



AWARENESS AND UTILIZATION EXTENT OF SAFE PLANT PROTECTION MEASURES AMONG THE VEGETABLE FARMERS IN EASTERN UTTAR PRADESH: A REVIEW

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Abstract

The paper assesses effect of independent variables on awareness and utilization extent of safe plant protection measures among the vegetable farmers. The farmers were contacted personally for data collection. The percentage, mean, standard deviation and correlation is used for calculation and drawing the inferences. Education, size of land holding, annual income, attitude and utilization were found highly significant and positively correlated with awareness extent, extension contact, awareness and utilization were found highly significant and positively correlated with attitude and Education, material possession, attitude and awareness were found highly significant and positively correlated with utilization extent had direct influence over awareness extent about safe plant protection measures. The paper encourages sustainable agriculture; the plant protection activities hold more importance in the overall vegetable crop production. The effort made at minimizing crop losses due to ravages of insect pests, disease, weeds, nematodes, rodents etc.

Keywords: Safe plant protection measures, independent variables, awareness extent, utilization extent and Vegetable Farmers etc.

Introduction

Vegetables comprises of a large number of plants, mostly, annual of which different part like leaf, stem, flowers bud, flower, fruits, root, etc. are eaten. They are one of the cheapest sources of natural nutritive foods. Their consumption in sufficient quality provides taste, palatability and increase appetite for maintenance of good health and is beneficial in protecting against some degenerative diseases (Maisnam and Singh, 2015). The vegetables are rich and comparatively cheaper source of vitamins. Consumption of these items provides taste, palatability, increases appetite and provides fibre for digestion and to prevent constipation. They also play key role in neutralizing the acids produced during digestion of pretentious and fatty foods and also provide valuable roughages which help in movement of food in intestine (Sahni and Kumari, 2017). The impact of pesticide residues can be minimized by taking certain measures such as the rational use of pesticides, promoting organic farming, exploit natural and bio pesticides, and proper implementation and amendment of pesticide-related laws (Grewal *et al.*, 2017). During the last five years, the incidence of pesticide residues in various commodities has increased from 1.2-2.6% (Koli and Bhardwaj, 2018). The vegetable production is low, because improved vegetable and seed production technologies are not fully adopted by the farmers at their own field (Suman, 2008).

This is need of special attention by providing training about vegetable production to the farmers so that their knowledge could be increased and the adoption of technology would ultimately be enhanced. There are many characteristics influencing the extent of knowledge about vegetable production technology, which also need manipulation towards higher production of vegetables (Suman, 2013). The powdery mildew; *Helicoverpa*, *Spodoptera* and Jassids were the important pests occur in vegetables. While coming to the safe handling of pesticides farmers opined that, they are taking personal protection measures like, use of face mask, gloves and turban while spraying of pesticides (Savitha and Srinivas, 2020). Some initiatives like to increase farmers contact with media, arrange more training program, ensure the proper price of organic vegetable and improve transportation should be taken in creating a favorable attitude of the farmers towards organic farming as well as the adoption of organic farming (Parvez *et al.*, 2018). Organic farming may be a good choice as cost-effective method that can trim down rural poverty and curb pollution (Hossain, 2013). Chemicals have created many problems such as topsoil depletion and degradation, reduced soil microbial activities, groundwater contamination etc. Besides, excessive use of agro-chemicals endangered human health hazard through pesticide residual effect, heavy metal contamination (Rossette, 2006; Haque, 2011).

