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Sales Practices in Pesticides Retail: A Case Study of Kerala

P. Indira Devi,* M.G. Jayasree, A.P. Sarada** and Rajesh K. Raju****

ABSTRACT

Despite the reports on negative externalities due to pesticide exposure by varying sections of the population, pesticide retailing continues to be a less focused sector. This paper analyse the market condition of pesticides in Kerala and the level of scientific knowledge on handling pesticides by the sales person. The study is based on information collected from 80 random sample of pesticide sale points from five different agro climatic zones in the state. There are 1908 retail outlets for pesticide sales in Kerala run by co-operatives (40 per cent) and private individuals (60 per cent) and large number of sales points which are not formally registered and seasonal in nature.

The level of sales of pesticides averages to 954 kg of formulations per month per shop. A maximum sale per shop is in high range zone and lowest in northern zone. The major crops in high ranges are mainly the commercial crops. In other places it was paddy and other food crops including coconut. Fungicides form 41 per cent of sales, insecticides 38 per cent, herbicides (4.5 per cent) and rodenticides (3 per cent). The awareness index constructed based on the responses to statements by the sales person showed that majority of the respondents (59 per cent) was in the range of 5-9, followed by 37 per cent in the range of 9-12. Four per cent of respondents were having a very high value of more than 12. The experience and education level are identified as the two major factors that influenced the awareness level. However the statements furnished by them did not match with their knowledge level as revealed by their responses to listing of banned pesticides. The pesticide regulation in India insists on the reporting of health damages due to pesticide handling at various stages of handling including retailing. None of the shops were maintaining such a register and they were not aware of the same. More than half of the respondents were of the view that there is only mild health risk at short term. On the contrary, they consider long term effect as more profound and fatal. The paper suggests policy interventions based on the study, which include active presence of public sector in sales, insisting on educational levels for pesticide dispensing ,strict compliance of legal aspects, monitoring and efficient data management.

Keywords: Pesticide sales, Health impacts, Awareness level

JEL: Q12, Q16, O15

I

INTRODUCTION

Despite the reports on negative externalities due to pesticide exposure by varying sections of the population (Nyakundi *et al.*, 2010; Devi, 2012; Bhardwaj and Sharma, 2013), pesticide retailing continues to be a neglected sector, with respect to monitoring and regulatory supervision. At the same time, the level of awareness and the dispensing pattern of the retailers indirectly influence the pesticide use pattern of farmers and end users, as most often they depend on the retailers for advice on the

*Professor (Agricultural Economics), **Research Associates respectively, Centre of Excellence in Environmental Economics, Kerala Agricultural University, Thrissur-680 656 (Kerala).

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choice of chemical and use pattern. In a nationwide study in India on pesticide use pattern by farmers (Shetty *et al.*, 2011), it was seen that only 20 per cent of the respondents obtained their information on plant protection aspect from the Agricultural Extension Officer and the rest 80 per cent of the farmers used unreliable information. Nearly 40 per cent farmers get totally unreliable information from untrained persons. In another study, 47 per cent farmers said they obtained information from pesticide sellers in the market and 33 per cent from neighbours or relatives. (Sadavy *et al.*, 2000).The influence of pesticide dealers on farmers decisions is well documented worldwide in studies conducted in China (Puyun *et al.*, 2007), South Africa (Rother *et al.*, 2008), United States (Wolf, 1995), Vietnam (Van Hoi *et al.*, 2009) and Tanzania (Leiki *et al*., 2014).

Pesticide distribution in India is handled through 1,78,979 sale points operated by private owners, public sector (Department of Agriculture/Horticulture), co-operative organisations and NGOs. Majority (90 per cent) of the retail trade is managed by the private sector. Co-operatives handle roughly 7 per cent of the retail outlets. Department of Agriculture (public sector) shows its presence only in 11 states (Himachal Pradesh, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, Uttaranchal and UT of Delhi). The absence of public sector outlets in majority of the states leave the pesticide markets to the almost monopoly of private sector as the co-operative sector is not strong enough to act as a buffer (Devi, 2015). In Kerala too, where the pesticide retailing is mainly under private sector, the dependence on the traders are reported to be quite high (Devi, 2010).

