



Knowledge Level of Farmers on Safe Use of Pesticides in Barpeta District of Assam

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Abstract

The study on the impact of awareness programme on farmers' knowledge regarding the safe use of pesticides revealed a significant increase in knowledge among the participants after the programme. Socio-economic factors were also analyzed for their association with knowledge gain. A positive correlation between education level and knowledge acquisition was observed from the study. However, the variables such as occupation, age, experience in farming, family type, information source about farming and farm size did not exhibit significant correlation. The results of investigation observed that the farmers often depended on the advice from other experienced farmers and agriculture input dealers regarding various farming activities. The input dealers and the farmers showed limited interest about the safe pesticide handling practices. The significant importance of awareness programme in improving the farmers' knowledge level was observed in the present investigation. Organizing regular and frequent awareness programme regarding safe handling of pesticides could be suggested to make people aware of the harmful effects of chemical pesticides.

Keywords: Awareness programme, Knowledge, Krishi Vigyan Kendra, Safe use of pesticides

Introduction

Modern agricultural technologies, scientific extension methodologies and enhanced focus of the government towards the agricultural sector boosted the growth of agriculture in India in recent years. Sixty five percent of the population of the country directly depends on agriculture with 22% share of GDP of the country (Patil, 2022). The economy of the state of Assam is also purely agrarian in nature and around 70% of the population depends on agriculture. The major land mass of Assam (98.4% of total geographical area 7.84 million hectares) belongs to the rural area. Average cropping intensity of Assam is 145.9% in a total cropped area of around 4.0 million hectare. Production of food grains after the era of green revolution boosted up in Assam with the modification of extension mechanism with

a new system of T&V (Training and Visit) during the year 1978-79 with the financial assistance of World Bank. Farmers started shifting towards the use of high-yielding varieties of paddy and other crops, adopting modern agricultural practices like use of chemical fertilizers and pesticides. Installation of about 50,000 Shallow Tube Wells (STWs) by the Department of Agriculture in 1995-96, as part of the World Bank-supported "Assam Rural Infrastructure and Agricultural Services Project (ARIASP)" was also an important step in increasing agricultural production in Assam. During the year 1999-2000, installation of another 99,000 STWs in the farmers' field of Assam under ARIASP and NABARD programme assured the irrigation facilities in around 3 lakh hectares of rice field. Thus the production of rice has boosted up in the state up to the level of self sufficiency. Availability

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of high-yielding and hybrid varieties of rice and vegetables, reliable irrigation facility from groundwater and the ease of getting loans through the Kisan Credit Card have attracted farmers towards application more chemical fertilizer and pesticide for getting higher production. Indiscriminate use of the chemical pesticides and fertilizers by farmers in Assam caused environmental pollution, loss of biodiversity, toxic residues and thus affected human health. In a study conducted by Hazarika and Hazarika (2013) found a positive correlation between the number of cancer cases and pesticide consumption in Barpeta district of Assam. Krishi Vigyan Kendra, Barpeta conducted awareness camps on the safe use of pesticides in the areas of higher pesticides consumption from 2009-10 to 2021-22 to educate the farmers about the harmful effect of the chemical pesticides and fertilizers. The present study aims to evaluate the impact of awareness camps on the knowledge level of farmers on safe use of pesticide in Barpeta district. The study also examined the factors influencing participation in the awareness camps, the extent of knowledge gained after the awareness programmes and any variation in knowledge levels based on socio economic profile of the participants.

