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Socio-economic determinants and buying behaviour of chilli farmers towards insecticides in Rajkot district

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Abstract

The present study investigates the buying behaviour of chilli farmers towards insecticides in Rajkot district of Gujarat. A descriptive research design with an ex post facto approach was employed. Using a multi-stage random sampling technique, 200 chilli farmers were selected from four talukas of Rajkot district. Data were collected through structured interviews and analyzed using percentage analysis and tabular representation. The findings revealed that chilli farming in the region is male-dominated, with the majority of farmers aged between 41-50 years and possessing moderate educational levels. Most respondents were small to semi-medium landholders with medium-sized households and relied on irrigated farming, particularly drip irrigation. Chemical insecticides were overwhelmingly preferred, followed by organic and biopesticides. Insecticide purchases were made frequently weekly or monthly indicating high pest pressure. Local agro-retailers were the dominant source of purchase, with cash and credit as the most common modes of payment. Agro service centres and peer recommendations were the primary sources of information, while digital and formal extension services remained underutilized. The study highlights the urgent need for promoting Integrated Pest Management (IPM), strengthening extension services, encouraging sustainable pest control inputs, improving digital literacy, and revitalizing farmer cooperatives. These measures can collectively reduce pesticide dependency, enhance informed decision-making, and promote environmentally sustainable farming practices.

Keywords: Chilli farmers, socio-economic profile, buying behaviour, insecticides

1. Introduction

Insecticide usage plays a critical role in chilli cultivation, a high-value spice crop extensively grown in India. The Rajkot district of Gujarat is recognized for its substantial contribution to chilli production, where pest infestation is a persistent challenge affecting both yield and profitability (Rao, Reddy, & Prasad, 2019) ^[19, 16]. Farmers' buying behaviour regarding insecticides significantly influences crop protection strategies, economic returns, and environmental sustainability (Kumari & Singh, 2020) ^[23]. Understanding how farmers in Rajkot select, purchase, and apply insecticides provides crucial insights into rural decision-making in agricultural input markets. These choices are shaped by diverse factors such as pest frequency, information availability, financial capacity, market access, and trust in input providers (Patel & Sharma, 2020; Meena, Singh, & Kumari, 2020) ^[14, 12]. In regions like Rajkot where traditional practices coexist with evolving modern techniques these behaviours mirror broader socio-economic and technological transitions in agriculture (Deshmukh & Patil, 2020) ^[5]. Farmers obtain information from various channels such as agro service centers, advertisements, extension services, and peer recommendations. However, informal sources often dominate due to accessibility and familiarity, despite the potential for misinformation (Chatterjee & Ghosh, 2018; Ravichandran & Kannan, 2019) ^[1, 18]. Similarly, the choice of insecticide purchase platform ranging from local retailers and cooperatives to emerging online platforms varies based on convenience, trust, and digital literacy (Choudhary, Meena, & Singh, 2019) ^[3]. With increasing concerns over indiscriminate pesticide usage, pest resistance, and environmental degradation, it is essential to assess how farmers make purchasing decisions. Promoting Integrated Pest Management (IPM) and

sustainable alternatives requires a deeper understanding of existing behaviours (Sharma & Mehta, 2018) [22]. The present study explores the insecticide buying behaviour of chilli farmers in Rajkot, focusing on their purchase frequency, sources of information, preferred payment modes, and trusted distribution channels. This study aims to inform policymakers, agri-input firms, and extension professionals in designing locally relevant and sustainable pest management interventions. The objectives are as follows

- To study the socio-economic profile of chilli farmers
- To find out the buying behaviour of chilli farmers towards insecticides

Research Methodology

Participants

The study was conducted in the Rajkot district of Gujarat, which comprises 14 talukas. Using a multi-stage sampling method, four talukas as Gondal, Jam Kandorana, Dhoraji, and Upleta were randomly selected for the study. From each of these talukas, 5 villages were chosen at random, and 10 chilli-growing farmers from each village were purposively selected, resulting in a total sample size of 200 farmers. The unit of analysis in this study was individual chilli farmers.

Measures

Data for the study were collected using a structured interview schedule specifically designed to address the research objectives. The schedule covered aspects such as the socio-economic characteristics of chilli farmers, their buying behaviour, factors influencing their purchase decisions, and the constraints they face in using insecticides. Primary data were obtained directly through personal interviews with the selected farmers, while secondary data

were sourced from government reports, academic journals, research papers, articles, and relevant company websites to support and enrich the analysis.

