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**Tarun Dhandhukiya**  
MBA (ABM) Scholar, ASPEE  
Agribusiness Management  
Institute, Navsari Agricultural  
University, Gujarat, India

**Swati Sharma**  
Assistant Professor, ASPEE  
Agribusiness Management  
Institute, Navsari Agricultural  
University, Navsari, Gujarat,  
India

**Kuldeep Choudhary**  
Assistant Professor, ASPEE  
Agribusiness Management  
Institute, Navsari Agricultural  
University, Navsari, Gujarat,  
India

**Vishal Thorat**  
Assistant Professor, ASPEE  
Agribusiness Management  
Institute, Navsari Agricultural  
University, Navsari, Gujarat,  
India

**Corresponding Author:**  
**Tarun Dhandhukiya**  
MBA (ABM) Scholar, ASPEE  
Agribusiness Management  
Institute, Navsari Agricultural  
University, Gujarat, India

## Buying behavior and usage pattern of farmers towards insecticide in Amreli district of Gujarat

**Tarun Dhandhukiya, Swati Sharma, Kuldeep Choudhary and Vishal Thorat**

### Abstract

India's agrochemical market forms 15 percent of the global market. The Indian agrochemical market is highly fragmented, with fierce competition from a large number of organized players. The study aims to take a closer look on buying behavior and usage pattern of farmers towards insecticide in Amreli district of Gujarat. In this regard a total of 200 farmers were surveyed from two Talukas of Amreli district, Gujarat. Primary data were collected with the help of a structured interview schedule. Secondary data was collected from various sources like relevant research papers, company's website, various published reports, Journals and articles. The study revealed that all farmers were aware of the damage caused by insects. Dealers were the primary source of information about insecticide, followed by neighbors and friends. Dealer recommendations were the most influential factor in the selection of insecticide. Farmers predominantly used three to four doses of insecticide per crop per season, and the preference for local insecticide brands was evident. Farmers showed a preference for larger packaging sizes for both solid and liquid insecticide. Mostly farmers preferred early morning for spraying insecticide and not used any protection while using insecticide. This study will help to Agrochemical Company to develop effective strategies for ensuring its position in the competitive market and effectively capturing farmers' attention.

**Keywords:** Agrochemical, buying behavior, usage, farmers, insecticide

### Introduction

Agriculture, along with its linked industries, is India's primary source of income. In its rural areas, 70% of households still rely primarily on agriculture for a living, with 86 percent of farmers being small and marginal. The contribution of agriculture to GDP is steadily falling. The ratio of agricultural and allied sectors in the entire economy, as well as the growth of agriculture and related sectors, have both dropped in the last 2-3 years, according to the second advance predictions of national income for 2022-23. Farmers' income, on the other hand, is gradually increasing. According to the Economic Survey of India 2021-22, the farming community's endurance in the face of extreme conditions resulted in a 3.4% increase in agriculture, while other sectors declined overall. Agrochemical is one of the inputs used in agriculture, including chemical fertilizers, herbicides, and insecticides. Most are mixtures of two or more chemicals; active ingredients that provide the desired effects, and inert ingredients stabilize or preserve the active ingredients or aid in application. Agrochemicals are pesticides, herbicides, or fertilizers used for the management of ecosystems in agricultural sectors. Rudimentary variations on agrochemicals have been used for millennia to improve the crop yields and control the populations of agricultural pests. India agrochemical industry is expected to grow 8-10 per cent by 2025, according to data by the Federation of Indian Chambers of Commerce and Industry (FICCI). The industry has a huge unrealized potential due to the low level of agrochemical consumption. India agrochemical market forms 15 per cent of the global market. Presently, India is the fourth-largest producer of agrochemicals after the US, Japan, and China. Its key segments include insecticides, fungicides, herbicides, bio-pesticides, and others. The Indian agrochemicals market is highly fragmented in nature with over 800 formulators. The competition is fierce with large number of organized sector players and significant share of spurious pesticides. The market has been witnessing mergers and acquisitions with large players buying out small manufacturers.

