



Farmer's Awareness and Buying Behaviour of Fungicide (Carbendazim 12% and Mancozeb 63% WP) for Cumin Crop in Selected Talukas of Surendranagar District, Gujarat

**Bhavesh A. Dodiya ^a, Dilip R. Vahoniya ^{b*}
and Dhruv N. Patoliya ^a**

^a International Agribusiness Management Institute, Anand Agricultural University, Anand, India.

^b Department of Agri-Entrepreneurship and Project Management, International Agribusiness Management Institute, Anand Agricultural University, Anand, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

India, despite being the fourth-largest producer of pesticides globally, accounts for only 3.75% of global pesticide usage, with fungicides playing a key role in disease management of high-value crops like cumin. This study investigates farmer awareness and buying behaviour regarding the use of a specific fungicide formulation (Carbendazim 12% and Mancozeb 63% WP), branded as

*Corresponding author: Email: dilip_iabmi@aau.in;

“Sapath,” in Surendranagar district of Gujarat. Using a descriptive research design, primary data were collected from 180 cumin farmers in Wadhwan, Muli, and Dasada talukas during January–March 2025 through purposive sampling. Data analysis employed Weighted Average Mean and Garrett Ranking techniques. The findings reveal that most farmers were middle-aged males with limited education, small landholdings, and moderate annual incomes (₹1–5 lakh). Chemical methods were universally used to combat diseases such as *Alternaria* blight and wilt. Brand image, agro-service center recommendations, and product performance were the most influential factors in purchase decisions, while credit facilities and packaging size had minimal effect. Only 24 percent of respondents had heard of the company, and awareness of the Sapath product was extremely low. Farmers expressed moderate satisfaction, particularly regarding price and availability, though concerns about product quality were noted. Promotional strategies such as farmer meetings and social media outreach proved more effective than traditional methods. The study emphasizes the need for targeted awareness campaigns, improved product quality, and localized promotional interventions to enhance responsible pesticide adoption among cumin farmers.

Keywords: *Fungicide; Sapath; farmer awareness; promotional tools; buying behaviour.*

1. INTRODUCTION

Agricultural development has a very rich history across various regions of the world. Around 10,000 years ago, farming practices first emerged in the fertile crescent of Mesopotamia, which includes present-day Iraq, Turkey, Syria, and Jordan. Early inhabitants of these areas gathered edible seeds using methods like fire-stick farming and forest gardening (Nuwamanya et al., 2023). As communities transitioned to a more settled lifestyle on farms, they began cultivating significant amounts of wheat, barley, peas, lentils, chickpeas, bitter vetch, and flax. In the Sahel region of Africa, rice and sorghum were domesticated approximately 7,500 years ago. Agriculture is one of the most important sectors of Indian economy. This sector occupied almost 47 percent geographical area of India (Otoo et al., 2024). In India, more than 70 percent of household depends on the agriculture sector. In 1950-51, agriculture sector provided 76 percent of employment, while in 2012-13, it decreases to 52 percent. Agriculture has always been an important sector for India, because it is the main export from the country and also supports other industries such as the textile industry (ex. Cotton) and Sugarcane derivatives (ex. Sugar) (Sharma et al., 2018 and Jain et al., 2023). With limited land and a rapidly growing population, increasing agricultural productivity is essential. Solutions include soil-less farming methods like hydroponics or increased use of chemical inputs (Sharma et al., 2020). Global agriculture incurs approximately 20-30 percent annual losses due to pests, diseases, and weeds (Reddy et al., 2024). Without pesticides, production losses in fruits, vegetables, and cereals could reach up to 78, 54, and 32

percent, respectively, making pesticide use crucial in modern farming (Tudi et al., 2021).