Procedure

A descriptive research design was adopted to explore the buying behaviour of chilli farmers, utilizing an ex post facto approach in which variables were observed in their natural settings without any manipulation. This approach is well-suited for social science research, particularly when aiming to describe current conditions and identify potential causal relationships where experimental control is not feasible. The study employed a multi-stage sampling method: in the first stage, four talukas were randomly selected from the Rajkot district; in the second stage, five villages were randomly chosen from each selected taluka; and in the third stage, ten chilli farmers were purposively selected from each village, resulting in a total sample of 200 farmers. Data were collected through personal interviews conducted with the farmers in their respective villages.

Statistical Analysis

To analyze the data and draw meaningful inferences, various statistical tools were employed. Percentage analysis was used to describe the socio-economic characteristics and behavioural patterns of chilli farmers, while tabular and graphical representations helped in organizing and presenting the data clearly. Ranking and Likert scale techniques were applied to measure the attitudes and preferences of farmers regarding insecticide usage. Additionally, the cumulative score method was used to evaluate the relative importance of different influencing factors and constraints faced by the farmers in their buying decisions.

Table 1: Socio-Economic Profile of Chilli Farmers

Gender of Respondents		
Gender	Frequency	Percentage
Male	200	100
Female	0	0
Total	200	100
Age of Respondents (years)		
Age Group (in Years)	Frequency	Percentage
18 - 30	27	13.50
31 - 40	54	27
41 - 50	85	42.50
Above 50	34	17
Total	200	100
Education of Respondents		
Education Level	Frequency	Percentage
Illiterate	20	10
Primary	48	24
SSC	63	31.50
HSC	50	25
Graduate	19	09.50
Post Graduate	00	00.00
Total	200	100
Landholding Size		
Land Holding	Frequency	Percentage
Marginal (up to 1 ha)	32	16
Small (1.01 - 2 ha)	55	27.50
Semi Medium (2.01 - 4 ha)	84	42
Medium (4.01 - 10 ha)	24	12

Large (more than 10 ha)	05	02.50
Total	200	100
Household size		
Household size	Frequency	Percentage
Small (< 4)	31	17.00
Medium (5-6)	90	50.00
Large (> 6)	59	33.00
Total	180	100
Monthly Income		
Annual Income	Frequency	Percentage
Below 1,00,000	38	19
1,00,001 - 2,00,000	72	36
2,00,001 - 4,00,000	59	29.50
4,00,001 - 6,00,000	27	13.50
Above 6,00,000	04	02
Total	200	100
Farming Experience		
Occupation	Frequency	Percentage (%)
Below 5 Years	22	11
5 - 10 Years	44	22
10 - 15 Years	108	54
More than 15 Years	26	13
Total	200	100
Type of Farming		
Types of Farming	Frequency	Percentage
Irrigated	195	97.50
Rainfed	05	02.50
Total	200	100
Method of Irrigation		
Method of Irrigation	Frequency	Percentage
Drip Irrigation	103	52.82
Surface Irrigation	84	43.07
Sprinkler Irrigation	8	04.11
Total	195	100
Occupation of Farmers		
FPC Membership	Frequency	Percentage (%)
Only farming	58	29
Farming + Animal Husbandry (AH)	91	45.50
Farming + Service/Business	41	20.50
Farming + AH + Service/Business	10	05
Total	200	100
Farming Experience in Chilli Farming		
Experience (in years)	Frequency	Percentage (%)
First time	24	12
Below 5 Years	78	39
5 to 10 Years	76	38
More than 10 Years	22	11
Total	200	100
Area under Chilli Cultivation		
Area Under Chilli Cultivation (Hectare)	Frequency	Percentage (%)
Up to 1 Ha	95	47.50
1.01- 2 Ha	68	34
2.01 - 4 Ha	30	15
4.01 - 10 Ha	07	03.50
> 10 Ha	00	00
Total	200	100

