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Insecticide brand preferences and buying behaviour among tobacco farmers in Anand District of Gujarat

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Abstract

Agrochemicals play a crucial role in modern agriculture by protecting crops and enhancing productivity, with insecticides being the most widely used category. India ranks fourth globally in the agrochemical industry, following the United States, Japan, and China, with more than 125 technical grade manufacturers and over 145,000 distributors. Despite this scale, India has the lowest per capita pesticide consumption at just 0.6 kg/ha. This empirical research study was focused on the insecticide brand preferences and buying behaviour among tobacco farmers in Anand District of Gujarat. Utilizing a descriptive cross-sectional research design and multi-stage sampling method, data were collected from 200 tobacco farmers across four talukas through a structured interview schedule. The findings revealed that Bayer was the most preferred insecticide brand among the farmers, followed by Syngenta and UPL. Key factors influencing buying behavior included past experience, product quality, and recommendations from progressive farmers. The major constraints faced by farmers while purchasing insecticides were high product prices, fear of adulteration, and lack of technical knowledge. This study provides insights into the decision-making patterns of tobacco farmers and highlights critical challenges and brand preferences in the agrochemical market.

Keywords: Agrochemicals, insecticides, tobacco farmers, buying behaviour, brand preferences, constraints, product quality

Introduction

Agrochemicals, a collective term for agricultural chemicals, play a critical role in enhancing crop productivity and protecting against pest-related damage. These chemicals include a broad range of pesticides such as insecticides, herbicides, fungicides, nematicides, and rodenticides, along with synthetic fertilizers and plant growth regulators. Among these, insecticides form the largest segment, accounting for nearly 60% of the Indian agrochemical market, reflecting their widespread use in pest-prone crops like paddy, cotton, and tobacco (TechSci Research, 2021) [9]. In a country where pests and diseases destroy nearly 20–25% of the agricultural produce annually, agrochemicals serve as a vital input in ensuring food security and crop profitability (Mohanti, 2021) [5].

India is the fourth-largest producer of agrochemicals globally, following the United States, Japan, and China. the Indian industry comprises approximately 125 technical grade manufacturers, 800 registered formulators, and over 145,000 distributors. Although India is a major exporter of pesticides, accounting for more than 50% of its total agrochemical output, the domestic consumption remains significantly low at just 0.58 kg/ha; much lower than developed countries like the USA (4.5 kg/ha) and Japan (11 kg/ha). Despite this, India holds substantial potential for both domestic expansion and export growth, particularly with the increasing demand for quality food, reduction in arable land, and frequent pest outbreaks.

The demand for agrochemicals, especially insecticides, is higher in crops that are economically valuable and vulnerable to pest attacks. One such crop is tobacco, which is highly sensitive to a variety of insect pests such as caterpillars, whiteflies, and aphids. Gujarat contributes about 45% of India's total tobacco production, with Anand district being one of the most significant production zones due to its favourable black alluvial soil, well-established irrigation systems, and ideal climatic conditions. Insecticides thus play a crucial role in tobacco cultivation, and their application is critical for protecting both yield and quality.

Over the years, the Indian agrochemical industry has witnessed significant changes, including the development of new molecules, increased focus on bio-pesticides, and the introduction of integrated pest management (IPM) strategies. However, challenges such as low R&D investment, distribution inefficiencies, the prevalence of spurious products, and limited farmer awareness continue to affect the sector's growth (Chemical Market Forecast, 2023) [1]. Additionally, long credit cycles, high inventory due to seasonal demand, and environmental concerns related to pesticide use have raised questions about sustainability and regulatory compliance.

This study focuses on the brand preferences and buying behaviour of tobacco farmers in Anand district, aiming to

explore the socio-economic background of farmers, their pesticide usage patterns, influencing factors in brand selection, and the key constraints they face in accessing or using insecticides.