**Objectives of the study**

1. To study the socio-economic profile of farmers.
2. To study the buying behavior of farmers towards insecticide.
3. To study the usage pattern of farmers towards insecticide.

**Research Methodology**

Descriptive research design was used for the purpose of the study. Non- probability Convenience sampling method was use for selecting 200 farmers. From Amreli district total 2 talukas, Amreli and Bagasara were selected based on convenience. From each taluka 10 village were selected randomly and from each village 10 farmers were selected randomly. Primary data were collected with the help of a structured interview schedule. Secondary data were collected from various sources like relevant research papers, company’s website, various published reports, Journals and articles. The quantitative approach was used for the data analysis. Simple Statistical tools and tabular analysis was done for the fulfilment of the objectives.

**Chi - Square Test**

The chi-square test is an important test amongst the several tests of significance developed by statisticians. Chi-square, symbolically written as  $\chi^2$  (pronounced as kiskare). As a non-parametric test, it can be used to determine if categorical data shows dependency or the two classifications are independent. Chi-square as a test of independence enables a researcher to explain whether or not two attributes are associated.  $\chi^2$  are calculated as follows:

$$\chi^2 = \frac{(O_i - E_i)^2}{E_i}$$

Where,  $O_i$ = Observed frequency

$E_i$  = Expected frequency

**Result and Discussion**

**Socio-economic profile of farmers**

**Table 1:** Socio- Economic Profile of Farmers

Demographic Variables	Parameters	Frequency	Percentage
Gender	Female	12	6
	Male	188	94
Age (years)	15-25	13	6.5
	26-35	27	13.5
	36-45	57	28.5
	46-55	89	44.5
	Above 55	14	7
Education qualification	Illiterate	4	2
	Below SSC	65	32.5
	SSC	51	25.5
	HSC	38	19
	Diploma	36	18
Annual Income of Farmers (Rs.)	UG/PG	6	3
	Below 50,000 or 50,000	27	13.5
	50,001-1,00,000	51	25.5
	1,00,001-2,00,000	75	37.5
	2,00,001-3,00,000	26	13
Total Landholdings (Ha)	Above 3,00,000	21	10.5
	Less than 1 Ha or 1 Ha	84	42
	1.1 to 2 Ha	61	30.5
	2.1 to 10 Ha	33	16.5
Type of Farming	More than 10 Ha	22	10
	Irrigated	133	66.5
Type of Irrigation	Rainfed	67	33.5
	Drip irrigation	31	15.5
	Sprinkle irrigation	6	3
Crop grown by farmer	Furrow irrigation	163	81.5
	Kharif	97	48.5
	Kharif, Rabi	79	39.5
	Kharif, Rabi, Zaid	24	12

Above table shown that 94 percent were male farmers and 6 percent were female farmers. Most of the farmers (45%) were in the age group of 46-55 years, followed by 29 percent farmers were in the age group of 36-45 years. Most of the farmers (26%) had completed education up to SSC level. The annual income of most of the farmers (38%) fell in the range of Rs. 1,00,001 to 2,00,000. Most of the farmers (42%) were marginal farmers who have less than 1 Ha or 1 Ha land, followed by 30 percent farmers were small farmers who have 1.1-2 Ha land. Most of the farmers (66%) had irrigated type of farming and most of the farmers (82%) had furrow irrigation. Mostly 48 percent of the farmers grew only kharif crops i.e. groundnut and cotton.

**Buying behavior of farmers towards insecticide**

All the 100 percent farmers were aware about the various damages caused by insects. Mostly 41 percent farmers got the information about insecticide from dealer, followed by 28 percent farmers got to know about insecticide from neighbor and friends, followed by 16 percent farmers got the information from the media advertisement, followed by 9 percent farmers got the information about insecticide from company representative, while only 6 percent farmers got the information about insecticide from extension officer. Mostly 47 percent farmers used insecticide based on dealer’s recommendation, followed by 17 percent farmers used insecticide based on progressive farmers recommendation,

followed by 14 percent farmers used fungicide based on company representative’s recommendation, followed by 6 percent farmers uses insecticide based on agriculture department’s recommendation. Followed by 11 percent farmers uses insecticide based on own determination of infestation level, while only 5 percent farmers uses insecticide as per advertisement.