The data in Table 1 reveals a comprehensive socio-economic profile of chilli farmers in Rajkot district. The entire respondent pool consisted of male farmers (100%), highlighting the male dominance in agricultural decision-making, a trend observed in other Indian studies as well (Kumari & Singh, 2020) [23]. Age-wise, the majority (42.5%) of the farmers fell in the 41-50 years category, suggesting that chilli farming is largely managed by middle-aged individuals, who are typically more experienced and risk-aware. Regarding education, most farmers had school-level

education, with only 9.5% being graduates and none being postgraduates. This shows moderate literacy levels, similar to findings by Patel and Parmar (2019) [13], where a large portion of horticulture farmers had education below HSC. In terms of landholding, semi-medium (2.01-4 ha) farmers formed the largest group (42%), followed by small and marginal farmers, which is consistent with the landholding patterns in Gujarat as reported by Singh *et al.* (2018) [24]. The majority of households (50%) were medium-sized (5-6 members), which is typical for rural India where joint

families are still common.

Income analysis revealed that 36% of farmers earn between ₹1-2 lakhs annually, and only 2% reported earnings above ₹6 lakhs, indicating that chilli farming is a low to moderate income-generating activity, aligning with Deshmukh and Wankhade's (2020) ^[5] findings on vegetable crop farmers. The farming experience showed that more than half (54%) had 10-15 years of farming experience, suggesting significant exposure to agricultural practices and possibly greater adoption of technology. A striking 97.5% practiced irrigated farming, and within that, 52.82% used drip irrigation, reflecting a positive shift toward efficient water use a trend supported by studies like that of Rao *et al.* (2021) ^[15]. In terms of livelihood, 45.5% were engaged in farming and animal husbandry, highlighting the mixed livelihood strategies often necessary in agrarian communities. Regarding chilli-specific experience, 39% had been cultivating chilli for less than five years, and another 38% had 5-10 years' experience, indicating growing interest in chilli cultivation among relatively new entrants. Lastly, the majority (47.5%) cultivated chilli on less than 1 hectare, underscoring the fragmented nature of landholding even in commercial crops like chilli.

Table 2: Types of Insecticides preferred by farmers in chilli crop

Type of Insecticides Used	Frequency	Rank
Biopesticides	19	III
Organic insecticides	142	II
Chemical insecticides	197	I

The data from Table 2 reveals that the overwhelming majority of chilli farmers (197 out of 200) prefer chemical insecticides, ranking them first in usage. This indicates a strong reliance on conventional pest management methods, likely due to their immediate effectiveness and easy market availability. Organic insecticides were the second most preferred (142 farmers), suggesting that while there is growing awareness and adoption of sustainable alternatives, it remains secondary to chemical options. Biopesticides were the least preferred (19 farmers), despite their eco-friendly nature and safety profile. This pattern reflects findings from earlier studies. For example, Babar *et al.* reported that most Indian vegetable growers favored chemical pesticides due to their quick action and consistent results, despite the long-term environmental risks. Gogoi and Deka observed that limited technical knowledge, higher costs, and lack of availability hinder the adoption of biopesticides, even when farmers are aware of their benefits. Similarly, Patel and Meena (2020) ^[12] noted that although awareness of organic and biological pest control methods is gradually increasing, actual usage remains limited due to insufficient training and lack of policy support. The preference hierarchy shown in this study highlights the need for intensified farmer education and extension efforts to promote integrated pest management (IPM) practices and the use of safer alternatives, balancing productivity with sustainability.

Table 3: Frequency of buying insecticides during the growing season

Frequency of Buying Insecticides	Frequency	Percentage (%)
1 time per season	00	00
2-3 times per season	23	11.50
Weekly	97	48.50

Monthly	80	40
Total	200	100

Table 3 presents the frequency of buying insecticides by chilli farmers during the growing season. The data reveals that none of the farmers reported purchasing insecticides only once per season. A small proportion (11.50%) of the respondents purchased insecticides 2-3 times per season. The majority of farmers indicated more frequent purchase habits, with 48.50% buying insecticides weekly and 40% on a monthly basis. This indicates a high level of dependence on chemical pest control methods throughout the cropping cycle. The dominance of weekly (48.50%) and monthly (40%) purchasing patterns suggests that pest and disease pressure is a persistent challenge for chilli growers, necessitating continuous interventions. Such frequent use may also be attributed to a lack of integrated pest management (IPM) practices or poor awareness about alternative, sustainable pest control techniques. These findings are in line with the results of Kumari and Singh (2020), who observed that vegetable farmers in Bihar applied insecticides on a weekly or biweekly basis to control recurring pest infestations. Similarly, Rao *et al.* (2019) ^[16] found that over 70% of chilli farmers in Andhra Pradesh used insecticides at least twice a month, driven by pest outbreaks and the lack of timely advisory services. The frequent application of insecticides, as shown in these studies, aligns with the current findings, highlighting the widespread reliance on chemical pest control. However, such trends also raise concerns about the sustainability of pest management practices. Over-reliance on insecticides can lead to pest resistance, environmental degradation, and increased input costs. According to Sharma and Mehta (2018) ^[22], farmers with better access to agricultural extension services showed reduced frequency of insecticide use due to improved knowledge of pest life cycles and thresholds for action.