At the same time the sustainable/green growth objectives in the agricultural sector promote the organic farming approaches and many states are shifting to an organic production mode. Kerala state has accepted an organic farming policy, with an objective of shifting the agriculture in the state to fully organic, by 2016. The present pesticide marketing situation in the state, thus, may pose a challenge in the attainment of this objective. There are little studies on the socio-economic aspects, awareness level and knowledge and dispensing pattern of these pesticide retailers in Kerala .This paper analyses the market condition of pesticides in Kerala and the level of scientific knowledge on handling pesticides by the sales person.

II

PESTICIDE RETAILING IN KERALA

Pesticide retailing in Kerala accounts only one per cent of that of the country. The Government of Kerala reports show that there are 1908 retail outlets for pesticide sales in Kerala run by co-operatives (40 per cent) and private individuals (60 per cent). Over the years, the public sector has completely withdrawn from the retail sales. Private retailing constitutes two-third and the role of co-operatives is being relegated to second in status. The private sector retail of pesticides is common in urban centres also, wherein they concentrate on chemicals for household pest control

and ornamental garden maintenance. Often they also act as service centres for pest control operation in residential buildings, office buildings and other commercial units. The sale of certain chemicals for pest control, especially domestic, is common through retail stationery shops as well (Table 1).

TABLE 1. PESTICIDE RETAIL SALE POINTS IN KERALA

Period as on	Department of Agriculture	Co-operatives	Private	Total
(1)	(2)	(3)	(4)	(5)
1999	1056	1625	2265	4946
2000	1056	1806	2248	5110
2001	1056	969	1091	3116
2002	1056	952	1073	3081
2003	--	606	1013	1619
2004	--	1030	2051	3081
2005	--	627	1442	2069
2010	--	534	913	1447
2012	--	756	1152	1908

Source: Compiled from Department of Agriculture, Government of Kerala.

The Primary Agricultural Credit Societies (PACS) run fertiliser and pesticide retail shops as one of their services to the agriculturalists. In our sample, 70 were privately run shops and 10 were run by cooperatives. The major role of private players in the sector underlines the importance of strong regulating and monitoring mechanism. Over the years, the cooperatives are withdrawing and the private operators are increasing in number. However, the number of retail sale points shows a decline.

Apart from this, there are large numbers of operators (direct sale representatives of producing firms/informal sellers) who operate in rural areas during the peak agricultural seasons. They directly sell the produce to the farmer and often do not have permanent sale points and their presence only seasonal. We could find many cases of field sales/direct sales of pesticides, which often take place during peak crop seasons. These agents/representatives refused to furnish any information and were not ready to converse with the research team. So we could not gather data on this aspect.

III

DATA AND METHODOLOGY

3.1 *Data Sources*

The paper is drawn from a pioneering exploratory study on the topic based on secondary and primary data. The secondary data was sourced from various agencies (Department of Agriculture, Government of Kerala), websites (www.agristat.com) and published sources (Economic Review, Government of Kerala; *Economic Survey*, Government of India; *Farm Guide*, Government of Kerala) for various years.

The primary data was collected through sample survey, the samples being selected based on multistage random sampling method. The state is demarcated into five agro-climatic zones based on soil characteristics, cropping pattern and climatic factors, viz., Northern (Malappuram, Kozhikode, Kannur, Kasaragod), Southern (Thiruvananthapuram, Kollam, Pathanamthitta, Alappuzha, Kottayam), Central (Palakkad, Thrissur, Eranakulam) High ranges (Wayanad, Idukki, Palakkad and high ranges of Thiruvananthapuram) and problem zones (Onattukara, Pokkali and Kole). From each zone four CD blocks were randomly selected for the study. From the selected blocks three Panchayats were randomly chosen. All the retail outlets in the selected Panchayat area were selected as sample units. For the purpose 130 retail points were contacted and tried to gather information. However, the data was either incomplete or unreliable in certain cases and a few of them refused to co-operate with the data collection. Despite repeated visits they were not ready to furnish the data and in some cases it was incomplete. Thus the paper is based on information collected from 80 respondents (shops).