Mostly 48 percent farmers were influenced by dealer or agro service center, followed by 12 percent farmers were influenced by fellow farmers, followed by 11 percent farmers were influenced by company personnel, followed by 7 percent farmers choose the brand as per their own decision, followed by 7 percent farmers were influenced by advertisement and peer Group, followed by 5 percent farmers were influenced by other influencer, while only 4 percent farmers were influenced by agriculture officer. Mostly 62 percent farmer’s purchased insecticide from the agro service center, followed by 18 percent farmers purchased from company person, followed by 12 percent farmers purchased insecticide from co-operative society, while only 8 percent farmers purchased insecticide from online source. Mostly 42 percent farmer’s purchased insecticide by credit, followed by 35 percent farmers purchased insecticide by both cash and credit, while 23 percent farmers purchased insecticide by cash.

Mostly 48 percent farmers sprayed 3 to 4 doses per crop per season, followed by 16 percent farmers sprayed 5 or more

doses, while 36 percent farmers sprayed 1 to 2 doses per crop per season. All the 100 percent farmers used both solid and liquid form of insecticide to control insects. Mostly 41 percent farmers used more than 2 kg insecticide per season per hectare, followed by 27 percent farmers used 1.1 to 2 kg insecticide, followed by 18 percent farmers used 0.5 to 1 kg insecticide per season per hectare, while 14 percent farmers used less than 0.5 kg insecticide per season per hectare. Mostly 45 percent farmers used more than 2 liters insecticide per season per hectare, followed by 32 percent farmers used 1.1 to 2 liters insecticide, followed by 18 percent farmers used 0.5 to 1 liter insecticide per season per hectare, while 5 percent farmers used less than 0.5 liter insecticide per season per hectare. Mostly farmers 49 percent preferred 1 kg packaging of solid insecticide, followed by 30 percent farmers preferred 500 gram packaging of solid insecticide, while 21 percent farmers preferred 250-gram packaging of solid insecticide. Mostly 51 percent farmers preferred 1 liter packaging of liquid insecticide, followed by 30 percent farmers preferred 0.5 liter packaging of liquid insecticide, while 19 percent farmers preferred 0.25 liter packaging of liquid insecticide. Mostly 45 percent farmers switched over to dealer who give credit when credit was not available, followed by 31 percent farmers reduced the quantity of application when credit was not available, while 24 percent farmers borrowed credit from others.

**Table 2:** Association between type of farming and season wise crop cultivation by farmers

Count of Type of farming	Column Labels			
Row Labels	Kharif	Kharif, Rabi	Kharif, Rabi, Zaid	Grand Total
Irrigated	72	47	14	133
Rainfed	25	24	18	67
Grand Total	97	79	24	200
<b>Chi square test</b>				
Chi square statistics value	DF		Chi square table value (0.05)	
15.84	2		5.99	

From above table, it could be inferred that the value of chi square statistics is 15.84 which is greater than the chi square table value at 0.05 level with degree of freedom is 2. Hence it

could be interpreted that Chi Square statistics is significant. So, relation between type of farming and season wise crop cultivation by farmers is established.

**Table 3:** Association between land holding and quantity of solid insecticide used by farmers per season per hectare

Count of Total land holding (ha)	Column labels				
Row Labels	0- 0.5 kg	0.5- 1 kg	1-2 kg	More than 2 kg	Grand Total
Less than 1 ha	14	11	25	34	84
1.1 to 2 ha	6	15	14	26	61
2.1 to 10 ha	4	7	10	12	33
More than 10 ha	4	3	6	9	22
Grand Total	28	36	55	81	200
<b>Chi square test</b>					
Chi square statistics value	DF			Chi square table value (0.05)	
7.16	9			16.92	

From above table, it could be inferred that the value of chi square statistics is 7.16 which is less than the chi square table value at 0.05 level with degree of freedom is 9. Hence it could be interpreted that Chi Square statistics is not significant. So, the relation between land holding and quantity of solid insecticide used by farmers is not established.