Pesticides play a vital role in agriculture by reducing crop losses and improving yield quality. Their use dates back to ancient civilizations, evolving from natural compounds to modern synthetic chemicals. Pesticides are mainly classified into herbicides, insecticides, fungicides, and rodenticides, each targeting specific threats to crops. Herbicides control weeds and have grown rapidly in use, especially in India, due to labor shortages. Insecticides manage harmful insects and are available in various chemical forms. Rodenticides help to control crop-damaging rodents, while fungicides combat fungal diseases and account for a large share of the global pesticide market. Despite their benefits, pesticides also pose environmental risks, making responsible use essential (Saini and Sharma, 2019).

According to Assad et al., (2021), 7 million tons of chemical pesticides are produced globally each year, with 4.6 million tons applied. Europe accounts for 45 percent of usage, the USA 24 percent, and India only 3.75 percent. Herbicides dominate the global pesticide market (50%), followed by fungicides (22.5%) and insecticides (20.4%) (Reddy et al., 2024). In 2020, the U.S. and Brazil were the top consumers. Global pesticide sales are projected to grow by 5.5 percent annually through 2031 (Salceanu et al., 2022). India began pesticide production in 1952 with BHC. Today, it ranks 4th in global production but 12th in usage, contributing just 1 percent of global consumption. Insecticides are the most commonly used type. Maharashtra and Uttar Pradesh lead in national consumption, together

using 41 percent of India's pesticides (Nayak & Solanki, 2021). The study aimed to assess farmers' awareness and buying behavior toward the company's product, evaluate market conditions and competitors, measure farmer satisfaction, and increase product awareness in the region.

1.1 Objectives

1. To study socio-economic profile of farmers
2. To determine the factors influencing farmer's buying behaviour
3. To study farmer's awareness and satisfaction level
4. To identify the effective promotional activities for farmers

2. MATERIALS AND METHODS

The study employed a descriptive research design to evaluate farmers' behaviour, awareness, and decision-making. The research was conducted in the cumin-growing talukas of Wadhwan, Muli, and Dasada within Surendranagar district of Gujarat. These areas were selected due to their high cumin acreage and relevance to the client company, Tyrone Agro Chemicals Pvt. Ltd. A purposive sampling technique was employed, focusing on cumin farmers actively cultivating during the *Rabi* season. This non-probability method allowed for targeted insights from experienced farmers who regularly apply fungicides. The final sample comprised 180 respondents across 30 villages. The sample size was justified based on prior studies of similar scope and consultations with local agricultural extension officers. It was considered sufficient to ensure socio-economic variation while remaining feasible for fieldwork within the study's duration from January 26 to March 26, 2025. Primary data were collected using a semi-structured interview schedule that captured demographic characteristics, farm practices, disease occurrence, pesticide usage, awareness levels, and satisfaction indicators. Secondary data were obtained from journals, institutional reports, and company records. Data were analyzed through tabular methods and statistical tools such as Weighted Average Mean and Garret Score (Nemoto and Beglar, 2014, Guh et al., 2008 & Christy, 2014).

Once all the respondents had submitted their responses, the total responses were gathered and organized into a table. Then multiply each response by its corresponding weight, and then

sum the products to find the total value. Total weight was obtained by adding all the weights, then the total value was divided by total weight to determine the weighted mean.

$$\text{Weighted average mean (X)} = (F_1X_1 + F_2X_2 + F_3X_3 + F_4X_4 + F_5X_5) / X_t$$

Where,

F = Weight given to each response

X = Number of responses

X_t = Total number of responses

Garrett's ranking was used to study this objective. In this method, respondents were asked to rank all the factors according to their preferences and the results of that ranking have been converted into score value with this formula:

$$\text{Percentage position} = 100 (R_{ij} - 0.5) / N_j$$

Where,

R_{ij} = Rank given for the *i*th variable by *j*th respondent

N_j = Number of variables ranked by *j*th respondent

3. RESULTS AND DISCUSSION

3.1 To study Socio-economic Profile of Farmers

The study surveyed 180 farmers, revealing that most were aged between 36-55 years, with only 7 percent under 35 and none under 25. Education levels showed 43 percent had primary education, 27 percent were illiterate, and only 3 percent had UG/PG education. All respondents were male.