3.2 *Data Collection and Analysis*

For collecting information from the respondents, personal interview method using structured, pre tested questionnaire was followed. Moreover, direct observations and Participatory Appraisal methods were also resorted to wherever necessary. For the analysis of data, apart from the averages and percentages, a Bivariate Probit model is applied to identify the factors that influence the awareness level. This was done by constructing an awareness index, and regressing the same with independent factors (age, education, experience and mass media exposure).

Sixteen questions were asked to the respondents to get their response on their attitude as well as behavioural pattern with respect to pesticide handling and use. Based on this an awareness index was constructed for each respondent. The weightage of 1 was given to the answer which ensures safer use and 0 if the behaviour or use pattern has a negative influence.

$$\text{The index was constructed as: } 1 = \frac{f1 \text{ X } 1 + f2 \text{ X } 0}{n}$$

where f_1 = no. of questions to which answer 1 was given,
$f2$= no. of questions to which answer 0 was given
n = no. of questions i.e., 16
So for any particular individual the maximum value will be 16.

The awareness on a technology and its proper adoption is generally decided by a host of factors, both social and economic. Logit and Probit models are generally used to predict the effect of change in the independent variable on the probability of belonging to a group when the dependent variables are dichotomous (Suresh *et*

al.,2007; Pandit *et al.*, 2007). This approach makes use of the heterogeneity in population that is relevant for behavioural response. Hence to generate dependent variables, respondents were divided into two groups, based on the value of the index as high and low awareness groups. The low awareness group members (0-8) were given the value of 0 and the other group was assigned the value 1. Logit model was used in this analysis, using SPSS package. So,

$Pi = \frac{1}{1+e^{-zi}}$ where Pi is the probability that the person is having a good awareness

$1-Pi = 1-\frac{1}{1+e^{-zi}}$ is the probability that the respondent is poor in awareness level

Taking logarithm on both sides,

$$\text{Ln}\left(\frac{Pi}{1-Pi}\right) = Zi = a+\sum_{i=1}^{n}\beta_i X_i + e_i$$

where Xi is the vector of independent variables and β_{is} are the coefficients to be estimated.

Here the variables are,

Y = low/high awareness level (0, 1)

X1= age in completed years was hypothesized to have a positive sign on level of awareness

X2= Education level in completed number of years of formal schooling A positive sign was hypothesized for this variable, as education was supposed to impart more awareness.

X3=Experience in retail sale in years. We assumed that more years of experience creates awareness on the negative effects of pesticide use through experience and observation. So we hypothesized a positive sign for this variable.

X4=Mass media exposure was supposed to increase the information level and hence was supposed to exert a positive effect.

The analysis was done by the package SPSS 17.0

IV

REULTS AND DISCUSSION

4.1. *The Socio-Economic Status of Respondents*

The respondents for the present study comprised shop owners, owners-cum-sales persons, sales persons and others including secretary or president of co-operatives who are present in the retail outlets regularly. Each shop was manned by more than one person, averaging at 1.85 person per shop. Thus the information on all the sales

persons were gathered and the details thus pertain to 148 persons from 80 shops. The socioeconomic details of the respondents are presented in Table 2. The respondents in the study at those persons, who are present in the shop most often, and handle or monitor the day to day activities. 17 per cent of the respondents were owners, 14 per cent were owners who were also handling the shops and working as sales persons. In 31 per cent of the cases, the secretaries of the PACS were the respondent. Most of them were in the age group of 30-40 years followed by 24 per cent in older groups (50-60 years). Reflecting the high educational attainments in Kerala, 29 per cent of the respondents were graduates and 15 per cent possessed a post-graduate qualification.

