

KNOWLEDGE LEVEL AND ADOPTION OF THE INTEGRATED PEST MANAGEMENT (IPM) TECHNIQUES: A STUDY AMONG THE VEGETABLE GROWERS OF KATWA SUB-DIVISION, BARDHAMAN DISTRICT

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ABSTRACT

In this paper, the authors tried to locate the factors that affected the knowledge level as well as the level of adoption of the Integrated Pest Management (IPM) techniques by the selected vegetable growers. All the farmers who had grown the four major vegetables viz. Brinjal, Pointed Gourd, Cauliflower and Cabbage commercially in more than 0.33 acre of farm land within the 5 km. radius of Katwa town in Katwa Sub-Division of Bardhaman District were selected for the present study. The present investigator found out from the present study that (1) a majority of the respondents had low knowledge index and low level of adoption of the IPM techniques, (2) age, caste, educational status, total monthly income of the family of the respondent, material possession, type of farm power used in vegetable cultivation, experience of respondent in vegetable cultivation, social participation, respondent's family contact with extension agencies and exposure of the respondent to mass media sources were significantly and positively correlated with Knowledge Index of the vegetable growers, (3) caste, educational status, total monthly income, type of dwelling and experience of respondent in vegetable cultivation were significantly and positively correlated with the adoption level of the respondents and (4) the knowledge index and adoption level of the respondents regarding the IPM techniques in the selected vegetable cultivation were highly and positively correlated.

Key words: Integrated pest management (IPM), Knowledge index, Level of adoption.

INTRODUCTION

Integrated Pest Management (IPM) is a scientific paradigm (Perkins, 1982) which is now of global significance. IPM refers to the management of pests by using preventive and curative measures through judicious combinations of cultural, mechanical, biological and chemical means (Lakshminarayan, 1998). Its basic concern is with designing and implementing pest management practices that meet the goals of farmers, consumers and governments in reducing pest losses while, at the same time, safeguarding against the longer term risk of environmental pollution, hazards to human health and reduce agricultural sustainability.

While the philosophy and ideas of IPM are now widely accepted in the political and scientific arena, the practical implementation of IPM has proved far more difficult to achieve. Most farmers do not think the IPM measures to be effective. In order to minimize crop loss, our farmers aggressively adopt self-defeating practices such as increasing either dosage or frequency of its effect on environment, health and socio-economic conditions of the community. Farmers have tended to overuse pesticide according to their perception of the worst pesticide losses. For example, farmers tend to overuse chemicals to achieve full protection of high value crops such as vegetables because the physical

appearance to the consumers or processors greatly affects the price of these crops.

This perception of the farmers about the IPM techniques gives rise to a broader question. i.e. whether there is any type of “knowledge Gap” of the vegetable growers regarding the use of the IPM technique. But, if the farmers are to manage pests in the best way, there is certain set of knowledge and information they need to be aware of, including conceptual and technical knowledge, as well as the ‘know – how’ to carry out certain practices. Keeping these in view, following objectives have been delineated for the study.

Objectives :

- (1) To study the socio- personal profile of the respondents,
- (2) To find out the distribution pattern of the respondents on the basis of the various categories of Knowledge Index(KI) in relation to the IPM techniques in the vegetable cultivation,
- (3) To examine the relationship between the socio- personal traits of the respondents with their KI in relation to the IPM techniques in the vegetable cultivation,
- (4) To examine the relationship between the socio- personal traits of the respondents with their adoption level in relation to the IPM techniques in the vegetable cultivation,
- (5) To suggest some measures (based on the findings), to enhance the knowledge level of the vegetable growers regarding the IPM techniques in the vegetable cultivation.

MATERIAL AND METHODS

All the 18 villages, falling under the five (5) kilometers radius of Katwa Town in the Katwa Sub-division in Barhaman District of West Bengal were selected for the present study, as these villages have sizeable population who grew the selected four vegetables commercially in more than 0.33 acre of farm land for last five years.

At present 150 such farmers were there who grew the brinjal, pointed gourd, cauliflower and cabbage commercially in more than 0.33 acre of farm land for the last five years. So, all the 150 vegetable growers were selected as the sample population of the present study. In the summer season, the production of brinjal and pointed gourd topped the list, whereas in the winter season, the production of cauliflower and cabbage topped the list of the produced vegetables in the selected Katwa - 1 Block. So, the two summer vegetables viz. Brinjal and pointed gourd and the two winter vegetables viz. cauliflower and cabbage were selected for the present study.

