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Market analysis on insecticide usage patterns for vegetable crops in Krishnagiri district in Tamil Nadu

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Abstract

This study examines insecticide usage patterns among vegetable farmers in the Krishnagiri district of Tamil Nadu, reflecting the growing importance of insecticides in safeguarding crop health amidst increasing pest pressures. The global insecticide market is expanding rapidly, with India being the fourth-largest producer of agrochemicals and a significant exporter. Insecticides are essential for controlling pests such as thrips, whiteflies and various caterpillars, which can cause substantial yield losses. Using a stratified simple random sampling method, data were collected from 300 farmers across 25 villages in Hosur tehsil between May 2024 and June 2024. The research assessed socio-economic profiles, insecticide usage patterns and the sources of information for purchase decisions. Findings reveal that local agricultural dealers are the primary source of information, with a notable preference among farmers for brands such as BASF and IIL. Most farmers reported using insecticides primarily during the Kharif season, suggesting seasonal dependency. The study also highlights a tendency among farmers to favour specific brands over extended periods, reflecting brand loyalty and trust in local suppliers. Overall, the results provide valuable insights into the practices and challenges faced by vegetable farmers, which can help inform agricultural policies and marketing strategies for insecticide producers in the region.

Keywords

agricultural practices; insecticide usage; Krishnagiri district; pest control; vegetable crops; market study

Introduction

The agricultural pesticides market is expected to grow by $26.23 billion between 2021 and 2025. By 2023, it is projected to expand at a compound annual growth rate (CAGR) of 11.5 %, reaching approximately $130.7 billion. This growth is driven by the adoption of intensive farming practices within the pesticides sector and accelerated economic development in emerging economies. (1).

Vegetables are a vital agricultural category that provides essential nutrients and vitamins to the human diet (2). Vegetables also have a significantly higher income elasticity compared to staple crops like rice, making them an important economic driver (3). Despite the stringent regulations imposed by international organizations such as the Environmental protection agency (EPA) and World Health Organization

(WHO) (4). In India, agencies such as the Central Insecticide Board and Registration Committee (CIBRC) and the Food Safety and Standards Authority of India (FSSAI) oversee pesticide manufacturing and usage. However, farmers often disregard the recommended dosage, timing and frequency of pesticide application (5).

The tomato fruit borer can lead to yield losses of 23-38 %, while the tomato pinworm has the potential to cause losses ranging from 80-100 % (6, 7). Effective pest management relies heavily on consistent monitoring of pest populations. The population of sucking insect pests, including aphids (*Aphis gossypii*), leafhoppers (*Amrasca bigutulla*), whiteflies (*Bemesia tabaci*), thrips (*T. tabaci*) and red spider mites (*Tetranychus urticae*), was recorded from five leaves (two from the middle, two from the lower and one from the upper part) of five randomly chosen plants per plot. Larval counts of leaf miners, tomato pinworm, leaf-eating caterpillars (*Spodoptera litura*) and tomato fruit borers (*H. armigera*) were recorded. Predatory insects and pheromone trap counts for *Phthorimaea absoluta* and *H. armigera* were also monitored. At the same time, disease indices for early blight, bacterial leaf spot, fusarium wilt, leaf curl virus and tomato mosaic virus were recorded weekly (8).

The increasing demand for vegetables, driven by rising incomes, shifting consumption patterns and decreasing farm incomes, has led to a shift toward high-value crops like vegetables and fruits. In addition to boosting farm income, vegetable cultivation offers significant potential for creating additional employment opportunities due to its labour-intensive nature.

The specific objective of the study is to analyze insecticide usage patterns among vegetable farmers. The agricultural input industry holds significant business potential in India. A study was undertaken because tomato is a key vegetable crop in Krishnagiri district and substantial amounts of insecticides are used in its cultivation. To capitalize on this potential, input companies need comprehensive data on farmers' insecticide usage patterns. This study aims to provide insights into these areas to help enhance sales. Additionally, it will shed light on the promotional strategies employed by various companies in the Krishnagiri district.

