, fear of adulteration, and limited product availability. These challenges indicate ongoing concerns regarding affordability, authenticity, and access to reliable agricultural inputs. Actionable recommendations of enhancing dealer networks, promoting peer learning, building trust of farmers and ensuring consistent product performance can positively impact farmer decision-making. Simultaneously, addressing key barriers such as pricing, quality assurance, and timely availability is essential to encourage wider adoption and effective usage of insecticides. The insights from this research can inform agrochemical companies, policymakers, and extension services in developing farmer-centric strategies that support sustainable and efficient agricultural practices.

Keywords: Agricultural inputs, agrochemicals, farmer constraints, insecticide, pesticide usage

Introduction

Agriculture continues to serve as a fundamental pillar of the Indian economy, contributing around 15% to the Gross Value Added (GVA) during the fiscal year 2022-23, marking a significant decline from approximately 35% in 1990-91. The agrochemical sector, comprising pesticides, herbicides, and fertilizers, plays a pivotal role in augmenting agricultural productivity by protecting crops from pests and improving soil fertility. The Indian agrochemical market, which includes insecticides as a major segment, was valued at approximately USD 6 billion in 2022 and is projected to grow at a compound annual growth rate (CAGR) of 8.5% between 2023 and 2028, potentially reaching USD 9.82 billion by 2028. As the global population continues to grow, the demand for food and agricultural output rises correspondingly. Advances in agricultural technologies, such as the development of high-yielding varieties and hybrids, have made crops more susceptible to pests and diseases. Among the various factors affecting crop health, damage caused by insects surpasses that from pathogens and weeds. Farmers have increasingly recognized the essential role of insecticides in controlling pest infestations and diseases, making their use an integral component of modern crop production. Pesticides, including insecticides, herbicides, fungicides, nematicides, and other plant protection chemicals, are crucial for enhancing agricultural productivity and ensuring successful harvests.

Review of literature

A thorough analysis of the available published literature shows that farmers face several constraints for purchase of insecticides.

Sahu and Singh (2017) [16] focused on post-application hygiene practices among sesame and groundnut farmers. Results indicated that 42% washed hands with plain water, 36% used soap, while 22% did not wash at all. Unsafe practices were linked to water scarcity and lack of awareness.

Patel *et al.* (2017) [11] documented that 95.5% of farmers in Banaskantha, Gujarat, faced high input costs. Other major issues included poor quality and non-availability during peak times. Suggestions included establishing local fertilizer depots and pricing reforms.

Chauhan and Patel (2018) [4] reported that 83% of farmers in Mehsana faced credit shortages. A lack of technical guidance (65%) and inappropriate packaging sizes (58%) were also significant constraints. Recommendations included agro-service center expansion and seasonal interest-free credit.

Patel and Joshi (2018) [12] found that 57% of oilseed farmers

in Rajkot and Jamnagar sprayed insecticides in the early morning, while 32% preferred evening due to temperature considerations. Timing choices were largely based on tradition and crop growth stages.

Thakor *et al.* (2019) [19] identified that 92.4% of farmers in Junagadh perceived high insecticide prices as a major constraint. In addition, 68.5% complained of non-availability during pest outbreaks, and 57.2% about adulterated products. Suggestions included training, rural depots, and insecticides on credit.

Kumar and Meena (2019) [6] highlighted that over 50% of sesame and cotton farmers in Surendranagar did not use any protective gear. Only 10% used gloves and 22% masks. Reasons cited included discomfort, lack of access, and unawareness.

Momin and Shaikh (2019) [9] examined pesticide purchase decisions in Vadodara, Gujarat. Among the findings, 80% sourced pesticides from company dealers and 70% bought on credit. Factors influencing purchase included price, brand image, yield performance, and dealer relationship.

Pravin *et al.* (2020) [13] evaluated herbicide buying behaviour and satisfaction in Gujarat. Using multiple regression and Likert scale, they found that brand image, experience, and crop area significantly influenced satisfaction. While most farmers were satisfied with quality, satisfaction with pricing and advertisement was mixed.

Rathod *et al.* (2020) [14] found that 49% of farmers in Amreli and Bhavnagar districts mixed insecticides with bare hands. Lack of training and access to proper tools were cited as key issues. The study recommended distribution of low-cost mixing tools and safety education.

Kumar *et al.* (2022) [7] conducted a study to examine the key constraints faced by vegetable growers in the purchase and use of pesticides. The study revealed that unawareness about the harmful effects of agrochemicals on human health was the most critical constraint, followed by limited availability and lack of updated usage practices. Improper disposal of pesticide containers also emerged as a concern. These findings support the present research by highlighting knowledge gaps and accessibility issues affecting pesticide use among farmers.