The data were collected with the help of a structured schedule / questionnaire developed for the study and through the personal interview method. The data were collected from January, 2005 to December, 2005 at the selected villages. After completion of data collection, thorough checking was made on the filled up schedules and then the schedules were numbered. The numbered schedules were tabulated according to their numbers. The collected data were properly coded, tabulated and analyzed.

Here, the Knowledge Index (K.I.) of the respondents regarding the IPM practices of the selected vegetables was calculated by the following formula: -

$$\text{Knowledge Index (K. I.)} = \frac{K_m}{P_m} \times 100$$

regarding the IPM. practices of the selected vegetables

Where, P_m = possible maximum number of the correct answers given by the respondents on the knowledge items regarding the IPM practices of the selected vegetables and.

K_m = actual number of the correct answers given by the respondents on the knowledge items regarding the IPM. practices of the selected vegetables.

Here the recommended level of knowledge and actual level of knowledge in relation to the IPM techniques in the vegetable cultivation were measured by the total number of IPM practices as suggested / recommended by the State Department of Agriculture, Government of West Bengal for the selected vegetable production and the total number of recommended IPM practices followed by the vegetable growers in the actual field level of production of selected vegetables. For measuring the KI of the vegetable growers in relation to the IPM techniques, the recommended package of practices in relation to the IPM techniques in the cultivation of brinjal, pointed gourd, cauliflower and cabbage, of the Department of Agriculture, Government of West Bengal was the bench-mark.

The KI in relation to the IPM techniques of the selected four vegetables of each individual of the earlier selected 150 respondents was calculated by the formula mentioned earlier. The mean and Standard Deviation (S.D.) of the individual KI regarding the IPM. practices of the selected vegetables of all the 150 respondents were calculated, which were 47.556 and 9.644 respectively. Then the respondents were categorized into three categories whose respective KI were High [More than (Mean + S.D.)] i.e. (KI of 57.21 and higher), Medium [(Mean – S.D.) to (Mean + S.D.)] i.e. (KI of 37.912 to 57.2) and Low [Less than (Mean – S.D.)] i.e. (KI up to 37.911).

The relationship between the selected 12 (twelve) socio-personal-economic-situational-extension traits of the respondents and their KI in relation to the IPM techniques in the selected vegetable cultivation was examined by using simple correlation co-efficient and multiple regression tools.

The adoption level of the respondents i.e. the vegetable growers were divided into four categories viz. (1) the respondents who had adopted all the package of practices as recommended by the Department of Agriculture, Government of West Bengal regarding the IPM practices for the selected

vegetables, (2) the respondents who had adopted the package of practices more than 50 percent of the number of the recommended practices, (3) the respondents who had adopted the package of practices up to 50 percent of the number of the recommended practices for the selected vegetables and (4) the respondents who did not adopt any of the package of practices as recommended by the Department of Agriculture, Government of West Bengal.

The relationship between the selected 12 traits of the respondents and their level of adoption in relation to the IPM techniques in the vegetable under study was examined by using simple correlation co-efficient.

RESULTS AND DISCUSSIONS :

Socio-Personal Profile of the Respondents

Data in Table – 1 revealed that a majority of respondents (34.61 per cent) belonged to middle age group (35.1-45 years), closely followed by (33.33 per cent) young age group (up to 35 years) and 32.00 per cent belonging to old age group (above 45 years). Middle caste was the predominant caste community with 52.67 per cent of the respondents belonging to that community, followed by Schedule Caste community with 34.67 per cent. Highest percentage of respondents i.e. 33.33 per cent were educated up to middle school level where as 18.67 per cent were educated up to Primary school level. Most of the respondents i.e. 84.33 per cent were married while rest of them were unmarried (12.67 per cent). The largest per centage of the population i.e. 85.33 per cent had 1-2 drought animals for cultivation. The data further revealed that the highest per centage of populations i.e. 49.33 per cent lived in Katcha Houses followed by 25.33 per cent living in Pucca Houses of one storey. The study also showed that the small families (up to 4 members) constituted a majority among the respondents with 54.67 per cent followed by the medium family (5-8 members) with 40 percent. A majority of the respondents who nearly constituted 56.00 per cent of the total number of

Table 1: Description of the respondents according to their socio-personal characteristics