TABLE 2. SOCIO ECONOMIC STATUS OF HUMAN RESOURCES IN PESTICIDE RETAIL SECTOR

Sl.No.	Particulars	Details						
(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)
1.	Status of the manpower	Owner	Owner cum sales persons	Sales man	Others (secretary/ President etc.)			Total
		25	21	56	46			148
		(17)	(14)	(38)	(31)			(100)
2.	Age of the respondent	18-20	20-30	30-40	40-50	50-60	>60	148
		5	26	39	30	35	13	(100)
		(3)	(18)	(26)	(20)	(24)	(9)	
3.	Education	Primary	UP	HS	SSLC	PDC	Degree PG	148
		2	23	5	31	52	43 12	(100)
		(1)	(2)	(7)	(21)	(35)	(29) (15)	
4.	Experience	<1 year	1-5	5-10	10-15	15-20	>20	
		8	46	47	18	16	13	148
		(5)	(31)	(32)	(12)	(11)	(9)	(100)
5.	Working hours	7 hrs	8 hrs	9 hrs	10 hrs	11 hrs	12 hrs	
		6	34	14	19	5	2	80
		(8)	(43)	(18)	(24)	(6)	(3)	(100)

One third of the respondents entered in to the business during the previous ten years. 9 per cent were associated with pesticide retailing for more than 20 years. For the majority (86 per cent), this work was the only work engagement. But 14 per cent were doing other work too. The average work hour per day was 8 hours. Usually, the shops open by 10 a.m. and close by 7 p.m. and 43 per cent of them follow this pattern. But one-fifth of the shops are kept open for longer hours (10 hours). A few shops in urban/semi urban areas follow longer working hours of 11-12 hours.

4.2 *Business Behaviour*

Some of the retail shops were undertaking both retailing and wholesaling. But majority (79 per cent) was confined to retailing alone. 9 per cent were wholesalers and the rest 12 per cent undertook both. They were mainly owned by co-operatives.

The sample retail shops varied in their business experience widely, and there were shops which were doing the business for more than 50 years. But mostly the shops

were in the business during the previous 21-25 years (18 per cent). Some retailers sourced their supply directly from the manufacturers (24 per cent) or through distributors (33 per cent) while majority (43 percent) depended on the wholesalers.

Majority of the pesticide retail shops were registered, though nearly 3 per cent were operating without registration. Surprisingly, some of them were doing the business for many years and was not monitored by the pesticide inspector and the registration was renewed continuously without much verification.

The business in small villages would be efficient and economic only through diversification in sale of products. Thus most of them (74 per cent) were involved in dealing various kinds of agricultural inputs like fertilisers, organic manures, pesticides, farm implements etc. Nearly 14 per cent were involved only in pesticide retailing while the rest were dealing with pesticides along with other agricultural equipment.

4.3 *Pesticide Sales Volume*

The retailers/wholesalers are legally bound to state the sales and stocks of pesticides handled by them, every month to the pesticide inspectors. This practice was followed regularly by only a few sample respondents (24 per cent). One per cent of the respondents had not furnished the report ever since they started the business.

Table 3 details the pesticide sales by the sample respondents, on the basis of volume of sales on the previous month in the selected sample shops, as reported by them. It is presented in the table as sales volume per shop of the formulation, in each zone. This data, as reported by them may not be the actual volume of sales, as per the indications/responses we experienced during data collection. However, it can be presumed that this amount can be the minimum at least. Further this is the total of formulations.

TABLE 3. ZONE -WISE AVERAGE SALES OF PESTICIDES (KG/SHOP/MONTH)

Sl.No.	Particulars	North	South	Central	High range	*Problem zone	Average
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Fungicides	252	297	354	579	402	377 (40)
2	Insecticides	279	315	401	463	390	369 (38)
3	Rodenticides	72	92	54	141	65	85 (9)
4	Herbicides	8	109	358	72	67	123 (12)
	Average	611(13)	813 (17)	1167 (24)	1255(26)	924(19)	954(100)

Source : Primary data drawn from the study.

*Problem zone is mainly the rice growing tracts (Kuttanad/Kole) where the land is below mean sea level.

The level of sales of pesticides averages to 954 kg of formulations per month per shop. A maximum sale per shop is in high range zone followed by Central and problem zones. The average sales were found to be the lowest in northern zone.