Materials and Methods

Selection of the study area

Krishnagiri district (Hosur Taluk) in Tamil Nadu was purposively chosen for the study due to its significance as a key region for cultivating vegetable crops such as tomato, cabbage, cauliflower, chili and brinjal. Fig. 1 shows major vegetable crops grown in Hosur (Krishnagiri) in 2023 in acres

Sampling design

Stratified simple random sampling was employed to collect data from Krishnagiri District (Hosur Taluk). In line with the study's objectives, 300 farmers were chosen for the survey. Farmers from 25 villages in Hosur Taluk were selected using simple random sampling, focusing on those cultivating significant crops in the region, including tomato (high acreage), brinjal (low acreage), cabbage, cauliflower and chili.

Selection of the sample respondents

The sampled farmers were users of insecticides for vegetable crops were selected using Random sampling technique from Krishnagiri district (Hosur tehsil) as shown in Table 1.

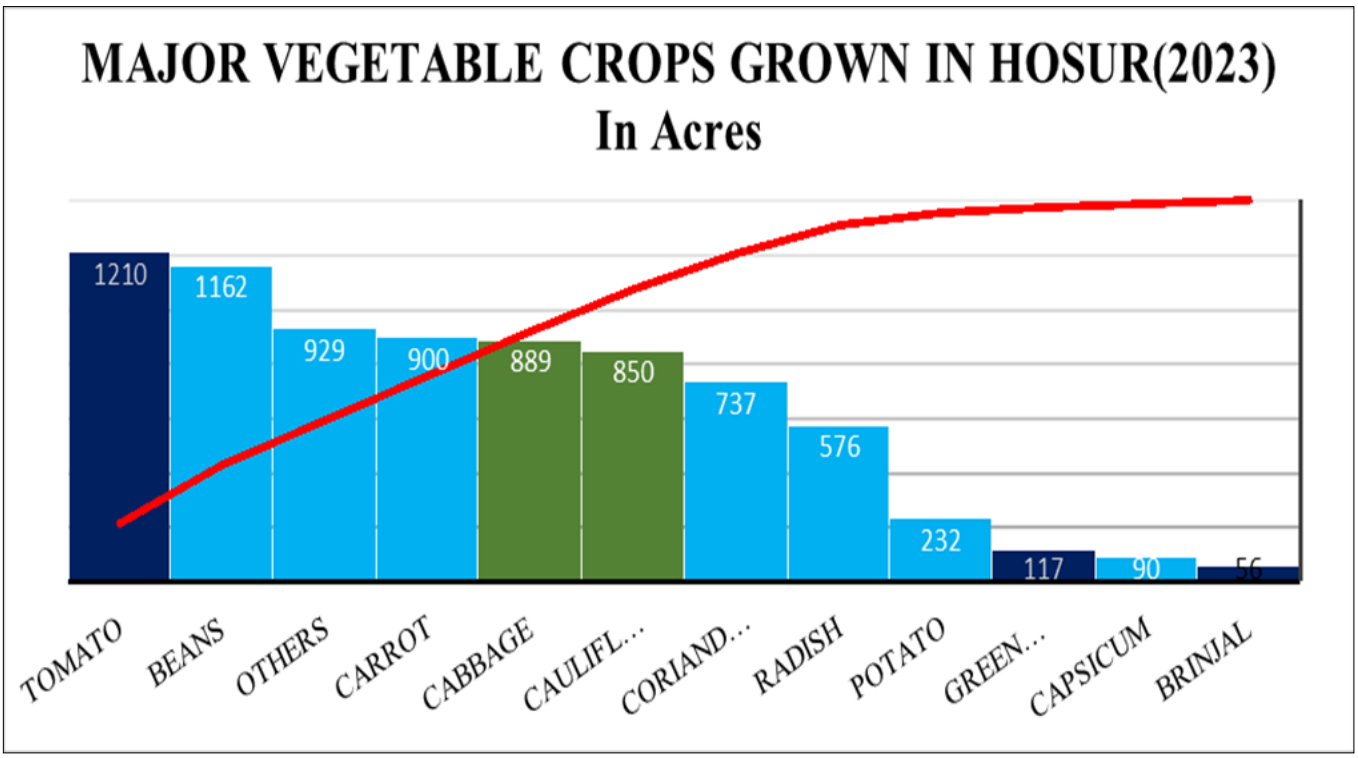

Fig. 1. Major vegetable crops grown in Hosur (Krishnagiri) in 2023 in Acres.