Materials and Methods

Study area

Within Gujarat, Anand district was purposively selected as the research area due to its prominence in tobacco cultivation. The district is widely recognized as a hub for high-quality tobacco production and is home to a significant population of tobacco-growing farmers. The selection of Anand is also justified by the region's favourable agro-climatic conditions—well-drained loamy to clayey soils, moderate rainfall, and warm temperatures—which are highly suitable for tobacco crops. In addition, Anand has a well-established input supply network, active extension services, and accessible agricultural markets, making it a vibrant zone for commercial farming. These factors are crucial for the present study, as they directly influence farmers' exposure to various insecticide brands, their purchasing decisions, and usage patterns.

Research methodology

The study employed a descriptive research design to understand various attributes affecting farmers' behaviour. It involved both primary and secondary data collection methods. Primary data were gathered through structured interviews with 200 farmers from four selected talukas, while secondary data were sourced from company records and relevant literature. multi-stage sampling technique was used, focusing on areas with high tobacco production. Four talukas Anand, Anklav, Borsad and Petlad were selected, and within these, five villages were chosen randomly. In each village, ten farmers were sampled, resulting in a total of 200 participants. Data collection took place between March and May 2025. The analysis used tabular methods and statistical tools such as mean scores, percentages, Likert scales and garrett ranking.

Results and Discussion

Socio-economic profile of tobacco farmers

Table 1: To study the socio-economic profile of tobacco farmers

Variables	Parameters	Frequency	Percentage
Gender	Male	191	95.5
	Female	9	4.5
	21-30	16	8
Age	31-40	51	25.5
	41-50	71	35.5
	Above 50	62	31
Educational qualification	Below SSC	81	40.5
	SSC	32	16
	HSC	61	30.5
	Graduation	15	7.5
	Post-Graduation	4	2
	Any other	7	3.5
Family type	Nuclear	133	66.5
	Joint	67	33.5
Farming experience	Below 5 years	13	6.5
	5-10 years	68	34
	11-15 years	99	49.5
	Above 15 years	20	10
Occupation	Farming only	115	57.5
	Farming + Animal husbandry	31	15.5
	Farming + Service	28	14
	Farming + Business	26	13
Land holding size	Marginal (up to 1 ha)	24	12
	Small (1.01 – 2 ha)	78	39
	Medium (2.01 – 4 ha)	68	34
	Large (more than 4 ha)	30	15
Type of farming	Irrigated	200	200
	Rainfed	0	0
Method of irrigation	Surface	156	78
	Drip	32	16
	Sprinkler	12	6
Annual family income	0 - 1,00,000	15	7.5
	1,00,001 - 2,00,000	34	17
	2,00,001 - 3,00,000	69	34.5
	3,00,001 - 4,00,000	53	26.5
	Above 4,00,000	29	14.5

Out of 200 respondents, a significant majority of farmers are male, comprising 95.5 percent, while only 4.5 percent are female. Age-wise, the largest group of farmers (35.5 percent) falls within the 41–50 years age range, followed by 31 percent who are above 50 years, indicating a mature farming population. Regarding educational qualifications,

40.5 percent of farmers have education below SSC, while 30.5 percent have completed Higher Secondary Certificate (HSC), and only 7.5 percent hold a graduation degree, reflecting a moderate level of education among farmers. Family structure is predominantly nuclear, with 66.5 percent living in nuclear families, while 33.5 percent belong to joint families. When it comes to farming experience, 49.5 percent of farmers have 11–15 years of experience, suggesting a seasoned agricultural workforce. Farming remains the sole occupation for 57.5 percent of respondents, while others combine it with animal husbandry (15.5%), service (14%), or business (13%). Landholding patterns reveal that 39 percent are small farmers owning 1.01–2 hectares of land, followed by 34 percent medium landholders with 2.01–4 hectares. All respondents (100%) practice irrigated farming, showing a complete reliance on irrigation. Among irrigation methods, surface irrigation is most prevalent (78%), followed by drip (16%) and sprinkler systems (6%). Income-wise, the majority of farmers (34.5 percent) fall within the ₹2,00,001–₹3,00,000 annual income range, followed by 26.5 percent earning ₹3,00,001–₹4,00,000. These findings offer a comprehensive view of the demographic and socioeconomic profile of the farming community in the Anand district.