Materials and Methods

The study was conducted in the Barpeta district of Assam, specifically in 10 randomly selected villages from five different blocks: Barpeta, Sarukhetri, Chenga, Gomafulbari and Chakchaka. These villages were chosen because they had undergone various awareness programmes on safe use of pesticides conducted by Krishi Vigyan Kendra, Barpeta, Assam between 2009-10 and 2021-22. A sample of 300 farmers was randomly selected from 10 villages which were known to have higher frequency of chemical pesticide usage. The interview schedule (close ended) was prepared and administered among the selected farmers to know the reason for attending the awareness programme on safe use of pesticides. From the pool of selected farmers, a simple random sampling technique was used to find out subset of 60 farmers. This subset was specifically chosen to assess both the pre-existing knowledge and knowledge gained after the awareness programmes. The evaluation focused on the ill effects associated with the use of pesticides and proper methods of handling pesticide safely. The evaluation of the knowledge gained by the participants was worked out with the method used by Upamanya et al. (2019) and Sarma et al. (2013). The two point scale knowledge test (1 for correct and 0 for incorrect answer) was designed to assess the disparity in mean score of knowledge. Its objective was to determine the distribution of respondents based on their knowledge levels and evaluate the significance of the difference between the mean knowledge scores before and after the awareness programmes. To evaluate the knowledge of selected farmers, a comprehensive set of 35 questions covering various aspects of chemical management and safe handling of pesticides was developed. Consequently, the respondents had the potential to attain a maximum score of 35. The method followed by Dasgupta (1989) was used to categorize the respondents into the three different classes

of knowledge level, i.e., low, medium and high.

Category	Score
Low	Below $(\bar{X} - S_d)$
Medium	$\bar{X} - S_d$ to $\bar{X} + S_d$
High	Above $\bar{X} + S_d$

Finally, with the paired 't' test, the significant difference in pre-existing and the knowledge acquired after the awareness programme was evaluated. The relationship was established between the knowledge gained from the awareness programme with the selected independent variables of the participants (education, family type, age, occupation, experience in farming, information source about farming and operational land holding).

Results and Discussion

Characteristics of the Respondents

The findings indicated that (Table 1) nearly half (48.33%) of the respondents of young age group (<35 years). Lack of employment opportunity as well as attraction of rural youth towards agriculture sector may be the reasons of higher participation of youths in the awareness programme. With respect to the educational level of the respondents, (33.33%) was 'matriculate' followed by 'higher secondary level' (25%), 'middle school' (21.67%) and 'graduation and above' (10%). It implies that the educated youths are attracted towards modern method of agriculture and interested to know about ill effect of pesticides and method of safe use of pesticides. Leihaothabam et al. (2020) also observed the 0% participation of illiterate farmers in Manipur, India in a study on assessment of training needs among the rice growers. The prime occupation of majority of the respondents (86.67%) was farming out of which 60% belongs to the marginal group (farming area is less than 1 hectare). Use of higher amount of pesticides to increase the productivity of the crop might be one of the reasons behind the involvement of more marginal farmers in the awareness camp on safe use of pesticides. The investigation showed that the majority of the respondents (51.67%) had 1 to 5 years of experience as farmer. The result indicated that the rural youths with minimum experience in farming were interested to know about the demerits of chemical pesticides as well as the method safe handling of pesticides. The results of the study are in conformity with the earlier result of the author (Upamanya et al., 2020), where it was found that the young farmers with minimum farming experiences are always interested to know about novelty in agriculture like mushroom enterprises. With respect to the source of information about farming, it was found that the majority of the farmers (40%) received the information from the fellow farmers followed by the input dealers (35%). However, 18.33% of the respondents used to receive the information from extension personnel. Here, the contribution of KVK in transferring the technical knowledge on modern method of farming was reflected.