The state-wide data on pesticide consumption shows that insecticides constitute the major share (2013-14) (Economic Review, 2015). The retail sale data shows

fungicides at 41 per cent and insecticides constitute 38 per cent followed by herbicides (4.5 per cent) and rodenticides (3 per cent).

Insecticides sale were more than that of fungicides in northern, southern and central regions while fungicide sales were higher in high ranges and problem zone. Rodenticide sales was highest in high ranges, where it constituted 11 per cent of the average sales. Weedicide sales were the highest at central zone followed by southern zone and high range zone.

The registration and licensing of pesticides in India follows the crop/ pest-specific approach. Each chemical is prescribed for the specific pest/crop and management and precautionary measures are also scientifically prescribed. The Package of Practice of KAU gives specific details in this regard on matters specific to Kerala. Earlier studies on field level practices on handling and use of pesticides have reported the farmer's choice of chemical as being done mainly based on the advice of the retailer. Most often the Krishi Bhavans and retail outlets are located in different locations. The practical difficulty of multiple visits and travel for advice from Krishi Bhavan and purchase from a different place prompt the farmers to depend on the retailers for such advice. The retailers often suggest the chemical, based on his knowledge gained through company representatives, previous experience and the level of commission offered for the chemical. They do not have the scientific training or the incentive to follow scientific practices in dispensing the chemical. Hence, none of the shops maintain a register regarding the sale specifying the crop/ pest/ purpose and were also not aware of the necessity. Our request to state the major crops to which pesticides are sold in any particular area was taken positively and their responses were compiled. The major crops in high ranges are mainly the commercial crops. In other places it was paddy and other food crops including coconut.

The general public of Kerala is known for the high level of literacy and access to mass media. Simultaneously, there have been debates on the health impacts of chemical pesticides and the high residue levels in the food articles sold in the state. This situation has created instances of local public resisting the application of pesticides in agricultural fields. Consequently, the traders of pesticides were very cautious in furnishing the information related to pesticide handling and its related aspects. We were often forced to seek the help of local Agricultural Officer to get the sales information from the respondents. Repeated visits or contacts were necessary to get the required information. This was very time consuming and costly. Often they refused to interact with the research team. We have tried our best to gather the information, but failed at some instances.

The respondents were not open in their responses and refused to answer or gave unclear answers to several questions. The mass media effect and controversies over the endosulphan spraying and its effects have generated an increased awareness in the society on the pesticide use. Hence, the retailers were careful in giving their responses, for fear of affecting their livelihood activity. We have tried to compile the item wise sales details from these shops and we could find very much difference in

the chemicals that are reported by the retailers and those that are reported by the State Department of Agriculture. Some of the chemicals reported by the retailers are not seen in the list furnished by the Department and vice versa. As we are not fully confident about the sales information provided by the respondents we are not attempting a discussion based on that data.

4.4. *Knowledge Level and Awareness*

The public awareness on the negative effects of the pesticide use is on the rise in Kerala. This is due to the high literacy rate as well as the recent mass media reports. The response to some of the questions/statements posed to the respondents highlighted this. Table 4 details the responses to statements regarding the awareness and handling practices of pesticides by the retailers. More than 80 per cent of the respondents stated that they can read the labels on the package and could understand the level of toxicity reading the sign on the label. However, 37 per cent of them were not aware of the term waiting period. Only 63 per cent of them had idea on the alternatives to chemical pesticide use and 52 per cent were aware of the concept IPM. Pesticide residue levels in the food were known to most of them (79 per cent).

TABLE 4. AWARENESS OF THE RESPONDENTS

Sl. No. (1)	Particulars (2)	Yes (per cent) (3)
1.	Do you read labels on the package	84
2.	If you cannot read do you seek help from others	52
3.	Are you aware of pesticide toxicity	84
4.	Are you able to understand the level of toxicity, reading the sign on the label	80
5.	Are you familiar with the word waiting period	37
6.	Do you know the alternatives to chemical pesticide use	63
7.	Have you heard about bio control agents/bio pesticides	82
8.	Are you familiar with the concept of IPM	52
9.	Are you aware of pesticides residue in food	79
10.	Can you list out some banned pesticides in the state	88
11.	Do you keep the pesticide bottle along with food items/water bottle	13
12.	Have you been instructed about safe pesticide handling method/undergone any formal training	11
13.	Do you wear protective gadgets while handling pesticide	1
14.	Do you wash your hands after touching pesticides	52
15.	Do you think that pesticides are the source of water/air pollution	68
16.	Do you think that pesticide handling and /or exposure overall has any negative impacts on health?	79