Table 1. Selection of the sample respondents in the study area

S.no	District	Block	Village	Sample Size (No of Farmers)
	Krishnagiri	Hosur	Alasapalli	10
			Avalapalli	10
			Athimugham	15
			Bagalur	25
			Berigai	10
			Belathur	10
			Dasarapalli	20
			Palavanapalli	15
			Onnalvadi	10
			Punagamdoddi	10
			Thorapalli	10
			Thummanapalli	10
			Ulavapalli	10
			Masandiram	10
			Venkatrayapuram	15
			Jeemangalam	15
			Gudichettulu	10
			Mulagapalli	15
			Kelavarapalli	10
			kelamangalam	10
			Siddanapalli	10
			Kalahasthipuram	10
			Nandimangalam	10
			Nallur	10
			Achandram	10
	TOTAL			300

Data collection procedure and analysis

Between May 2024 and June 2024, interviews were conducted with vegetable farmers. A systematic questionnaire comprising two main sections was created to gather necessary information. The first section focuses on the socioeconomic profile of the respondents, including age, education, family size and farming experience. The second section addresses insecticide usage patterns, such as the use of insecticides from various companies among the sample farmers, length of usage from the same company, seasons of pesticide application and sources of information for insecticide purchase.

Tools of analysis

The collected data were processed, categorized and organized into tables to facilitate meaningful inferences. Additionally, the data underwent percentage analysis. The details of the analysis and the tools and methodologies used for the study, are outlined below.

Conventional analysis

Tool used for this analysis is MS Excel

Conventional analysis was used to examine the socio-economic characteristics, including age, education and family size to assess Socio economic profile of farmers.

Conventional analysis =

100 * Number of respondents / Total number of respondents

Garrett's ranking technique

Garrett (1965) proposed a scoring technique for converting ranks into scores based on the number of items ranked by each respondent. Garett's ranking scoring technique was applied to rank the source of information for insecticide usage farmers. The ranks provided by the respondents were transformed into percent positions using the following formula.

Percentage position = 100*(Rij - 0.5) / Nj (9)

Rij= Rank given for it factor by the jth individual

Nj= Number of factors ranked by the jth individual

Results and Discussion

Socio-economic profile of farmers

Table 2 shows the socioeconomic profile of farmers, including variables such as family size, age, education and farming experience.

Family size: The prevalence of medium-sized families (59.33 %) suggests a balance between available labor and resource demands within farming operations. Compared to smaller families (17.33 %), medium-sized families likely have more hands to assist with farm work, potentially increasing productivity. However, they may also face greater pressure to generate income to support a larger household than smaller families. In contrast, large families (23.34 %), while possessing a significant labor pool, might experience internal conflicts in decision-making regarding resource allocation and farm management due to a greater number of stakeholders. This dynamic of labor availability versus resource demands and decision-making complexity differentiates the potential influence of each family size on farming practices.

Age distribution: The dominance of middle-aged respondents (61 %) suggests a wealth of farming experience combined with a potential openness to new technologies. Compared to younger farmers (17 %), middle-aged farmers may rely more on established practices but are likely more financially stable to invest in insecticide application. Older farmers (22 %), while possessing extensive experience, might be less inclined to adopt new insecticides or application methods due to

Table 2. Socio-economic profile of farmers

Variable	Category	Frequency	Percentage
Family Size	Small (2-4 members)	52	17.33
	Medium(5-10members)	178	59.33
	Large(>10members)	70	23.34
Age	Young age (<35)	51	17
	Middle age (35-50)	183	61
	Old age (>50)	66	22
Education	Illiterate (0)	9	3
	Primary School (1-5)	26	8.66
	Secondary School (5-10)	118	39.33
	Higher Secondary (11-12)	46	15.33
	Graduation and above	15	5
Farming Experience	Low (upto 10 years)	75	25
	Medium(10-30years)	177	59
	High(>30years)	48	16

ingrained habits or physical limitations. This age distribution thus influences the pace and type of insecticide adoption within the farming community, with middle-aged farmers likely playing a key role in bridging traditional and modern approaches.