Sl. No.	Variables	Frequency (%)
1. Age		
	Young (<35 years)	29 (48.33)
	Middle (35-55)	24 (40.00)
	Old (> 55)	7 (11.67)
2. Educational qualification		
	Illiterate (0)	0 (0)
	Primary Education completed (1)	13(21.67)
	Middle School Education completed (2)	11 (18.33)
	Matriculate (3)	13 (21.67)
	Higher Secondary passed (4)	14 (23.33)
	Graduation and above (5)	9 (15.00)
3. Occupation		
	Farming (1)	52 (86.67)
	Government service (2)	2 (3.33)
	Businessman (3)	1 (1.67)
	Others (daily labourers, carpenters, etc.) (4)	5 (8.33)
4. Family type		
	Nucleus (1)	58 (96.67)
	Joint (2)	2 (3.33)
5. Experience in farming		
	1-5 years (1)	31 (51.67)
	6-10 years (2)	17 (28.33)
	> 11 years (3)	12 (20.00)
6. Information source about farming		
	Extension personnel (1)	11 (18.33)
	Experienced farmers/ Fellow farmers (2)	24 (40.00)
	Fertilizer and pesticide dealers (3)	21 (35.00)
	Newspaper/ Radio/ TV (4)	4 (6.67)
7. Farm size		
	Landless (1)	0 (0.00)
	Marginal (<1 ha) (2)	36 (60.00)
	Small (1-2 ha) (3)	16 (26.67)
	Medium (3-10 ha) (4)	8 (13.33)
	Large (>10 ha) (5)	0 (0.00)

Reasons of Participation in Awareness Programme on Safe Use of Pesticides

In the following table (Table 2), the frequency as well as percentage of number of respondents based on the reasons for participating in the awareness camp on safe use of pesticides as informed by them was shown. Most of the

Sl. No.	Reasons for participation	Number (%)
1.	To enhance knowledge on chemical management of pests and diseases in agriculture	113 (37.67)
2.	To know about specific chemical used for specific pests and diseases	96 (32.00)
3.	To know the different methods regarding the safe use of pesticides	178 (59.33)
4.	To know about the waiting period of pesticides	23 (7.67)
5.	To get the information on ill effect of pesticides on human health	102 (34.00)
6.	To know about the recommended dose of the pesticides	59 (19.67)
6.	To know overall information of pesticides used in agriculture	259 (86.33)
7.	To establish good relationship with KVK scientists	85 (28.33)

respondents (86.33%) joined the awareness camp to know the overall information of pesticides used in agriculture. During a study in Kilolo district of Tanzania, Mwamakimbula (2014) also found that most of the farmers were motivated to attend the extension training to achieve the latest knowledge on agriculture. However, 59.33% of the participants wanted to know about the different methods regarding the safe use of pesticides. Some of the respondents (37.67%) also joined the awareness camp to get more information about the chemical management of pests and diseases, 32% of the respondents were interested to know about the accurate pesticide for management of specific pest. However, very few numbers (7.67%) of respondents joined the camps to know about the waiting periods of the particular pesticides. It implies that farmers were less concerned about the health of the consumers while selling their vegetables in the market.

Impact of Awareness Camps on the Knowledge Gained about Pesticides and Safe Use of Pesticides

The change in the knowledge level of the participants with regard to pesticides and their method of proper handling before and after the awareness programmes are stated in table 3. In the aspects like the information about material safety data sheets of a pesticide and the name of the banned nematicides, none of the respondents could answer correctly. In some practical questions like the amount of spray solution required per hectare in a high volume sprayer, 35% of the respondents could answer correctly before the awareness programme where as 10% of the respondents knew about the requirement of spray volume in ultra low volume sprayer. However, the gain in knowledge level after the awareness programme was found to be satisfactory in most of the information about pesticides and their safe use. Post awareness evaluation indicated that above

Table 3: Frequency and percentage distribution of respondents based on the knowledge on safe use of pesticides