Singh *et al.* (2022) [18] highlighted production and marketing issues among sesame and mustard growers, such as limited irrigation, insufficient seed quality, poor storage facilities, and lack of credit. Their study emphasized the importance of improved infrastructure and farmer training to overcome these constraints.

Ladumor *et al.* (2023) [8] investigated fertiliser buying behaviour in Kheda district. All 100 participants used fertiliser in rice crops, with 41% cultivating 2.01-4 acres. Monthly income ranged from ₹20,001-30,000, and 13% were graduates, reflecting moderate education and income levels.

Sahoo and Dudhagara (2023) [15] studied the purchasing behaviour and problems faced by both farmers and dealers concerning insecticides in Keshod taluka, Junagadh district. Their study pointed out issues like delayed availability, counterfeit products, and inadequate after-sales service, which influenced both farmer trust and satisfaction levels.

Paghadar and Thakkar (2023) [10] conducted a study in Jamnagar district, Gujarat, to assess farmers' awareness, buying behaviour, and challenges related to insecticide use in sesame cultivation. Based on responses from 120 farmers, the study found that while farmers were knowledgeable about dosages and bio-pesticides, they lacked awareness of sprayer types, brands, and timing of application. Purchase decisions were mainly influenced by past experience, dealer recommendations, and brand image. Key constraints included high prices, lack of discounts, poor quality, adulteration concerns, and limited availability, aligning with the focus of present research work on farmer behaviour and purchase challenges.

Chaudhari and Thakkar (2023) [3] reported interesting insights based on their landmark study on influencing factors and farmers' constraints for improved planting material in Jhabua District of Madhya Pradesh. Based on a survey of 100 farmers selected through purposive sampling method, they found that majority of the farmers were using previous years' produced material for seed purpose and commercial nurseries was the major source of seedling procurement. Major constraints faced by the farmers in getting quality planting material were high price, unavailability of range of variety, late delivery, non-uniform seedling, and inadequate variety of seed.

Dabhi and Thakkar (2024) [5] found that most of the farmers got aware about fungicides from agro service centre and the most influencing factors for purchase of fungicides were found to be dealer recommendation followed by past experience and price. Constraints faced by most of the farmers were high cost of fungicides followed by lack of technical knowledge.

Zapda and Thakkar (2024) [20] in their landmark study on awareness and purchasing behaviour of farmers towards insecticides for sesamum crop in Saurashtra region of Gujarat reported that farmers' brand preferences for specific insecticides were influenced by competitive pricing, past experiences, and the opinions of progressive farmers. Price sensitivity was significant, leading farmers to switch brands when prices were high, products were unavailable, or credit facilities were lacking. It was also found that farmers' choices were also strongly influenced by farmer meetings and field demonstrations.

Bhalodiya and Thakkar (2024) [1] reported that farmers' brand preferences were mainly influenced by dealers' recommendation. Higher prices and fear of adulteration were found to be the main constraints perceived by farmers in the purchase of cotton pesticides.

Chaudhari *et al.* (2025) [2] conducted empirical research work, utilizing the published theoretical literature and descriptive cross-sectional research design, and examined the constraints faced by farmers in procurement and production of hybrid pearl millet seeds. A total of 200 farmers were selected across four talukas of North Gujarat region using a multistage random sampling approach and surveyed using a structured interview schedule. The results revealed that the top most five constraints faced by farmers were high price of the seeds, concerns about seed authenticity, inadequate credit access, fear of spurious products and lack of technical knowledge; highlighting that economic barriers, product authenticity concerns, and limited access to knowledge and resources significantly affect hybrid seed adoption among farmers.

Sanapala *et al.* (2025) [17] conducted empirical investigation in the Siddipet district of Telangana to identify the major challenges faced by farmers in purchasing biofertilizers. The

results revealed that lack of technical knowledge was the most significant constraint, followed by higher price and timely unavailability of the product. Other issues included concerns about product quality, fear of adulteration, and lack of credit access. Dealer support and packaging size were considered less critical.

In nutshell, there have been plethora of research studies highlighting the constraints faced by farmers while making purchase decision for insecticides for different crops. But, there is a dearth of empirical research on assessment of socio-economic determinants of farmers and perceived constraints in buying insecticides, particularly in Andhra Pradesh; and this study is a sincere attempt to fill that void.

Materials and Methods

The study was carried out with the following Research Objectives

- To explore the socio-economic determinants of farmers.
- To identify the constraints faced by farmers while purchasing insecticides.

The present study employed a descriptive cross-sectional design to explore the research objectives. Kurnool district in Andhra Pradesh was intentionally chosen as the study location due to its active agricultural practices and extensive use of insecticides in farming. Primary information was obtained through a structured interview schedule by engaging with farmers directly. To complement the findings, secondary data were gathered from journals, official reports, books, and credible websites. A multistage sampling method was employed for the selection of respondents. In total, 200 farmers were chosen to participate in the research.