Education level: The education data reveals that many respondents have completed secondary school (39.33 %), with a small percentage being illiterate (3 %) or having attained a graduate degree (5 %). The education distribution suggests that while many farmers have a solid base through secondary education, targeted training programs could further enhance their knowledge and skills in areas like safe and effective insecticide use.

Farming experience: Most respondents have medium farming experience (59 %), while those with low experience account for (25 %) and those with high experience make up (16 %). This suggests that most farmers possess a reasonable level of farming experience, which may influence their practices and decision-making.Targeted training and extension programs are crucial to promote integrated pest management strategies across all experience levels, ensuring both effective pest control and environmental sustainability.

Overall, the findings indicate a primarily middle-aged, moderately educated population with medium family sizes and farming experience, which could affect agricultural practices and productivity in the area.

Insecticide usage pattern among vegetable farmers

Farmers have historically looked for methods to manage insect infestations on vegetables. All the sampled farmers utilized insecticides for the vegetable crops they grew.

Key pests affecting vegetable crops in Krishnagiri district

The primary pests in vegetable crops include thrips, whiteflies, mites, shoot borers, fruit borers, aphids, jassids and other pests such as tobacco caterpillars, cutworms, bugs and weevils.

Usage of insecticides of different companies among sample farmers

Table 3 indicates that in the Krishnagiri district, many vegetable farmers favored BASF (21.66 %), IIL (18.66 %) and Godrej Agrovet (17 %), which were ranked first, second and third by the farmers and they found these brands' products to be effective in controlling pests and diseases, leading to better yields and income. The other companies mentioned include Syngenta, Dhanuka, Corteva, Indofil, Jivagro, FMC and Brofeya.

Length of insecticide usage from the same company

The sample farmers consistently used insecticides from the same company for extended periods. The analysis of their ongoing preference for insecticides from the same company is detailed in Table 4.

Among the respondent farmers, 30.33 % had used a specific product for the past 3-4 years, while 25.66 % had used the same product for 5-6 years. Additionally, 19.33 % of the sample farmers reported using it for 1-2 years and 14.66 % used the same insecticide for 7-9 years. The remaining 10% of farmers reported that they are still using the same insecticide, which indicates both brand loyalty and a lack of awareness. It reflects a mix of both brand loyalty and potential lack of awareness. While some farmers may be genuinely satisfied with a particular product and company, others might be using the same insecticide simply because they are not aware of or haven't been adequately informed about alternatives.

Table 3. Usage of insecticides of different companies among sample farmers

Trade name	Company	Dosage per acre	Number of farmers	Percentage
Exponus	BASF	17ml, 25ml, 34ml	65	21.66
Shinwa	IIL	160ml	56	18.66
Gracia	GODREJ AGROVET	160ml	51	17.00
Alecto	INDOFIL	50ml	10	3.33
Simodis	SYNGENTA	120ml, 240ml	41	13.66
Benevia	FMC	180ml, 240ml, 360ml	10	3.33
Delegate	CORTEVA	180ml	16	5.33
Ultimare	JIVAGRO	50ml	10	3.33
Brofeya	PI	50ml	9	3.00
Lanevo	DHANUKA AGRITECH	250ml	32	10.66
	TOTAL		300	100.00

Table 4. Length of insecticide usage from the same company

S. no.	Length of usage (years)	Number of farmers	Percent (%)
1	1-2	58	19.33
2	3-4	91	30.33
3	5-6	77	25.66
4	7-9	44	14.66
5	Above 10	30	10.00

Seasons of insecticide usage

Fig. 2, 3 clearly show that insecticides for vegetable crops are used throughout the Kharif and Rabi seasons. Farmers cultivating vegetables reported usage during both the Kharif and Rabi seasons.