Buying behaviour of tobacco farmers

Most of the farmers (158) preferred purchasing insecticides from local dealers, followed by cooperatives (47), FPOs (32), and online platforms (28). Despite promotional efforts to boost online sales, traditional outlets remain the dominant source due to trust and accessibility. In terms of information sources, farmer meetings played the most influential role, followed by advertisements, progressive farmers, field demonstrations, and agro service centers. This reflects the importance of personal interactions and community-based knowledge sharing in shaping purchase decisions. Regarding payment modes, a significant proportion of farmers preferred credit-only transactions, while others used both cash and credit. Digital payments are gradually emerging, but the majority still rely on traditional methods, highlighting the credit-oriented mindset of rural farmers.

Experience levels also influenced buying behaviour, with most farmers having 6 to 9 years of experience using insecticides, followed by those with 3 to 6 years, and fewer with over 9 or below 3 years of experience. Usage frequency was high, with many farmers applying insecticides five to six times a year or even more frequently. Purchase frequency followed a similar trend, with most farmers buying insecticides three to four times a year, while some made purchases as per need or more than four times annually.

Brand preferences of insecticides

The study found that Bayer was the most well-known insecticide brand among the respondents, with 183 farmers reporting awareness of it. This was followed by Syngenta (135 farmers) and UPL (126 farmers), indicating their strong presence in the market. Other brands such as BASF (97), Tata Rallis (82), PI Industries (75), and Indofil (74) also showed considerable awareness. Moderate recognition was observed for Adama (68), Corteva (64), and Gharda (59), while fewer farmers were aware of Ayushi Crop Science (48), SML (42), and other smaller brands (36). This distribution shows that a few specific brands had higher penetration and visibility among the farming community, while others were known to a limited extent.

In terms of brand preference, Bayer remained the most favored, with 20% of the farmers choosing it as their preferred insecticide brand. Syngenta (13.5%) and UPL (10.5%) were also commonly selected, followed by BASF (9.5%) and Tata Rallis (7.5%). Indofil, Adama, and Corteva were preferred by 7%, 6.5%, and 5.5% of respondents respectively. Ayushi Crop Science and Gharda each accounted for 5% of the preferences, while PI Industries (4.5%) and SML (4%) had relatively lower selection rates. A small percentage (1.5%) mentioned other brands. The data indicates that farmers' brand choices are influenced by familiarity and perceived effectiveness, with a few dominant brands leading both in awareness and preference.

Table 2: Factors influencing farmers' Brand Preference towards insecticides (n= 200)

Factors	SA (5)	A (4)	N (3)	D (2)	SD (1)	CS	Mean	Rank
Quality	78	53	29	23	17	752	3.76	II
Brand loyalty	55	46	38	31	30	665	3.32	VII
Competitive price	82	51	31	19	17	762	3.81	I
Timely availability	65	48	37	22	28	700	3.50	VI
Previous experience	72	62	28	17	21	747	3.73	III
Field officer/dealers influence	69	57	25	23	26	720	3.60	V
Progressive farmers opinion	74	56	26	21	23	737	3.68	IV
Sales promotional activity	38	49	35	42	36	611	3.05	VIII
Advertisement	30	51	33	47	39	586	2.93	IX

Note: Strongly Agree (SA): 5; Agree (A): 4; Neutral (N): 3; Disagree (DA): 2; Strongly Disagree (SD): 1
Cumulative Score (CS) = Maximum Scale × No. of Farmers
Mean = Cumulative Score (CS) / Total No. of Farmers (200)