Sampling Plan

In the first stage, Kurnool district of Andhra Pradesh was selected purposively due to its significant agricultural activity and widespread use of insecticides.

In the second stage, four talukas were randomly selected out of the 26 talukas in the district.

In the third stage, five villages were randomly chosen from each of the selected talukas.

Finally, in the fourth stage, ten farmers were randomly selected from each village. This multistage random sampling method resulted in a total sample size of 200 farmers for the study.

Sample Size

In this study total 200 farmers were selected from the Kurnool district of Andhra Pradesh state.

Table 1: Sampling Plan

District (Stage I)	Name of Taluka (Stage II)	No. of Villages (Stage III)	No. of farmers from each village (Stage IV)	Total no. of farmers
Kurnool	Kurnool	5	10	50
	Kodumur	5	10	50
	Yemmiganur	5	10	50
	Adoni	5	10	50
Total	4	20	40	200

Analytical tool

For analysis, both descriptive and statistical techniques were employed, including the use of averages, percentages, and the Garrett Ranking method to assess and prioritize the constraints faced by farmers in purchasing insecticides.

Henry Garrett Ranking Method

The Garrett ranking technique was used to explore constraints as perceived by farmers in buying insecticides.

In Garrett ranking technique, per cent position was calculated using following formula.

Percent position = 100 (Rij - 0.5)/ Nj

Where,

Rij = Rank given for the ith variable by jth respondents

Nj = Number of variables ranked by jth respondents

In the Garrett's ranking technique, the per cent positions were converted into scores. Thus, for each factor the scores of the various respondents were added and then mean values were estimated. The attribute with the highest value was considered as the most important one and the other follow in order.

Results and Discussion

Socio-economic characteristics of farmers

Table 2: Socio-economic characteristics of farmers (n=200)

Variables	Parameters	Frequency	Percentage (%)
Gender	Male	189	94.5
	Female	11	5.5
Age (in years)	18 - 30	22	11
	31 - 40	68	34
	41 - 50	72	36
	Above 50	38	19
Education level	Below SSC	49	24.5
	SSC	56	28
	HSC	85	42.5
	Graduate	8	4
	Post Graduate	2	1
	Any Other	0	0
Farming experience (years)	Below 5 years	42	21

	5 - 10 years	66	33
	11 - 15 years	78	39
	Above 15 years	14	7
Occupation of farmers	Farming	110	55
	Farming + Animal Husbandry	50	25
	Farming + Service	28	14
	Farming + Business	12	6
Land holding size (ha)	Marginal (up - 1 ha)	84	42
	Small (1.01 - 2 ha)	63	31.5
	Medium (2.01-4 ha)	45	22.5
	Large (more than 4 ha)	8	4
Type of farming	Irrigated	189	94.5
	Rainfed	11	5.5
Annual income of farmers (Rs.)	Below 1,00,000	47	23.5
	1,00,000 - 2,00,000	69	34.5
	2,00,001 - 3,00,000	59	29.5
	3,00,001 - 4,00,000	20	10
	Above 4,00,000	5	2.5

Out of 200 farmers, the majority (94.5%) were male, showing low female participation in farming. Most farmers were middle-aged, with 36% aged 41-50 and 34% aged 31-40. Only 11% were between 18-30 years. In education, 42.5% had studied up to HSC, while very few (5%) were graduates or postgraduates. Farming experience was mainly between 5-15 years, with 39% having 11-15 years and 33% having 5-10 years. About 55% depended solely on farming, while others combined it with animal husbandry (25%), service (14%), or business (6%). Landholding was mostly marginal (42%) and small (31.5%), with only 4% having large holdings. The majority (94.5%) practiced irrigated farming. Annual income ranged mostly between ₹1,00,001-₹3,00,000 for 64% of farmers. Only 23.5% earned below ₹1,00,000 and 12.5% earned more than ₹3,00,000.

Constraints faced by farmers while purchasing insecticides

Table 3: Percent Position and Garret Value (n=200)

Sr. No	Rank	100 (Rij - 0.5)/Nj	Percent position value	Garette value
1	1	100(1-0.5)/8	6.25	80
2	2	100(2-0.5)/8	18.75	68
3	3	100(3-0.5)/8	31.25	60
4	4	100(4-0.5)/8	43.75	53
5	5	100(5-0.5)/8	56.25	47
6	6	100(6-0.5)/8	68.75	40
7	7	100(7-0.5)/8	81.25	32
8	8	100(8-0.5)/8	93.75	20

The table depicts the transformation of rank data into Garrett scores to identify the most significant constraints based on respondent preferences. Each rank was converted into a percent position using the formula 100(Rij - 0.5)/Nj, where *Rij* is the rank given for the i-th factor by the j-th individual, and *Nj* is the total number of factors ranked. These percent positions were then converted into Garrett scores using standard Garrett's Table. A higher Garrett value indicates greater importance or severity of the factor as perceived by respondents. In this case, the factor ranked 1st received the highest Garrett score (80), suggesting it was the most critical among all, whereas the 8th rank had the lowest score (20), indicating least importance.