Most farmers (67%) owned 1-2 hectares of land, with very few having more than 4 hectares. Similarly, 91 percent cultivated cumin on less than 2 hectares. In terms of income, 51 percent earned ₹1-3 lakh annually, and 42 percent earned ₹3.1-5 lakh. Family size ranged mostly between 3-5 members (65%), with only 2 percent having a 2-member family.

Alternaria blight was the most reported cumin disease (55%), followed by wilt (35%) and powdery mildew (10%). For disease control, all farmers used chemical methods; 28 percent used both chemical and cultural practices, and some also practiced sanitation or exclusion.

Table 1. Socio-economic profile of farmers

Sr. No.	Particulars	Respondents	Percentage
1	Age		
	<25	0	0
	26-35	12	7
	36-45	69	38
	46-55	66	37
	>55	33	18
	Total	180	100
2	Education		
	Illiterate	48	27
	Up to primary	78	43
	SSC	36	20
	HSC	12	7
	UG/PG	6	3
	Total	180	100
3	Gender		
	Male	180	100
	Female	0	0
	Total	180	100
4	Landholding		
	<1	18	10
	1-2	120	67
	2.1-4	39	22
	>4	3	1
	Total	180	100
5	Area under cumin		
	<1	82	46
	1-2	81	45
	2.1-4	15	8
	>4	2	1
	Total	180	100
6	Annual income		
	<1	12	7
	1-3	93	51
	3.1-5	75	42
	5.1-10	0	0
	>10	0	0
	Total	180	100
7	Family size		
	2	3	2
	3-5	117	65
	>5	60	33
	Total	180	100
8	Major Disease		
	Alternaria Blight	99	55
	Wilt	63	35
	Powdery mildew	18	10
	Total	180	100
9	Method of control		
	Cultural	51	28
	Chemical	180	100
	Sanitation	18	10
	Exclusion	15	8
	Other	0	0
	Total	180	100

3.2 To Determine the Factors Influencing Farmer's Buying Behaviour

Study highlights the factors influencing farmers' pesticide purchasing decisions. Responses were grouped into five categories: Most Important, Important, Neutral, Slightly Important, and Least Important. Key factors considered include Brand Image, Farmer Recommendations, Agro-Service Center Advice, Price, and Product Performance. The importance of each factor was determined using the Weighted Average Mean (WAM).

The analysis revealed that Brand Image ranked as the top influencing factor (WAM 4.16), followed by agro-service center recommendations (4.09), product quality (4.06), and recommendations from fellow farmers (4.05). Product performance and previous experience also played significant roles. Credit facilities, however, were rated the least influential.

3.3 To Study Farmer's Awareness and Satisfaction Level

The third objective highlights the awareness and satisfaction levels of farmers regarding the company and its product, Sapath fungicide.

Finding reveals that a significant majority of farmers (76%) are unaware of the company, while only 24 percent (43 out of 180) have awareness. Results further show limited awareness about the Sapath fungicide specifically, 37 percent of farmers are not well aware of it, only 4 percent are highly aware, and the remaining are either moderately aware or

somewhat familiar. This indicates a need for improved outreach and promotional efforts by the company. It further evaluates farmer satisfaction using Weighted Average Mean (WAM). The highest satisfaction was reported for product availability (WAM 3.31), followed closely by price (3.30). However, product quality received the lowest satisfaction score, suggesting that while accessibility and affordability are strengths, quality perception needs improvement.

These findings underscore the importance of increasing product awareness and enhancing quality to boost overall.

3.4 To Identify the Effective Promotional Activities for Farmers

The fourth objective highlights the promotional activities that most influence farmers and provides insight for shaping future marketing strategies.

Eight different promotional methods were ranked based on how farmers rated their effectiveness, from Rank 1 (most effective) to Rank 8 (least effective).