The analysis of factors influencing farmers' brand preference towards insecticides revealed that competitive pricing was the most influential factor, with the highest mean score of 3.81. This indicates that affordability plays a significant role in shaping farmers' choices. Product quality followed closely with a mean score of 3.76, suggesting that farmers prioritize effective and reliable products. Prior experience with the brand also had a strong impact, reflected by a mean score of 3.73, showing that familiarity and past performance influence repeat purchases. Recommendations from progressive farmers (mean score: 3.68) and influence from field officers or dealers (3.60) were also found to be important in shaping preferences. Timely availability of insecticides had a moderate influence with a mean score of 3.50, indicating that accessibility also affects brand selection. Meanwhile, brand loyalty (3.32), sales promotional activities (3.05), and advertisements (2.93) were less influential compared to other factors. Overall, the findings suggest that economic and performance-related attributes have a greater impact on farmers' brand preferences than promotional or branding efforts.

Factors influencing farmers while buying insecticides

Table 3: Factors that influence Respondents' Buying Behaviour while Buying Insecticides (n= 200)

Factors	HI (5)	I (4)	N (3)	SI (2)	UI (1)	CS	Mean	Rank
Advertisement	45	43	35	43	34	622	3.11	VIII
Brand image of company	65	52	34	32	17	716	3.58	V
Timely availability	49	42	37	45	27	641	3.21	VII
Credit availability	35	38	32	40	27	530	2.65	XII
Price	66	52	39	23	20	721	3.60	IV
Dealers' recommendation	59	61	25	30	25	699	3.49	VI
Packaging size	42	40	34	41	30	584	2.92	IX
Offers/Discounts	37	41	33	36	24	544	2.72	XI
Field demonstration activity	40	39	36	39	28	570	2.85	X
Progressive farmers influence	79	56	29	23	13	765	3.82	II
Past experience	81	59	27	22	11	778	3.89	I
Quality	69	57	24	36	14	731	3.65	III

Note: Highly important: 5; Important: 4; Neutral: 3; Somewhat Important: 2; Unimportant: 1
Cumulative Score (CS) = Maximum Scale × No. of Farmers
Mean = Cumulative Score (CS) / Total No. of Farmers (200)

Table 3 presents the factors influencing farmers' buying behavior towards insecticides. Among all the factors considered, past experience received the highest mean score of 3.89, indicating that previous satisfaction with a product greatly guides future purchasing decisions. The influence of progressive farmers ranked second (mean score: 3.82), emphasizing the importance of peer advice within the farming community. Quality of the product (3.65), competitive pricing (3.60), and the brand image of the company (3.58) also played substantial roles in shaping farmers' preferences. Dealers' recommendations (3.49) and timely availability (3.21) were moderately influential, suggesting that accessibility and local trust also factor into decision-making. In contrast, factors such as advertisement (3.11), packaging size (2.92), field demonstrations (2.85), offers or discounts (2.72), and credit availability (2.65) were found to be less influential.

Constraints faced by tobacco farmers

Table 4: Constraints faced by Respondents while Buying Insecticides

Sr. No.	Constraints	Total Garrett Value	Mean Score	Rank
1	Poor labelling	9519	47.59	VIII
2	High price	10915	54.57	I
3	Fear of adulteration	10619	53.09	II
4	No discount	9698	48.49	VII
5	Lack of credit availability	9866	49.33	VI
6	Unavailability of product	10309	51.54	IV
7	Unavailability of suitable packaging size	10147	50.73	V
8	Lack of technical knowledge	10439	52.19	III

Tobacco farmers faced multiple constraints while purchasing insecticides, with "High Price" emerging as the most critical issue, receiving the highest mean score of 54.57 and ranked first, indicating that affordability was a major concern for the majority. The second most pressing constraint was the "Fear of Adulteration" with a mean score of 53.09, reflecting the widespread issue of fake or substandard products in the market. Ranked third, "Lack of Technical Knowledge" (mean score 52.19) hindered farmers from making proper choices regarding insecticide use. "Unavailability of Product" was placed at the fourth rank with a mean score of 51.54, while "Unavailability of Suitable Packaging Size" stood fifth with a score of 50.73. Further, farmers also struggled with "Lack of Credit Availability" (mean score 49.33, sixth rank), "No Discount" (mean score 48.49, seventh rank), and "Poor Labelling" (mean score 47.59, eighth rank), which collectively influenced their buying behavior and access to quality crop protection solutions.