Table 4: Place of buying the insecticides

Place of Buying the Insecticides	Frequency	Percentage
Online platform	30	15
Local retailers	160	80
Farmers' cooperatives	10	05
Total	200	100

Table 4 illustrates the distribution of chilli farmers based on their preferred source for purchasing insecticides. A significant majority (80%) of the respondents reported buying insecticides from local retailers, indicating a strong reliance on easily accessible, nearby agro-input shops. Only 15% of the farmers used online platforms, while a mere 5% purchased through farmers' cooperatives. The dominance of local retailers suggests that proximity, familiarity, and possibly credit availability are major factors influencing purchase decisions. Many farmers may lack trust in or access to digital marketplaces or may be unfamiliar with cooperative structures for input supply. The low engagement with cooperatives highlights an underutilization of collective input procurement mechanisms, which could otherwise offer better prices and quality assurance. These findings are consistent with those of Deshmukh and Patil (2020) ^[5], who reported that over 75% of cotton farmers in Maharashtra preferred local agro-dealers due to convenience and established relationships.

Similarly, Choudhary *et al.* (2019) ^[3] found that although awareness of online agro-input platforms was increasing, actual usage remained low among smallholder farmers due to digital illiteracy and concerns about product authenticity. The minimal use of cooperative societies echoes the observations by Sarkar and Singh (2018) ^[20], who noted structural and operational challenges in many cooperatives, making them less attractive to farmers. Limited inventory, delayed supply, and bureaucratic hurdles were identified as deterrents in cooperative-based procurement systems.

Table 5: Mode of Payment Preferred for buying insecticides

Mode of payment	Frequency	Percentage
Cash only	96	48
Credit only	74	37
Digital Payment	30	15
Total	200	100

Table 5 presents data on the preferred mode of payment used by chilli farmers when purchasing insecticides. The majority of farmers (48%) reported using cash-only as their mode of payment. A significant portion (37%) preferred credit-only purchases, while 15% utilized digital payments. The high reliance on cash indicates that traditional payment practices still dominate agricultural input transactions, especially in rural and semi-urban regions. This may be due to limited access to digital infrastructure, low digital literacy, or a preference for physical transactions that offer immediate closure. The substantial share of credit-based purchases (37%) also highlights the economic vulnerability of many farmers who depend on short-term credit—often extended by local retailers—to meet input needs during the cropping season. The relatively low adoption of digital payment methods (15%) suggests that despite the growing penetration of financial technology in India, barriers such as poor internet connectivity, lack of awareness, or distrust in online systems persist in the agriculture sector. These trends are supported by findings from Kumar and Singh (2021) ^[9], who reported that nearly half of vegetable farmers in Uttar Pradesh relied on cash transactions for input purchases, citing trust and convenience. Verma *et al.* (2019) ^[25] found that about one-third of smallholder farmers preferred credit from agro-dealers due to liquidity constraints and the flexibility it offered during the crop cycle. Meanwhile, Patel and Sharma (2020) ^[12] observed that digital payment adoption remained under 20% among pesticide buyers in Gujarat, primarily due to lack of training and poor mobile network coverage. The high dependence on cash and credit, with minimal digital payment usage, reflects the need for targeted financial literacy campaigns, improved rural banking infrastructure, and trust-building measures to increase digital inclusion among farming communities.