N = 150

Characteristics	Categories	No.	% age
Age	Young (18-35 years)	50	33.33
	Middle (35.1-45 years)	52	34.67
	Old (> 45 years)	48	32.00
Caste	Higher Caste	11	07.33
	Middle Caste	79	52.67
	Other Backward Caste	08	05.33
	Schedule Caste	51	34.67
	Schedule Tribe	00	00.00
Educational Qualification	Illiterate	23	15.33
	Functionally literate	28	18.67
	Educated up to Primary level	00	00.00
	Educated up to Middle level	50	33.33
	Madhyamik passed	22	14.67
	Higher Secondary passed	06	04.00
	Graduate, Post Graduate and above	21	14.00
Marital Status	Married	131	87.33
	Unmarried	19	12.67
Farm Power used	No Drought animals	22	14.67
	1-2 drought animal	128	85.33
	3-4 drought animals	00	00.00
	5 and more drought animals	00	00.00
	Power Tillers	07	04.67
	Tractors	68	45.33
Type of Dwelling	Shanty/ Hut	01	00.67
	Katcha House	74	49.33
	Mixed House	21	14.00
	Pucca House (One Storeyed)	38	25.33
	Pucca House (More than one Storeyed)	16	10.67
Family Size	Small family (up to 4 members)	82	54.67
	Medium Family (5 to 8 members)	60	40.00
	Large Family (above 8 members)	08	05.33

Family Type	Nuclear family	108
Income	Up to Rs. 2000/- per month	84
Participation	Member of one organization	47
Respondent's	Up to Rs. 3000/- per month	42
Communication	Member of more than one organization	01
	Motorcycles. 4000/- per month	06
Implements	Office holder	00
	Up to Rs. 5000/- per month	00
	Public Leader	01
	Bicycle - Rs. 6000/- per month	42
	Ball 600/- and above per month	06
Operational land	Telephone/Mobile Phone	08
Fielding	Over 2000 ha.	03
Possession	Telephone	08
A. Farm	Radio	89
Implements	Radio Plough	3
	Duster	12
	Sprayer	115
	Sickles	150
	Spade	150

respondents were earning a meager family income of Rs. 2000/- only or less per month, followed by 28.00 per cent of the respondents whose families earned Rs. 2001/- to Rs. 3000/- only per month. The profile shows that all the respondents had sickles and spade as agricultural implements. It was appreciable to note that a high percentage of the respondents i.e. 76.67 per cent had their own Sprayers. The profile clearly tells us that a vast majority of the respondents i.e. 94.67 per cent had their own bicycles for transportation purposes. Approximately one third of the respondents i.e. 34.00 per cent had their own Bullock Carts for transportation. It was also observed from the 'Table 1' that an emphatic majority of the respondents i.e. 92.00 per cent of the respondents held operational land holdings whose size was up to 1.00 hectare. Nearly 07.33 per cent of the respondent had operational land holdings whose sizes varied from 1.01-2 hectares. None of the total of 150 numbers of the respondents had a secondary occupation. It was also evident that 38.00 per cent of the respondents had up to five years experience in vegetable cultivation followed by 24.66 per cent of the respondents with 5.1 to 9.9 years experience, closely followed by 20.67 per cent with more than 15 years experience in vegetable cultivation.

The Distribution of the respondents on the basis of the knowledge index of the respondents regarding the IPM techniques in the selected vegetable cultivation

There were six numbers of knowledge items, upon which the knowledge level of the respondents regarding the IPM practices of the selected vegetables was measured. These knowledge items were:

- (i) Knowledge about the rotation of applied pesticides,

- (ii) Knowledge about the bio-pesticides,
- (iii) Knowledge about the Economic Threshold Limit (E.T.L.) concept,
- (iv) Knowledge about the I.P.M. practices of the selected vegetables,
- (v) Knowledge about the 'Friendly Insect' and 'Enemy Insect' of the selected vegetables and
- (vi) Knowledge about the advantages and disadvantages of the pesticide application on the 'Friendly' and 'Enemy' insects of the selected vegetables.

On the basis of the above mentioned six numbers of knowledge items, KI regarding the IPM practices of the selected vegetables of each individual respondent was calculated. The mean and Standard Deviation (S.D.) of the individual KI regarding the IPM practices of the selected vegetables of all the 150 respondents were calculated, which were 47.556 and 9.644 respectively. Then the respondents were categorized into three categories of respondents whose respective KI were high, medium and low.