Conclusion

Insecticides play a crucial role in modern agriculture, especially in crops like tobacco, where pest pressure is significant and directly affects yield and quality. For farmers, choosing the right brand of insecticide is vital, as it influences both crop health and profitability. In this study, 200 tobacco farmers from the Anand district were surveyed to understand their buying behaviour and brand preferences. The majority of farmers were between 41 to 50 years of age, had education levels below SSC, and mostly belonged to the small and medium farmer category with an annual income of ₹2.01 to ₹4 lakh. It was observed that most farmers purchased insecticides from local agri-input dealers and relied on sources like farmer meetings and advertisements for information. Payment was commonly made through credit or mixed modes, and farmers preferred insecticide brands such as Bayer, Syngenta, and UPL, influenced by factors like past experience, product quality, and peer recommendations. However, challenges like high prices, fear of adulteration, and lack of technical knowledge were significant constraints, highlighting the need for affordable, authentic products and better field-level support to guide farmers in making informed decisions.

Suggestions

The high price of insecticide was reported to be the most important constraint by farmers. They often need to buy them on credit. To help them, companies should sell insecticides in small and low-cost packets, so even small and marginal farmers can afford them.

Fear of adulterated or fake insecticides was the second biggest problem faced by farmers. To address this, companies should utilize secure packaging and QR codes, enabling farmers to verify the authenticity of the product. There should be a proper system to track the product from the factory to the shop. Farmers also need training and awareness programs to help them recognize genuine products.

As per the data, local dealers were ranked highest among multiple response options for place of purchase, surpassing cooperatives, FPOs, and online platforms. Therefore, strengthening dealer engagement can directly improve product reach and sales performance.

Lack of technical knowledge is a major constraint for many farmers. To address this, organizations should hold regular farmer meetings focused on training. These sessions should cover proper pesticide use, safety measures, and pest management techniques. Providing hands-on guidance will

help farmers use insecticides more effectively and safely. This will improve crop health and farmer confidence in using these products.

Future scope

To build upon the findings of this study, future research could undertake comparative analyses across different districts or states to identify regional variations in insecticide brand preferences and buying behaviour. Since local dealers were found to play a significant role in influencing farmer choices, further studies can assess the extent of their influence and the impact of their training and ethical practices. With the gradual emergence of digital platforms in agriculture, research should also explore the potential of online tools and mobile applications in enhancing farmers' access to information and safe purchasing options. Moreover, evaluating the effectiveness of farmer training programs and awareness campaigns on the safe and rational use of insecticides could yield valuable insights, especially through longitudinal studies. Investigating the psychological dimensions of brand trust, loyalty, and risk perception in rural settings would add depth to the understanding of purchasing patterns. As the agricultural sector increasingly emphasizes sustainability, exploring the adoption and challenges related to bio-insecticides among tobacco farmers would be timely and relevant. Additionally, policy-oriented research evaluating the effectiveness of government interventions, subsidies, and regulations in improving pesticide access and safety could guide future policymaking. Lastly, innovations in supply chain management and packaging, such as sachet sizes, tamper-proof seals, and QR code verification, should be studied for their potential to enhance product authenticity and purchasing confidence among farmers.

Conflict of Interest

Authors have declared that no competing interests exist.

Author contributions

Prof. (Dr.) Mehul G. Thakkar – Conceived and designed the analysis and contributed data or analysis tools

Mr. Bhavikkumar P. Joshi – Collected the data; contributed data or analysis tools; performed the analysis and wrote the paper.

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