**3. Usage pattern of farmers towards insecticide**

Mostly 74 percent farmers preferred early morning time for spraying, followed by 23 percent farmer’s preferred evening time for spraying, while 3 percent farmers preferred afternoon

time for spraying insecticide. Mostly 69 percent farmer’s mixed insecticide by using stick, followed by 20 percent farmers mixed insecticide by bare hands, while 11 percent farmers mixed insecticide by others practices. Mostly 73 percent farmers not used any protection, followed by 16 percent farmers used shoes, followed by 7 percent farmers used gloves and only 4 percent farmer’s use mask while using insecticide. Mostly 84 percent farmers washed hand using soap after applying the insecticide, while only 16 percent farmers wash hand using plain water after applying insecticide.

**Table 4:** Association between land holding and quantity of liquid insecticide used by farmers per season per hectare

Count of Total land holding (ha)	Column labels				
Row Labels	0- 0.5 liter	0.5- 1 liter	1-2 liter	More than 2 liter	Grand Total
Less than 1 ha	4	11	30	39	84
1.1 to 2 ha	3	14	16	28	61
2.1 to 10 ha	1	7	11	14	33
More than 10 ha	3	3	7	9	22
Grand Total	11	35	64	90	200
<b>Chi square test</b>					
Chi square statistics value	DF		Chi square table value (0.05)		
6.67	9		16.92		

From above table, it could be inferred that the value of chi square statistics is 6.67 which is less than the chi square table value at 0.05 level with degree of freedom is 9. Hence it could

be interpreted that Chi Square statistics is not significant. So, the relation between land holding and quantity of liquid insecticide used by farmers is not established.

**Table 5:** Association between season wise crop cultivation and number of insecticide sprays given per crop per season

Count of season wise crop cultivation	Column labels			
Row Labels	1-2 dose	3-4 dose	5 or more dose	Grand Total
Kharif	45	31	21	97
Kharif, Rabi	23	35	21	79
Kharif, Rabi, Zaid	5	15	4	24
Grand Total	73	81	46	200
<b>Chi square test</b>				
Chi square statistics value	DF		Chi square table value (0.05)	
11.20	4		9.48	

From above table, it could be inferred that the value of chi square statistics is 11.20 which is greater than the chi square table value at 0.05 level with degree of freedom is 4. Hence it could be interpreted that Chi Square statistics is significant.

So, the relation between season wise crop cultivation and number of insecticide sprays given per crop per season is established.

**Table 6:** Association between type of farming and number of insecticide sprays given per crop per season

Count of type of farming	Column labels			
Row Labels	1-2 dose	3-4 dose	5 or more dose	Grand Total
Irrigated	54	44	33	133
Rainfed	17	37	13	67
Grand Total	73	81	46	200
<b>Chi square test</b>				
Chi square statistics value	DF		Chi square table value (0.05)	
9.38	2		5.99	

From above table, it could be inferred that the value of chi square statistics is 9.38 which is greater than the chi square table value at 0.05 level with degree of freedom is 2. Hence it could be interpreted that Chi Square statistics is significant. So, the relation between type of farming and number of insecticide sprays given per crop per season is established.

liquid insecticide. Mostly farmers preferred early morning for spraying insecticide and not used any protection while using insecticide. It is crucial for the Agrochemical Company to understand the socio-economic factors, buying behavior, and usage pattern of farmers to develop effective strategies for ensuring its position in the competitive market and effectively capturing farmers' attention.

## Conclusion

The study revealed that the majority of farmers were male. The age distribution showed that farmers in the age group of 46–55 years constituted the largest segment, and the income level of farmers was predominantly in the range of Rs. 1,00,001 to 2,00,000. Education levels varied, with most farmers having completed below SSC level education. In terms of buying behavior and usage patterns of insecticide, it was found that all farmers were aware of the damage caused by insects. Dealers were the primary source of information about insecticide, followed by neighbors and friends. Dealer recommendations were the most influential factor in the selection of insecticide. Farmers predominantly used three to four doses of insecticide per crop per season. Credit availability played a crucial role in insecticide purchases, with most farmers opting for credit from dealers. Farmers showed a preference for larger packaging sizes for both solid and

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