The categorization of the vegetable growers according to their individual KI regarding the IPM practices of the vegetables under study was given in Table 2.

From the Table 2, table, it was safely noted that an overwhelming majority of the respondents i.e. 94.00 per cent had low KI regarding the IPM practices of the selected vegetables and the rest i.e. 06 per cent of the respondents had medium KI. It was also noted that no respondent belonged to high KI category regarding the IPM practices of the selected vegetables. This picture gave rise to the fact that in general a very low level of knowledge regarding the IPM practices of the selected vegetables existed among the vegetable growers.

Deviation (S.D.) of the individual KI regarding the	31
IPM practices of the selected vegetables of all the	25
150 respondents were calculated, which were 47.556	37
and 9.644 respectively. Then the respondents were	57
categorized into three categories of respondents	
whose respective KI were high, medium and low.	

Table 2: Distribution of the respondents according to their respective KI regarding the IPM practices of the selected vegetables under study.

Category of KI	Frequency	Percentage
High KI	00	00.00
Medium KI	09	06.00
Low KI	141	94.00
Total	150	100.00

Table 3: Correlation co-efficient between independent variables and KI regarding the IPM practices of the selected vegetables (Y_1) (Dependent variable)

Variables	r-value
Age of the respondent (X_1)	0.2148**
Caste of the respondent (X_2)	0.1796*
Educational Status of the respondent (X_3)	0.5697**
Total monthly income of the family of respondent (X_4)	0.2763**
Type of dwelling of respondent (X_5)	0.1392
Material Possession of respondent (X_6)	0.1605*
Respondent's total cultivable land (X_7)	0.0207
Type of farm power used by the respondent in vegetable cultivation (X_8)	.1963**
Experience of respondent in vegetable cultivation (X_9)	0.3017**
Social participation of respondent (X_{10})	0.1360*
Respondent's family contact with extension agencies (X_{11})	0.1556*
Exposure of the respondent's to mass media sources (X_{12})	0.1527*

* Correlation is significant at 0.05 level of significance

** Correlation is significant at 0.01 level of significance

Relationship between Socio-personal Traits of the Respondents and their KI regarding the IPM techniques in the selected vegetable cultivation

The correlation coefficient between the twelve (12) independent socio-personal- variables and the dependent variable (Y_1) viz. KI regarding the IPM. practices of the selected vegetables was given in the Table 3.

The Table 3 showed that the independent variables X_1 (age of the respondent), X_2 (caste of respondent), X_3 (educational status of respondent), X_4 (total monthly income of the family), X_6 (material possession), X_8 (type of farm power used by respondent in vegetable cultivation), X_9 (experience of respondent in vegetable cultivation), X_{10} (social

participation), X_{11} (family contact with extension agencies) and X_{12} (exposure of the respondent to mass media sources) were significantly and positively correlated with the dependent variable KI of the vegetable growers in relation to the IPM practices of the selected vegetables. This means that more the age, higher the caste, higher the educational status, increased total monthly income of the family, a more diverse and modern range material possession, more the sophisticated type of farm power used in vegetable cultivation, more the experience in vegetable cultivation, enhanced social participation, higher level contact with extension agencies and more exposure to mass media sources would ensure a higher KI of the vegetable growers in relation to the IPM practices of the selected vegetables.

Table 4: Rank position of the independent variables in predicting the dependent variable (Y_1) (Knowledge Index regarding the IPM practices of the selected vegetable)

Independent Variables	Coefficient 'B' value	Std. error	't' value
X_1 (Age of the respondent)	1.201	0.493	2.434*
X_2 (Caste of the respondent)	0.395	0.377	1.049
X_3 (Educational Status of the respondent)	0.585	0.086	6.805**
X_4 (Total monthly income of the family of respondent)	0.574	0.298	1.926*
X_5 (Type of dwelling of respondent)	0.326	0.127	2.565**
X_6 (Material Possession of respondent)	0.720	0.371	1.940*
X_7 (Respondent's total cultivable land)	0.534	0.333	1.604
X_8 (Type of farm power used by the respondent in vegetable cultivation)	0.571	0.218	2.617**
X_9 (Experience of respondent in vegetable cultivation)	7.070	2.998	2.358**
X_{10} (Social participation of respondent)	3.196	1.371	2.331**
X_{11} (Respondent's family contact with extension agencies)	0.159	0.072	2.204*
X_{12} (Exposure of the respondent to mass media sources)	0.080	0.042	1.905*

 $R^2 = 0.526$

F = 10.337

Intercept constant = 6.467

* Correlation is significant at 0.05 level of significance.