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I. Personal, social, economic, communication and psychological variables of the vegetable farmers

Age: Age, the amount of time something has been alive or has existed. Most of the farmers who grow vegetable are young age or middle age. Krishnamurthy *et al.* (2016) revealed that, majority of the respondents were middle aged (64%). Sindhuja and Shanthasheela (2017) revealed that majority (89.5%) of the farmers who adopted precision farming techniques were more than 45 years old. This in turn implies that the people under old age category are more adaptive to precision farming in real time than other category of ages. The adoption of alternate irrigation is to overcome the failed rainfall and dry land conditions which the people of old age are ready for precision farming. Chavan *et al.* (2018) revealed that in case of the non-exported onion farmers it can be seen in the table that, 13.33% farmers belonged to the age group of 25-35 years, 66.67% between 36-45 years, which is the major group of non-exporters and 20% of the farmers were above 45 years of age. Whereas, in case of exported onion growers 40% of farmers were 25-35 years is the major group, 30% between 36-45 years and 30% of the farmers were above 45 years of age. Singh *et al.* (2018) revealed that the maximum number of respondents (63.75%) was observed in middle age category followed by old (19.58%) and young (16.66%) respondents. The probable reason for such distribution might be that the majority of middle age group were enthusiastic and more dynamic in performing various socio-economic activities in general and vegetable growing in specific.

Education: Education is the process of facilitating learning, or the acquisition of knowledge, skills, values, beliefs and habits. In present days Farmers not having very good level of education. About 50% of the farmers have only primary education. Women have not much more educated in comparison to man. Saini *et al.* (2017) revealed that majority (27.5%) of respondent possessed high school. Chavan *et al.* (2018) revealed that in case of non-exported onion farmers, it can be seen that, 6.67% of the farmers studied up to school level or matriculation, 33.33% of the farmers had higher secondary education, while 60% of them were graduated. None of them had a post graduate degree. In case of exported onion growers, 0.3% of the sample farmers had studied up to matriculation, 13.33% had higher secondary education, 70% were graduate and 13.33% were post graduate. According to the quantum score analysis, the non-exported onion growers had 3.53 score, and the exported onion growers had 3.93 score out of 5. Singh *et al.* (2018) focused that literacy percentage of the respondents was observed to be 94.16% literate and 5.84% illiterate. Further, the distribution of literate respondents descending order as order as 21.25%, 18.33%, 15%, 11.66%, 11.66%, 10% and 06.25% for middle, high school, intermediate, can read and write, graduate, primary and can signature only, respectively. Hence, it may be said that the

educational standard of the respondents was considerably good in comparison to average literacy rate of the state and country as such

Marital status: Most of the farmers are belonging to rural arias and they think marriage is necessary for healthy life. Women's are contributing equally in farming and vegetable growing. They have good skill in crop management like weed management, intercropping, insect pest collection and other management practices. Alamerie *et al.* (2013) revealed that majority (about 84%) of the respondents are male-headed households. In terms of the marital status of the household heads, majority (about 81%) of the sample respondents are married. Ayanwale and Amusan (2014) revealed that 78% of the respondents are married. However, further examination revealed that only 24.6% were in a monogamous marriage while as much as 54.2% were in a polygamous marriage. Singh *et al.* (2018) observed that maximum number of the respondents were married (96.67%) against it (3.33%) respondents were unmarried. The ratio between unmarried and married was 1:29.03. The probable reason that almost every farmer who attain the age of 30 years was married.

Caste: Cast is not involving in vegetable growers because vegetables are cash crop and the people who have less land, they can grow vegetable and get highly benefit. In old time vegetable growers are called "Koiri" and they belong "Maurya" OBC cast. Singh *et al.* (2012) indicated that the maximum number of the respondents (59%) were found belonged to backward caste, followed by general (26%) and scheduled caste (16%) respectively. Mishra and Ghadei (2015) found that 36.1% of vegetable farmers belonged to OBC caste category followed by SC (32.68%) and General (30.73%). Only one respondent was found from ST category. Maurya *et al.* (2017) depicted that the majority of the brinjal growers were found other backward caste (62.5%). Papnai *et al.* (2017) noticed that majority of the respondents (78.34%) belonged to general category which included Brahmins and Thakur followed by other backward caste (15.83%) and Scheduled caste (05.83%) including Gorkhaali and Jatav. Saini *et al.* (2017) revealed that majority of the respondents 67.5 belonging to the OBC group. Singh *et al.* (2018) indicated that the maximum numbers of respondents (42.5%) were observed general caste followed by other backward caste (33.33%) and scheduled caste (24.16%), respectively. The probable reason that the backward caste was found dominantly engaged in vegetable production in the area of study.