It further analyzes these responses using mean values and Garrett's ranking. The findings show that farmer meetings are the most impactful promotional tool (mean score: 64.95), followed by social media advertisements (62.18) and field demonstrations (60.21). Traditional methods like TV ads, leaflets, and posters had a moderate influence, while exhibitions and wall paintings were rated the least effective.

Table 2. Factors influencing Buying behaviour of farmers

Sr. No.	Factors	MI	I	N	SI	LI	Total	WAM	Rank
1	Brand Image	96	38	29	13	4	180	4.16	1
2	Recommendation by Agro-Service Centre	93	36	31	15	5	180	4.09	2
3	Quality	91	35	33	16	5	180	4.06	3
4	Recommendation by Farmers	89	40	30	14	7	180	4.05	4
5	Performance of product	83	41	33	17	6	180	3.98	5
6	Past experience	85	36	38	14	7	180	3.96	6
7	Timely availability	77	35	42	19	7	180	3.86	7
8	Price	76	33	43	20	8	180	3.82	8
9	Demonstration	68	30	52	19	11	180	3.69	9
10	Advertisement	65	33	49	21	12	180	3.65	10
11	Packaging size	51	35	51	28	15	180	3.43	11
12	Credit facilities	44	33	53	31	19	180	3.28	12

(MI = Most important, I = Important, N = Neutral, SI = Slightly important, LI = Least important)
(Nemoto and Beglar, 2014 & Guh et al., 2008)

Table 3. Farmer awareness regarding the company and the product

Sr. No.	Particulars	Respondents	Percentage
1	Heard about company?		
	Yes	43	24
	No	137	76
	Total	180	100
2	Level of awareness regarding the product		
	Highly aware	6	4
	Aware	33	18
	Moderately aware	33	18
	Slightly aware	42	23
	Not aware at all	66	37
	Total	180	100

Table 4. Satisfaction level of farmers

Sr. No.	Factors	HS	S	N	DS	HD	Total	WAM
1	Price	24	30	111	6	9	180	3.3
2	Yield	9	39	105	18	9	180	3.11
3	Performance	9	33	105	24	9	180	3.05
4	Availability	27	33	96	18	6	180	3.31
5	Quality	6	33	102	27	12	180	2.96

(HS = Highly satisfied, S = Satisfied, N = Neutral, DS = Dissatisfied, HD = Highly dissatisfied)
(Nemoto and Beglar, 2014 & Guh et al. 2008)

Table 5. Promotional activities for farmers

Sr. No.	Factors	Garret score	Mean	Rank
1	Farmer meeting	80	64.95	1
2	Social media advertisement	67	62.18	2
3	Field demonstration	60	60.21	3
4	T.V. advertisement	53	56.17	4
5	Leaflet	47	55.60	5
6	Poster	40	54.55	6
7	Exhibition	32	46.54	7
8	Wall painting	20	43.4	8

(Christy, 2014)

This suggests that direct, interactive promotions such as meetings and field demonstrations resonate best with farmers in the study area. The company should prioritize these methods in its future outreach plans to improve engagement and product visibility.

4. CONCLUSION

The study underscores important insights into the socio-economic background, awareness, and buying behaviours of cumin farmers in Gujarat's Surendranagar district. The results showed that most farmers are middle-aged males with limited

formal education, typically managing small landholdings and earning between ₹1-5 lakh annually. They rely heavily on chemical methods to control diseases, particularly Alternaria blight and wilt, and trust agro-dealers for product recommendations. Key factors influencing fungicide selection include brand image, agro-service centre guidance, and product performance, while credit facilities play a minimal role. Awareness of the company and its Sapath fungicide is low, highlighting the need for improved outreach. Although farmers expressed satisfaction with product availability and pricing, concerns about product quality persist. To

enhance adoption and informed use, there is a pressing need for targeted awareness campaigns, localized demonstrations, and improved product standards. Companies should prioritize direct farmer engagement through meetings and digital media to build trust and encourage adoption.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that they have no known competing financial interests or non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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