** Correlation is significant at 0.01 level of significance.

The result of the multiple regression analysis with significant $\hat{\alpha}$ values with the total 150 respondents was tabulated and noted down in the Table 4.

It is apparent from the Table – 4 that the value of coefficient of multiple determinations R^2 with twelve independent variables is 0.526. The value of F ratio is 10.337, which is significant at 0.01 level of probability. This reveals that the twelve independent variables put together, contributed to a significant amount of variation to a proportion of 52.60 percent in the KI of the respondents in relation to the IPM practices of the selected vegetables. On the other hand, it is also revealed through the values of the regression coefficient ' $\hat{\alpha}$ ' that the independent variables viz. the caste of the respondents and the respondent's total cultivable land on the individual basis did not contribute significantly to the variation in the KI of the respondents in relation to the IPM practices of the selected vegetables.

The relationship between the socio-personal traits of the selected vegetable growers with their adoption level in relation to the IPM techniques in the vegetable cultivation

The correlation of coefficient between the twelve (12) independent socio-personal- variables and the dependent variable (Y_2) viz. the adoption level of the respondents regarding the IPM techniques in the selected vegetable cultivation was given in the following table.

The Table – 5 showed that the independent variables X_2 (caste), X_3 (educational status), X_4 (total monthly income of the family), X_5 (type of dwelling) and X_9 (experience in vegetable cultivation) were significantly and positively correlated with the dependent variable (Y_2) the adoption level of the respondents regarding the IPM techniques in the selected vegetable cultivation. This means that higher the caste, higher educational status, more total monthly income, more developed and modern type of dwelling lived in and increased level of the experience of the respondents in the cultivation of the selected vegetables would ensure higher level of adoption regarding the IPM techniques in the selected vegetable cultivation.

Suggestions :

- (i) The extension agencies should be made more efficient to acquaint the farmers for the recent developments in the plant protection measures and IPM techniques in the vegetable cultivation.

Table 5: Correlation of co-efficient between the independent variables and the adoption Level of the respondents regarding the IPM techniques in the selected vegetable cultivation (Dependent variable) (Y_2)

Sl. No	Variables	r-value
01	Age of the respondent (X_1)	- 0.095
02	Caste of the respondent (X_2)	0.274**
03	Educational Status of the respondent (X_3)	0.183*
04	Total monthly income of the family of respondent (X_4)	0.372**
05	Type of dwelling of respondent (X_5)	0.189*
06	Material Possession of respondent (X_6)	0.084
07	Respondent's total cultivable land (X_7)	- 0.064
08	Type of farm power used by the respondent in vegetable cultivation (X_8)	0 .091
09	Experience of respondent in vegetable cultivation (X_9)	0 .192*
10	Social participation of respondent (X_{10})	0 .054
11	Respondent's family contact with extension agencies (X_{11})	0 .021
12	Exposure of the respondent's to mass media sources (X_{12})	0 .064

* Correlation is significant at 0.05 level of significance.

** Correlation is significant at 0.01 level of significance.

- (ii) The extension agencies both public sector and private sector should focus their campaign on educating the vegetable growers on the number of different chemical groups of the pesticides used, frequency of the pesticide use, quantity of the pesticides use and the strength of the different pesticides to be used and the Economic Threshold Limit (ETL) of the attacking pests in the vegetable cultivation.
- (iii) The Top-Down Approach of Agricultural Extension in India has generally served the resource-rich farmers. So, a new extension approach is needed containing the following features –
- Emphasis on the Farming System Approach by detailing the insect-pest, disease occurrence pattern of a particular vegetable field.
 - Promotion of the Farmers Participatory Approach by incorporating the vegetable growers' traditional knowledge about the Bio-pesticides and the natural enemies of the pests of the vegetables in the ambit of the IPM techniques (consisting of physical, mechanical, cultural, biological chemical methods) of the vegetables grown by the farmers.
 - The new extension approach should aim to build the capacity in the vegetable growers by making them technologically as well as mentally equipped about the intrigues of the IPM techniques of the vegetables.
 - The extension personnel should intensively and efficiently use the user friendly Information Technology and Mass Media to spread the information and knowledge on the various aspects of judicious use of the pesticides as well as the IPM techniques for the vegetable cultivation.

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