Table 4: Ranks given by farmers to each factor and garret score calculation (n=200)

Constraints faced by farmers	1st* 80	2nd* 68	3rd* 60	4th * 53	5th * 47	6th * 40	7th * 32	8th * 20
Product availability	22 (1760)	25 (1700)	24 (1440)	23 (1219)	32 (1504)	24 (960)	28 (896)	22 (440)
Lack of information on the product on the package regarding the use of insecticides	18 (1440)	22 (1496)	21 (1260)	16 (848)	19 (893)	27 (1080)	31 (992)	46 (920)
High price	45 (3600)	33 (2244)	26 (1560)	24 (1272)	22 (1037)	14 (560)	20 (640)	16 (320)
Fear of adulteration	25 (2000)	26 (1768)	27 (1620)	32 (1696)	28 (1316)	25 (1000)	22 (704)	15 (300)
No discount	29 (2320)	26 (1768)	28 (1680)	29 (1537)	31 (1457)	25 (1000)	16 (512)	16 (320)
Lack of credit availability	20 (1600)	22 (1496)	25 (1500)	28 (1484)	26 (1222)	32 (1280)	28 (896)	19 (380)
Lack of suitable Packaging size	19 (1520)	18 (1224)	22 (1320)	25 (1325)	21 (987)	32 (1280)	34 (1088)	29 (580)
Poor quality of products	31 (2480)	34 (2312)	29 (1740)	27 (1431)	23 (1081)	20 (800)	21 (672)	15 (300)

Among all the constraints, High price emerged as the most critical issue, receiving the highest total Garrett score, indicating that farmers widely perceive insecticides as expensive and cost-prohibitive. This was followed by Poor quality of products and Fear of adulteration, which also received high scores, reflecting concerns about the authenticity and reliability of the products. Constraints like No discount and Lack of credit availability ranked in the middle, suggesting moderate influence on farmers' decisions. On the lower end, Lack of suitable packaging size and Lack of information on the product package received comparatively lower scores, indicating they are less pressing but still relevant issues. Overall, the results highlight price, product quality, and trust as the most significant barriers, suggesting a need for policy intervention, better pricing strategies, and strict quality control measures in the agrochemical market.

Table 5: Constraints faced by farmers while purchasing insecticides

Constrains	Total Garrett Value	Mean	Rank
High Price	11233	56.16	I
Poor quality of products	10816	54.08	II
No discount	10594	52.97	III
Fear of adulteration	10404	52.02	IV
Product availability	9919	49.59	V
Lack of credit availability	9858	49.29	VI
Lack of suitable Packing Size	9324	46.62	VII
Lack of information on the product on the package regarding the use of insecticides	8929	44.64	VIII

Farmers of Kurnool district reported several constraints that they faced during purchase of insecticides (Table 5). Among these, high price was identified as the most critical issue, with a mean score of 56.16, placing it in the first rank. This was followed by poor quality of products comes as the second most constraint, reflecting farmers' concerns about the effectiveness and reliability of the items they buy. The lack of discounts ranked third, indicating that price incentives were important for making products more affordable. Fear of adulteration was the fourth major constraint, showing worries about the authenticity and trustworthiness of products. Product availability was ranked fifth, highlighting challenges related to accessing the required inputs when needed.

Conclusion

The Indian agrochemical market represents a crucial segment of the global agricultural industry, characterized by intense competition and the rapidly evolving needs of farmers. The present study, conducted among 200 farmers, provides valuable insights into the major constraints faced by Indian farmers. The findings revealed that high price emerged as the most significant barrier, followed by poor product quality, lack of discounts, fear of adulteration, and limited product availability. These challenges reflect ongoing issues related to affordability, authenticity, and timely access to agrochemical products. Overall, the study concludes that enhancing farmer trust through reliable dealer networks, peer engagement, and consistent product performance is essential. Simultaneously, addressing key constraints such as pricing, quality assurance, and availability can significantly improve the adoption and usage of agrochemical inputs. These insights can guide agrochemical companies, policymakers, and extension services in designing farmer-centric strategies that promote sustainable agricultural practices and improved productivity.

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