Family type: Most of the vegetable grower's family is joint family because vegetable growing and management are labour intensive. Singh *et al.* (2012) depicted that the joint family system was found to be dominant (70%) over single family system (30%) among vegetable growers. Chouhan *et al.* (2017) showed that leads to division of the families into nuclear families. 62% and 72.67% farmers having nuclear

family and 38% and 27.33% farmers having joint family of Basavanapura and Hejjige village, respectively. Saini *et al.* (2017) showed that majority of the respondent's 60% belonged to nuclear family and the rest 40% belonged to joint family category. Singh *et al.* (2018) showed that joint families are more than in nuclear/ single families. In terms of percentage 61.66% respondents belong to joint type families and 38.33% belong to nuclear/ single type of family's system. It means nuclear family system is dominant in the area of study.

Size of Family: Family size is the important factor correlated to vegetable growers because for a good earning, farmer grow intercrop and border crop of different crop period. These crops need more cult rural practices and monitoring for various factors *i.e.* (Insect pest, diseases, nematodes, reptiles and weed etc.). Generally medium and large size families are involved in vegetable growing according to the finding of different researchers and scalars. Chavan *et al.* (2018) reported that in case of Non-Exported Onion growers, it was seen that, 3.33% families had 1-3 members, 90% families had 4-6 members and 6.67% of families had more than 6 family members. In case of Exported Onion growers, 16.67% families had 1-3 members, 73.33% families had 4-6 members and 10% of families had more than 6 family members. And the average family size in Non-Exported Onion growers was seen to be 4.90 and that in Exported was seen 4.63. Singh *et al.* (2018) observed that 61.66% of the respondent families were observed such who had 6-13 members in their family followed by 27.08% family having up to 5 members and only 11.25 % respondent's family having 14 and above and above members in their family. The average size of the family was observed in 8.9 members per family. It might be due to dominant nuclear family system existence in the study area.

Size of landholding: Vegetables are the cash crop. For growing of this, farmers get the direct benefit from selling their product in market. Vegetables are not dependent on big market and it can be selling in rural and village market also so, the family which have less land is also grow and cultivate vegetable. One more reason behind vegetable growers is the vegetable have short period to grow, because of these small farmers prefer to vegetable growing. Chavan *et al.* (2018) showed that in case of non-exported onion growers, 40% of the sample farmers had less than 2 hectares of land holding and 60% of the farmers had 2-5 hectares of land while none of them had more than 5 hectare of land holding. Whereas, in case of exported onion growers, 6.66% of sample farmers were seen to have less than 2 hectares of land holding, 66.67% of farmers had 2-5 hectares of land holding and 26.67% of sample farmers had more than 5 hectares of land holding. The total land holding under non-exported and exported onion growers were calculated to be 67.3 hectares and 128.1 hectares while the total Area under *rabi* onion was calculated to be 24.6 hectares and 31.95 hectares, respectively. Singh *et al.* (2018) indicated that most of the respondents 32.5% was

found in the land holding category as small farmers (1-2 ha), followed by 27.08% categories of marginal farmers (less than 1 ha), 21.66% in the categories of medium farmers (2-4 ha) and 18.75% in the category's farmers of large (4 ha and above), respectively. The average land holding of the respondents was found to be 3.30 hectare. Therefore, it may be said that the small and marginal farmers were mostly there in the study area. It might be due to fragmentation of the family.