Even though 89 per cent were not scientifically trained on the safe handling of the pesticides, majority (87 per cent) did not keep food items/ water bottles along with the pesticide bottles. Majority of the respondents were not using protective gadgets while handling pesticides. 48 per cent of them did not wash the hands after touching pesticides and about 32 per cent did not consider pesticides as the source of water /air pollution.

The level of awareness, as per their responses, can be considered as not very high while going through the responses. The awareness index showed that majority of the respondents (59 per cent) was in the range of 5-9, followed by 37 per cent in the range of 9-12. Four per cent of respondents were having a very high value of more than 12. The respondent`s awareness with regard to the pesticide toxicity levels, health impacts and resultant behaviour decide the level and extent of negative externalities associated with pesticide use.

However the statements furnished by them did not match with their knowledge level, at least in certain cases. For instance, 88 per cent of the respondents expressed the confidence of listing banned pesticides in the state, but about 15 pesticides were wrongly listed by the respondents (Table 5). Those pesticides whose usage was restricted were considered as the banned pesticides by the respondents very often.

TABLE 5. LIST OF PESTICIDES LISTED BY THE RESPONDENTS AS BANNED

(1)	Pesticide (2)	No of respondents (3)	Actual status (4)
1.	Chlorantranilprole	25 (31)	
2.	Cypermethrin	37 (46)	
3.	BHC	30 (37)	Banned
4.	Phosphamidon	41 (51)_	
5.	Flubendamide	23 (28)	
6.	Pyrethiroid	18 (22)	
7.	Methyl Parathion	19 (23)	Restricted use
8.	Monocrotophos	18 (22)	Restricted use (banned in vegetables)
9.	Dimethoate	25 (31)	
10.	Carbaryl	9 (11)	
11.	Triazophos	29 (36)	
12.	Profenofos	32 (40)	
13.	Endosulphan	71 (89)	
14.	Deltamethrin and trizophos	18 (22)	
15.	Benzamidazol	43 (53)	
16.	Methyl mercury chloride	15 (18)	Restricted Use
17.	Bispyrabac sodium	21 (26)	

4.5 *The Health Impacts*

Majority of the respondents (79 per cent) had known that pesticides handling cause negative impacts on human health. However, they were reluctant to furnish details on the health damages experienced by them if any. Most of them refused to respond to the questions in this aspect. The reported data on the health damages due to pesticide poisoning at national and state level is furnished in Table 6. The poisoning due to pesticides in India was maximum of 12715 in 2011-12. This has further declined to 9276 (14-15). This includes the figures from government health care system only and the actual number presumably can be much higher. An average 12-15 per cent of the poisoning cases reported from across the country are from Kerala. The mortality rate in India revolves around 11-18 per cent. Compared to this the rate was found to be much higher in Kerala till 2008-09 (21 per cent). However it

is relieving to note that the mortality rate has sizeably reduced since then and no cases was reported in 2014-15.

TABLE 6. PESTICIDE POISONING CASES IN INDIA AND KERALA'

	No. of poisoning cases		No. of deaths	
Year	Kerala *	India	Kerala ***	India**
(1)	(2)	(3)	(4)	(5)
2007-08	943 (15.82)	5962	203 (21.53)	693 (11.62)
2008-09	666 (6.79)	9806	146 (21.92)	1470 (14.99)
2009-10	1066 (14.98)	7115	88 (8.26)	796 (11.19)
2010-11	695 (12.25)	5674	41 (5.90)	1049 (18.49)
2011-12	1614 (12.69)	12715	120 (7.43)	1314 (10.33)
2012-13	636 (5.92)	10741	27 (4.25)	1027 (9.56)
2013-14	337 (4.11)	8196	2 (0.59)	848 (10.35)
2014-15	183 (1.97)	9276	NIL	733 (7.90)

Source: www.indiastat.com

*Figure in brackets are per cent to that of India.