Sl. No.	Knowledge regarding safe use of pesticides	Frequency and Percentage	
		Pre-training (n=60)	Post-training (n=60)
1.	Name of five fungicides	11 (18.33)	52 (86.67)
2.	Name of five insecticides	14 (23.33)	48 (80.00)
3.	Name of five herbicides	16 (26.67)	49 (81.67)
4.	Name of one nematicide	4 (6.67)	38 (63.33)
5.	Name of one acaricide	5 (8.33)	53 (88.33)
6.	Name the active ingredient present in the fungicide "Bavistin"	2 (3.33)	41 (68.33)
7.	Name the active ingredient present in the insecticide "Ustad"	5 (8.33)	40 (66.67)
8.	Name the active ingredient present in the nematicide "Furadon"	3 (5.00)	35 (58.33)
9.	Range of spray volume per hectare area for spraying with High Volume Sprayer	21 (35.00)	50 (83.33)
10.	Range of spray volume per hectare area for spraying with Low Volume Sprayer	15 (25.00)	50 (83.33)
11.	Range of spray volume per hectare area for spraying with Ultra Low Volume Sprayer	6 (10.00)	41 (68.33)
12.	Recommended dose of Tricyclazole 75 WP against rice blast disease	7 (11.67)	50 (83.33)
13.	Waiting period of insecticide Chlorantraniliprole 18.5% SC when used in brinjal	7 (11.67)	35 (58.33)
14.	Mention the name of a sticker used in spraying	7 (11.67)	45 (75.00)
15.	Different way of entering pesticide into human body	17 (28.33)	60 (100.00)
16.	Name some human diseases due to pesticide poisoning	21 (35.00)	60 (100.00)
17.	Name of personal protective equipments used during the time of spraying pesticides	3 (5.00)	45 (75.00)
18.	Care taken during the opening of pesticide bottles	22 (36.67)	57 (95.00)
19.	Care taken during spraying of pesticides	22 (36.67)	59 (98.33)
20.	Care taken after spraying of pesticides	22 (36.67)	58 (96.67)
21.	Information on first aid when pesticides have been spilled on the skin	11 (18.33)	55 (91.67)
22.	Information on first aid when pesticides have entered into the eyes	16 (26.67)	60 (100.00)
23.	Information on first aid when pesticides have been inhaled	3 (5.00)	55 (91.67)
24.	Information on first aid when pesticides have been swallowed	8 (13.33)	54 (90.00)
25.	Information about Material Safety Data Sheets of a pesticide	0 (0.00)	52 (86.67)
26.	Name of one banned fungicide	3 (5.00)	32 (53.33)
27.	Name of one banned insecticide	12 (20.00)	32 (53.33)
28.	Name of one banned herbicide	2 (3.33)	28 (46.67)
29.	Name of one banned nematicide	0 (0.00)	22 (36.67)
30.	Name of one microbial insecticide	8 (13.33)	48 (80.00)
31.	Name of one microbial fungicide	9 (15.00)	45 (75.00)
32.	Name of one botanical insecticide	15 (25.00)	46 (76.67)
33.	Information about pheromone trap	16 (26.67)	52 (86.67)
34.	Information about trichocard	17 (28.33)	48 (80.00)
35.	Information about Integrated Pests and Diseases Management	11 (18.33)	42 (70.00)

80% of the farmers answered correctly in 19 numbers out of 35 questions and more than 70% farmers answered correctly in 23 numbers out of 35 questions. In some of the aspects like different ways of entering pesticide into human body, name some human diseases due to pesticide poisoning, information on first aid when pesticides have entered into the eyes, all the respondents answered

correctly. The achievement in terms of gain in knowledge might be attributed to the positive impact of the training or awareness programme which was stated by earlier workers like Macfarlane *et al.* (2008) and Jallow *et al.* (2017). Educational background of the participants and the interest on chemical management might be the important factors behind awareness gain in knowledge (Shahi *et al.*, 2018).

Categorization of Respondents with respect to Level of Knowledge

Based on the evaluation with respect to the knowledge level on safe use of pesticides before and after the awareness programme, the respondents were classified into three groups namely low, medium and high. Results of the study indicated that 50% of the respondents possessed a low level of knowledge regarding the safe use of pesticides, while the remaining 50% had a moderate knowledge level prior to the awareness programme. However, following the intervention, it was observed that all the respondents demonstrated an increase in their knowledge levels, with 48.33% achieving

a medium level of knowledge and 51.67% reaching a high level (Table 4). The calculated value of *t'* (48.46) clearly indicated a significant increase in knowledge level after participating in the awareness programme compared to the period before the programme. The lower level of knowledge observed before the awareness programme period among the farmers of Barpeta district might be associated with lack of awareness regarding the safe handling of pesticides. The shift in knowledge level from lower to medium and high following the awareness programme serves as a clear indication of programme's effectiveness, highlighting the success of the initiative undertaken by Krishi Vigyan Kendra.