Occupation: Main occupations of the vegetable growers are the agriculture. Vegetable wants to more time and more management than other cereal crop. The farmers which involve in vegetable growing are all time engage with this between growing to marketing so, they cannot get extra time for other work. Majority of the vegetable grower's occupation is agriculture. Chavan *et al.* (2018) found that in case of non-exported onion growers, 36.67% of the farmers' sole occupation was agriculture. While 30% farmers were involved in both agriculture and business, and 33.33% were involved in agriculture cum service. In case on exported onion growers, 46.66% of the farmers' occupation was agriculture only. While 26.67% farmers were involved in both agriculture and business and 26.67% were involved in agriculture cum service. The occupational level of non-exported farm was 1.96 and that of exported farm was 1.80 score at 3 quantum score. Singh *et al.* (2018) found that the maximum 48.33% respondent was observed such who had their main occupation as agriculture followed by service 15.83%, agriculture labour 12.5%, Agro based enterprise 9.16%, business 7.50% and caste-based occupation 6.66%, as main occupation, respectively. The maximum 33.33% respondent was observed such who had their subsidiary occupation as agriculture followed by 21.25% respondent caste-based occupation, 10.41% agro-based enterprise, 9.16% service, 2.91% business and 1.25 agriculture labour as subsidiary occupation, respectively. Hence, it may be noticed that a considerable number of the respondents had occupations other than agriculture for their livelihood.

Material possession: They were further also indicated that respondents were reported having Kudal followed by shovel desi plough, pata, cultivator, chaffcutter, thresher, winnower, disc plough and seed drill with 97, 86, 76, 75, 69, 43, 36, 30 and 2%, respectively. They were further also indicated that respondents were reported having kudal followed by shovel desi plough, pata, cultivator, chaffcutter, thresher, winnower, disc plough and seed drill with 97, 86, 76,75, 69, 43, 36, 30 and 2%, respectively. Therefore, the condition of farm implements with the respondents revealed considerably good. They were further also indicated that majority of the respondents (98%) were found possessing cycle as a main conveyance followed by scooter/bike (64%), bullock cart (22%), trolley (16%), Jeep (11%) and car (05%) respectively. Some of them (04%) were having truck with them. They were further also indicated that cent percent respondents were found having mobile/ telephone with them followed by radio

(88%) television (69%), general magazine (40%), newspapers (33%) and agricultural books (21%), respectively. The telephones/ mobiles agricultural magazines and journals were also reported with as 46.06 and 2% respondents. It would be better to note here that the maximum farmers were having marginal or small piece of land, but the condition of farm power, farm implements and transportation materials was considerably good because the farmers use these materials for providing services to other farmers on hired basis.

Housing pattern: House of the farmers is mixed type. Majority of the farmers have cattle and livestock so, they maintain their kaccha makan. Now the days form government schemes most of the farmers have pucca type house. Prakash (2007) found that majority of the respondents were live in pacca house. Singh *et al.* (2012) revealed that pucca and mixed type of houses were observed maximum. Hence, the dwelling condition of the respondents was considerably good. Mishra and Ghadei (2015) indicated that, pertaining to type of house possession, that mixed type of habitation was observed to the extent of 63.41% followed by 25.8% pucca category and 10% kachcha. So, it can be concluded that vegetable farmers were having better quality house. Singh *et al.* (2018) indicated that 69.58% majority of the respondents reported having pucca type house followed by 27.5% mixed and 2.91% kachha, housing pattern respectively. It means that this area was having pucca type of housing pattern. The probable reason that respondents were having quality houses.

Social Participation: Vegetable growers are directly joint with the market for selling their product. They need to communicate with other farmers to know market rate and market prices. Most of the farmers make their grope or joint with any organisation which can raises the problem of the vegetable groves. Papnai *et al.* (2017) found that regarding social participation that 31.67% of the respondents were involved in socio-political institutions like Panchayat followed by 23.33% in co-operative societies, 13.33% in societies like farmers forum and 11.67% of the respondents were engaged in various Youth clubs like Yuvak Mangal Dal and Yuvati Mangal Dal. Merely five percent of the respondents were engaged in dairy co-operatives. Singh *et al.* (2018) indicated that the 35% of the respondents participates in one organization followed by 25.00% respondent's office bearer, 24.16% respondent's participation in two organizations, 9.16 did not take any participation and 6.66% respondents' participation in more than two organizations, respectively. Less participation in social organization might be due to probable reason that respondents are found less social participation.