Table 6: Source of Information about Insecticides before making a purchase

Source of Information	Frequency	Rank
Agro Service Centre	178	I
Company representatives	50	V
Trade shows or agricultural fairs	62	IV
Advertisements (TV, radio, print)	66	III
Agricultural extension services	36	VII

Recommendations from other farmers	90	II
Online Research	42	VI

Table 6 presents the various sources from which chilli farmers obtain information about insecticides prior to purchase. The data show that the Agro Service Centre is the most relied upon source, with 178 respondents ranking it first. Recommendations from other farmers ranked second (90 responses), followed by Advertisements (TV, radio, print) (66), Trade shows or agricultural fairs (62), and Company representatives (50). Online research and agricultural extension services were ranked lowest, with only 42 and 36 respondents respectively. The dominance of agro service centres as the primary information source highlights the central role that input dealers and local agro-vendors play in farmers' decision-making processes. These centres are often easily accessible, perceived as trustworthy, and offer product-specific guidance at the point of sale. Furthermore, the influence of peer recommendations from fellow farmers suggests the importance of social networks in shaping on-farm practices, particularly in rural settings where formal advisory systems may be weak. Interestingly, mass media advertisements and agricultural fairs also play a considerable role in disseminating product information. However, the relatively low influence of extension services and online platforms suggests a gap in formal agricultural advisory dissemination and digital literacy among chilli farmers. This underlines the need for strengthening public extension systems and promoting credible digital information platforms.

These observations are in line with the study by Meena *et al.* (2020), who reported that agro-dealers were the most trusted source of pesticide-related information among vegetable farmers in Rajasthan. Ravichandran and Kannan (2019) ^[18] also found that peer learning and farmer-to-farmer interaction significantly influenced crop protection decisions in Tamil Nadu. Similarly, Chatterjee and Ghosh (2018) ^[2] emphasized that despite the growing availability of digital information, limited access and low trust in online sources constrained its use in rural Bengal. The poor performance of agricultural extension services mirrors earlier findings that underfunding, inadequate staffing, and lack of regular contact with farmers diminish the effectiveness of formal agricultural advisory systems.

Suggestions

- **Adopt Integrated Pest Management (IPM):** Frequent insecticide use risks pest resistance and health hazards. Farmers should be trained in IPM, blending chemical and eco-friendly practices (Sharma & Mehta, 2018) ^[22].
- **Use Trusted Information Sources:** Dependence on informal sources can lead to input misuse. Extension services and agro-service centers offer reliable, science-based guidance (Chatterjee & Ghosh, 2018) ^[2].
- **Utilize Digital Platforms cautiously and strategically:** Digital tools can improve access to quality inputs and price transparency. Proper training will ensure safe and effective platform usage by farmers.
- **Shift towards Sustainable Inputs:** Organic insecticides and biopesticides can protect the environment and soil health. Small-scale trials or group procurement can ease the transition to greener options.

- **Form or Strengthen Farmer Cooperatives:** Cooperatives can boost bargaining power and reduce input costs. They also help ensure quality control and limit dependence on informal credit (Sarkar & Singh, 2018)^[20].

Conclusion

The present study provides a comprehensive understanding of the socio-economic characteristics of chilli farmers in Rajkot district and their buying behaviour toward insecticides. The analysis reveals that chilli farming is predominantly male-led and practiced mostly by middle-aged farmers with moderate education levels. A majority of the farmers operate on small to semi-medium landholdings and rely heavily on irrigated farming, particularly using drip irrigation methods. Their income levels suggest that chilli cultivation remains a moderately profitable but economically constrained activity for most. With regard to insecticide use, the findings underscore a strong preference for chemical insecticides, largely driven by their immediate effectiveness and ease of access through local retailers. Despite awareness of organic alternatives and biopesticides, their adoption remains limited due to cost, availability, and lack of technical know-how. Farmers reported frequent purchases—often on a weekly or monthly basis—highlighting a high dependency on chemical solutions for pest management. This purchasing pattern raises concerns about sustainability, input costs, and potential environmental risks. Local agro-dealers and service centres emerged as the most influential information sources, followed by peer recommendations. The low reliance on agricultural extension services and online platforms suggests a gap in formal advisory support and digital inclusion. Cash and credit remained the dominant payment modes, reflecting traditional financial behaviour and liquidity issues among farmers.

Given these insights, the study emphasizes the urgent need for structured interventions, such as training programs on Integrated Pest Management (IPM), improved access to reliable advisory services, promotion of digital literacy, and institutional support for sustainable inputs. Strengthening farmer cooperatives and promoting responsible insecticide use can enhance both economic resilience and environmental sustainability in chilli cultivation.

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