Table 4: Classification of respondents by knowledge gained on safe use of pesticides

Category	Score range	Before (n=60)				After (n=60)				't' value
		Frequency & Percentage	Mean score	S.D.	C.V.	Frequency & Percentage	Mean score	S.D.	C.V.	
Low	0-6	30 (50.00)				0 (0.00)				
Medium	6-28	30 (50.00)	6.02	3.66	60.86	29 (48.33)	27.28	3.21	11.75	48.46**
High	28-35	0 (0.00)				31 (51.67)				

[*Significant at 0.05 level of probability; **Significant at 0.01 level of probability]

Relationship between Independent Variables and the Enhancement of Respondents' Knowledge

The participants of the awareness programme displayed varying scores influenced by a range of socio economic factors. To assess the relationship between knowledge acquisition and selected independent variables, the Pearson's Product Moment Correlation Coefficient was applied (Table 5). The findings indicated a positive but non-significant correlation between knowledge gained and variables such as occupation, age, family type, source of information about farming experience in farming and farm size. The negative correlation observed with the source of information about farming implies that farmers often rely on the advice from agriculture input dealers for various solutions related to pests and disease management of crops, while the dealer themselves show little interest in discussing about safe handling practices of pesticides. However, a significant positive correlation was found ($r=0.294$) between

respondents' education level and knowledge gained during the awareness programme. The findings suggest that participants with higher level of education exhibited greater knowledge acquisition.

Based on the above results it was evident that in a majority of cases, the respondents exhibited enhanced levels of knowledge regarding safe pesticide use, improved understanding of pesticide hazard control and increased awareness of safety behaviour in post-participation compared to their knowledge levels prior to the awareness programme. Concerning farmers' knowledge on safe use of pesticide (the calculated value of '*t'* = 48.46') clearly indicated a significant increase in knowledge level after participating in the awareness programme compared to the period before the programme. Socio personal characters like occupation, age, experience in farming, type of family, source of information about farming and size of farm size showed a positive correlation with the respondents' enhanced knowledge. Thus, it is essential to focus on interventions that enhance knowledge and ensure compliance with safety behaviours. The effectiveness of capacity building with the help of awareness camps, training, study materials and demonstration to enhance participants' knowledge on safe and judicious use of pesticide were also reported in the studies conducted by Kombusadee and Kurukodt (2021) in So Phisai District, Thailand; Sabran and Abas (2021) in Pulau Pinang, Malaysia; Tayade and Chinchmaltpure (2016) in Amravati District, Maharashtra; and Sam *et al.* (2008) in South India. These studies consistently demonstrated similar findings affirming positive impact of such intervention like awareness programme on increasing participants' existing knowledge.

Conclusion

The present study emphasizes the importance of awareness

Table 5: Association of selected independent variables with the knowledge gained by respondents

Sl. No.	Variables	Knowledge gained	
		'r' value	'P' value
1.	Age	0.004	0.609
2.	Education	0.294*	0.024
3.	Occupation	0.011	0.988
4.	Family type	0.040	0.472
5.	Experience in farming	0.063	0.503
6.	Source of information about farming	-0.058	0.385
7.	Farm size	0.031	0.850

[*Significant at 0.05 level probability]

programme in enhancing farmers' knowledge level about the safe handling of pesticides. It was observed that the younger and educated farmers gained more knowledge on safe handling of pesticides as well as the negative impact of pesticides on human health, environment and biodiversity. To ensure successful knowledge transfer on safe handling of pesticides in agriculture, it is recommended to consider the participants' educational qualifications. However, regular awareness programmes are necessary to educate farmers about the banned pesticides, first aid during accidental pesticides poisoning as well as the detrimental effects of chemical pesticides.

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