** Figure in brackets are per cent of mortality in India.

*** Figure in brackets are per cent of mortality in Kerala

The pesticide regulation in India insists on the reporting of health damages due to pesticide handling at various stages of handling including retailing. Those, who are handling pesticides are to undergo regular medical examination and the register regarding the same is to be maintained (Form XXII, Rule37). None of the shops were maintaining such a register and they were not aware of the same.

Pesticides cause health damages of two types- short term (which get manifested within hours to days of exposure) and long term (which takes years to get manifested). he short term health damages include headache, blurred vision and eye irritations, skin irritation, nausea, vomiting, palpitation and general giddiness, depending upon the type of chemical. The long term effects are generally cancerous affecting different body parts or renal problems. We tried to understand the subject's perception regarding these two types of health risks.

More than half of the respondents were of the view that there is only mild health risk at short term. On the contrary, they consider long term effect as more profound and fatal (Table 7). Surprisingly, some of them believe that there is no adverse health effect in long run. The respondents working in these shops enjoyed the main source of income for livelihood from this. Though they were aware of the potential health

TABLE 7. PESTICIDE EXPOSURE AND HEALTH IMPACT- THE PERCEPTION OF RESPONDENTS

Sl.No.	Details	Short term health impact perceptions (per cent of respondents)	Long term health impact perceptions (per cent of respondents)
(1)	(2)	(3)	(4)
1.	No effect	18	1
2.	Mild effect	62	6
3.	Some effect	11	14
4.	Serious effect	8	54
5.	Fatal effect	1	25
Total		100	100

risks, the alternative occupation options were limited. At the same time they were not adopting any protective gadgets while handling the pesticides, which can be attributed to the general lethargy and carelessness.

We tried to understand the health damages experienced by them, during the occupation. But none of them were ready to respond to the question, for fear of loss of occupation. We have not come across any scientific study that focused on the health damages of these groups of people, in Kerala. Kesavachandran *et al.*, 2009 details the types of pesticides sold and the infrastructural status of retail shops and warehouses based on a study of 20 shops in urban areas of Lucknow. The health impacts of the pesticide exposure were assessed based on detailed clinical examination and comparison with control population. The retail shop keepers showed higher morbidity than control population. Significant relative risk for sickness related to cardiovascular, genitourinary, respiratory, nervous and dermal systems were observed among exposed subjects. The direct/indirect and short/ long term health impacts of pesticide exposure thus, are an area of concern in agricultural production.

A study in USA between 1998 to 2005 reported that workers employed in two retail industry sectors (farm supply stores and hardware stores) had significantly increased acute pesticide poisoning incidence rates (Calvert *et al.*, 2007). The Mexican study reported significantly lower butyl cholinesterase activity, hemoglobin and hematocrit, elevated platelet count and elevated liver enzyme activity among the retailers and they experienced burning sensations in the skin more frequently compared to controls (Rojas-Garcia *et al.*, 2011).

WHO has suggested three main types of community interventions to reduce the health (suicide effects) damage due to pesticide exposure in developing countries. This includes safer storage (household and community level), education and psychological interventions. The educational interventions are to be focused on pesticide retailers, among others. The training should contain information on health risks, appropriate use, storage and disposal. There should be monitoring mechanisms to assess the level of compliance with regulations. Because of the limited number of wholesalers and retailers, this type of intervention is really cost effective.

4.6 *Factors Influencing the Awareness*

The regression analysis (logit model) fitted to the data to analyse the awareness level gives interesting findings (Table 8). Age of the respondent does not have significant influence on awareness level and it shows negative influence. Education level (as measured by years of schooling) and experience as retailer were the major factors that influenced the level of awareness. The education indirectly helps in understanding the scientific aspects of pesticides handling.