Annual income: Vegetable growing farmer need to manage the factored which is involved in vegetable production. After selling their product they do not have much more profit as other business. with the finding of Boruah *et al.* (2015)

indicated that majority (51.67%) of the respondents belonged to group with annual income ranging from Rs 25001-50000 followed by 25% with annual income between Rs.75001 and above, 20.83% had income level between Rs. 50001-75000 and only 2.5% of the respondents were found income level up to Rs. 25000 in overall sample. Sindhuja and Shanthasheela (2017) indicated that more than half (56.32%) of the beneficiaries had earned Rs. 1,00,001-2,00,000 followed by 36.78% who had earned Rs. 50,001-1,00,000 and remaining 6.90% had earned above Rs. 2,00,000. This indicates that marginal farmers of income below 1 lakh per annum are more inclined towards the adoption of precision farming techniques than the medium farmers earning above 2 lakh per annum. Singh *et al.* (2018) observed that maximum (50.83%) of the respondents were observed that those families whose annual income were found in the categories of Rs. 60,001-2,70,000 and belonged from the medium categories followed by low categories *viz.*, 32.91% (Rs. up to 60,000) and only 16.25% respondent were who belonged from high categories of income Rs. 2,70,001 and above, respectively.

Extension Contact: Extension is main limitation factor for vegetable growers. They do not have proper knowledge to grow the vegetable which can get the more profit. For extension they depend only Television, Radio and other old things. They do not have properly knowledge of the schemes of the government and subsidy for famers. Papnai *et al.* (2017) revealed that maximum of respondents (63.33%) had medium level of extension agency contact, followed by low (22.5%) and high extension agency contact (14.17%). Majority of the respondents were having contact with extension agencies because these villages were adopted by the Krishi Vigyan Kendras of the respective districts. It was that most of the respondents (65.00%) were having medium level of information seeking behaviour, followed by low level (23.33%) and high level of information seeking behaviour (11.67%). Sindhuja and Shanthasheela (2017) observed that 44.25% beneficiaries had high level of contact with extension and other agencies, followed by 28.16% had low level of contact with extension agency and the rest (27.59%) had medium level of contact with extension and other agencies.

II. Extent of awareness of vegetable farmers regarding safe plant protection

Vegetables have the major role in our diet. Protein, Vitamins, Minerals and Ions are available with the vegetables. So is our duty to work with farmer to give valuable suggestions and too aware for organic farming. The benefits of organic farming and health hazard from chemical agrochemicals. Alex *et al.* (2018) indicated that high risks of exposure of the vegetable farmers to toxicity and health hazards to pesticides. 71.4% of the farmers agreed that pesticide use poses some potential risk to human health while 63.6% agreed that it poses risk also to the environment. The majority of the farmers (48.1%) stored their pesticides in the

open field. Some respondents also stored their pesticides in open shed meant just for pesticides (18.2%), and locked chemical stores designated only for pesticides (14.3%). A worrying 6.5% of the farmers reported storing pesticides within their living area. Over 67% of the farmers indicated using one personal protective equipment (PPE) at least during handling and spraying of pesticides. Among respondents who reported using PPE, 11% were all the recommended six key PPE items (coveralls, protective boots, glasses/goggles, gloves, respirator and hat). Tijjani *et al.* (2018) revealed that majority (64%) of the farmers were aware of pesticide safety use and practices (64%). Followed by farmers were the major source of information on pesticide safety use and practices (48%). The major factors that influenced awareness among the farmers were age, household size and farm size. Therefore, it is recommended that farmers' awareness on disposal of pesticide containers, mixing of pesticides should be raised through regular workshops and symposia.