In Table 5, among the respondents, 53 % used insecticides specifically during the Kharif season, while

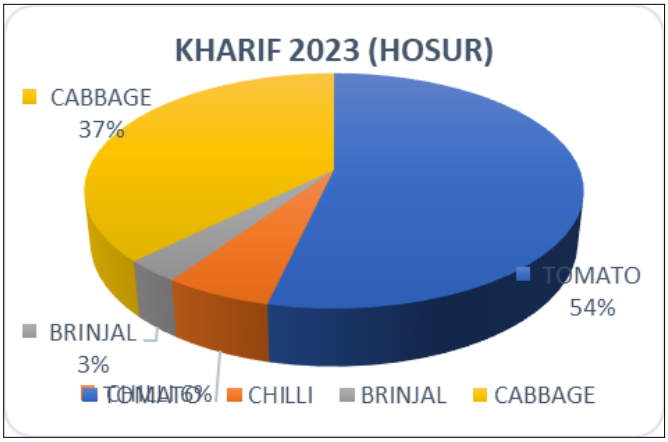

Fig. 2. Major vegetable crops grown during the Kharif season.

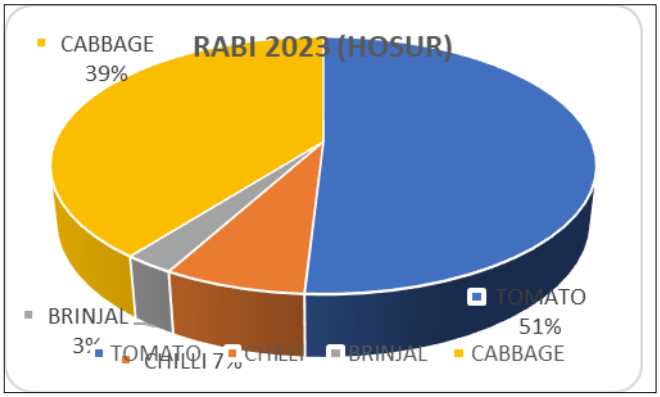

Fig. 3. Major vegetable crops grown during the Rabi season.

Table 5. Seasons of insecticide usage

S. no.	Season of Pesticide usage	Number of	Percent (%)
1	Kharif	168	53
2	Rabi	132	47

47 % applied them during the Rabi season

Sources of information for insecticide purchase

The primary source for purchasing insecticides was local agricultural input supply dealers. These dealers not only facilitated the distribution of insecticides but also served as a vital source of information regarding the products and their applications. The dealers involved in distribution may also impact the quantities and types of insecticides that farmers use in their production activities.

According to Table 6, dealers' advice was rated as the primary source of information, receiving an average score of 74. This was followed in order by retailers, company representatives, co-farmers, Agri/Horti offices, KVK and universities, as ranked by the respondents.

Table 6. Sources of information for insecticide purchase

S. no.	Source of Information	Garrets Score	Rank
1	Dealers	74	I
2	Retailers	64	II
3	Company Representatives	57	III
4	Advertisement	51	IV
5	Co-Farmers	45	V
6	Agri/Horti Office	38	VI
7	KVK	29	VII
8	University	6	VIII

Conclusion

This study underscores the critical role of insecticide usage in managing pest infestations among vegetable farmers in Krishnagiri District, Tamil Nadu. The findings reveal a strong preference for specific brands, with local dealers serving as farmers' primary source of information. The findings indicate that insecticide usage is predominantly concentrated during the Kharif season, reflecting the seasonal nature of pest management practices. Additionally, the socio-economic profiles of the respondents suggest a moderately educated and experienced farmer population, which may influence their decision-making in pest control. Policymakers and extension agents can create more effective interventions that promote safe and sustainable pest management practices in the Krishnagiri district, ultimately enhancing agricultural productivity and protecting the environment and public health. These insights can help agrochemical companies in tailoring their marketing and outreach strategies better to meet the needs of farmers in the region. Stakeholders can enhance agricultural productivity and sustainability in the vegetable sector by fostering informed usage patterns and promoting safe application practices.

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Authors' contributions

VRL carried out data collection and fieldwork coordination with farmers and drafted the manuscript. KU and SS supervised and edited the manuscript. MN and RG participated in coordinated and verified statistical analysis. All authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None

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