The experience as salesman might have made the respondent aware of the negative externalities associated with chemical pesticides and hence it was hypothesised to have a positive effect on awareness level. The observation and

TABLE 8. ESTIMATED PROBIT REGRESSION COEFFICIENTS OF FACTORS INFLUENCING AWARENESS ON PESTICIDE HANDLING

Variable	Co-efficient (β)	Z statistic
(1)	(2)	(3)
Age (years)	-0.1009	- 0.68
Education (years of schooling)	1.1109*	1.65
Experience (years)	1.0579***	6.59
Mass-media exposure (Dummy; Yes=1 No=0)	0.3422	0.82
Intercept	-2.1990**	- 1.66
No. of observations	80	
Log likelihood	-21.01	
Pseudo R^2	0.7421	

***,** and * significant at 1, 5 and 10 per cent level, respectively.

discussion with farmers/distributors and other sources of information may also be more for them. Our analysis suggests that salesmen who were more experienced tend to be more aware about the scientific aspects of chemical pesticides and its handling.

Though exposure to mass media was hypothesised to favour awareness about pesticide handling, the effect was not significant. The effect of formal training on the subject was supposed to have imparted better knowledge and awareness. Surprisingly none of the respondents had ever attended such training programme and hence it was not possible to include the variable in the analysis. The situation however, suggests the need for organising training programme to the sales men in pesticide outlets. There are trainings and awareness camps on green technologies and safe handling of pesticides conducted by the state Department of Agriculture which are usually targeted to farmers. Little focus is given to pesticide retailers/sales person, whom the farmers often depend for information. This gap is to be addressed and there should be specially tailor-made awareness programme for this group of stakeholders.

V

CONCLUSION

The level of risk in agriculture due to pests and diseases are always reported to be very high in India. Both the farmers (especially the small and marginal farmers who depend on farming for their livelihood), and the commercial operators in agriculture have to depend on chemical pest control methods for effective management of pests. The adoption of ecofriendly practices in pest management are often constrained by technological, social or economic reasons. For instance, the technological substitutes for weed control (mechanical) are often not adopted due to practical implementation problems at field level (rotoweeder for example). The absence of easy access to green technologies (biocontrol agents) and the apprehensions on their quality often prompt the farmer to adopt the conventional chemical based practices, to which he is accustomed.

In an anxiety to guard against the potential risk, the farmer often adopts chemical spray as a prophylactic measure than a control mechanism. The local information gained from fellow farmers and the guidance from retailers decides the chemical that is used. Several studies confirm retail traders as a major source of consultancy and advice for pest management. The private manufacturers play a vital role in this area of information dissemination through these retail operators as well as direct farm trials and sales during peak agricultural seasons.

Pesticide retailing in Kerala is currently managed mainly by the private sector and the farmer decisions on pest control are often influenced by them. It is important to also involve the public sector in pesticide retailing, taking a major role. There should be continuous capacity building programme (mandatory) for the retail sale person, to update their knowledge on chemical/and non-chemical methods of pest management. The licensing and its renewal of retail sales should be based on the realistic assessment of the performance of the shop with respect to the dispensing and compliance of mandatory behaviour (maintenance of accounts/registers/reporting/ adoption of scientific practices in handling/knowledge and information updating). Preferably, the license may be issued to those who hold graduate degree in Agriculture and the sales person also should have prescribed minimum educational qualification and continuous mandatory capacity building programme. There are large number of agents/company representatives who operate in rural areas, during peak agricultural seasons. The licensing and reporting should also be made compulsory for them also.

The data management in pesticide use is to be made more scientific. The monthly statement of stock and sales from all retailers are to be regularly collected and compiled. The decision to make the agricultural production to completely organic can be achieved through regulating the retail sales of pesticides. The easy access and unscientific advises are to be prevented and scientific approach and practices must be ensured. The Local Self Governments can also take role in ensuring the sale of only legally permitted pesticides in their locality. The details of the stock of the chemicals are to be clearly displayed in front of the shop and the lists of banned chemicals are to be displayed in prominent places and premises of the shop so that the local public is aware of it. Though prescription based sale is made obligatory, it was not seen complied at grassroot level.

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