III. Utilization extent of technology by the farmers regarding safe plant protection measures

Kafle (2011) reported that out three factors, farmers' participation in organic farming related trainings and visits, farm size and compatibility of organic farming to their situations as the main determinants of adoption of organic farming among farmers. Iyagba *et al.* (2017) showed that low use of fertilizers but higher dependence on organic materials though awareness of OA is low in both LGAs, 27.6% and 37.7% in Etche and Omuma LGAs respectively but very willing to accept it, 68.4% in Etche and 64.9% in Omuma LGAs. Major organic material used is mulch while the least used is ash. Land is adequate for cultivation and common farming practice adopted in both LGAs is shifting cultivation, control weeds mainly by hand weeding and use dry weeds for mulching. Respondents accepted the availability of organic materials, major benefit of OA as control of pests and weeds. Nguyen *et al.* (2018) reported that ill-timed applications posing potential hazards to the human health and environment. Improved training and monitoring of pesticide residues on foodstuffs and in agricultural soils and community water supplies are needed to ensure safe farmer practices. Community-based training and education, jointly funded by local, national and international agricultural production and food safety groups, would be a cost-effective method of minimizing pesticide applications and improving food safety.

IV. Association between socio-economic variables and dependent variables

Kumar *et al.* (2010) indicated that that the mean scores of KAP in the post test were significantly higher than the pre-test. Tandi *et al.* (2014) showed that significant association between the method of pesticides application and farm size ($P < 0.001$). Most farmers (85%) reported at least one symptom

of acute pesticide poisoning following spraying. Boruah *et al.* (2015) showed that positive and significant relationship was found between entrepreneurial behavior and education level, size of the family, size of operational land holding and annual family income of the respondents in the district. The four components *viz.*, education, family size, size of operational land holding and annual family income were found to be the most contributing factors for entrepreneurial behavior. Rana *et al.* (2017) revealed that majority of the farmers (95.4%) had positive attitude towards organic vegetable cultivation. Correlation analysis indicates that level of education, extension media contact and agricultural training received had positive and significant relationship with their attitude score. Those variables which showed the positive and significant relationship had direct influence over awareness/utilization extent about safe plant protection measures. It meant that if the values of these variables increase, the awareness extent about safe plant protection measures will also increase.

Conclusion

This paper demonstrated that the majority of respondents were of middle aged and literate including formal and informal education. Backward caste farmers were dominantly engaged in vegetable enterprises belonging to nuclear family system. Maximum vegetable growers were marginal farmers and reported agriculture as their main occupation. Mixed type of houses was more. Almost all vegetable growers were above the poverty line. Diesel engine and Electric motor were dominant farm power along with farm implements. The cycle was main conveyance with all vegetable growers. The mobile phone followed by radio possessed by majority. Good extension contact was observed. The majority of respondent's main formal source of information fertilizers/seed stores, informal source of information family members and television in mass media was main source of information. Good extension contact was observed. The economic motivation, scientific orientation and risk-orientations were observed of medium levels. Education, size of land holding, annual income, attitude and utilization were found highly significant and positively correlated with awareness extent, extension contact, awareness and utilization were found highly significant and positively correlated with attitude and Education, material possession, attitude and awareness were found highly significant and positively correlated with utilization extent had direct influence over awareness extent about safe plant protection measures. Finally, intervention strategies by regulatory agencies to strengthen enforcement mechanisms of current pesticide laws, through regular surveillance and monitoring pesticide safety compliance at the retail and farm level is a necessity in promoting safe pesticide use. In addition, the importation, sale and the use of highly hazardous pesticides should be restricted. The adverse effects of pesticides have been widely documented. Keeping

in view the importance of this area, it is imperative to say that the govt. should initiate the awareness campaign etc. So that these important demands can be manage and avoid the health and environmental hazards.

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