

International Journal of Agriculture Extension and Social Development

Volume 9; SP-Issue 3; March 2026; Page No. 30-33

Received: 15-01-2026
Accepted: 17-02-2026

Indexed Journal
Peer Reviewed Journal

Utilization behaviour of onion growers towards integrated pest management practices in jodhpur district of Rajasthan

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DOI: <https://doi.org/10.33545/26180723.2026.v9.i3Sa.3343>

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Abstract

To explore the extent of utilization behaviour of onion growers towards integrated pest management practices in Jodhpur district of Rajasthan state, the study was conducted in the year 2022 with 120 respondents. Villages were selected on the basis of highest area and production under onion crop. The selection of respondents was done through proportionate random sampling, from ten selected villages of two panchayat samitis in Jodhpur district. The results revealed that the highest level of utilization was found in respect of application of Cultural method was summer ploughing. In context to Mechanical and Physical practices Mass trapping of pests, had highest level of utilization. Among Biological and Chemical practices conservation of natural enemies and use of pesticides were found to be most utilized practices, respectively. A strong and positive correlation was found between utilization behaviour and factors such as mass media exposure, occupation, family income, land holding, social participation and extension contacts. The results of the multinomial logit model depicted, that age and land holding found to be negatively and positively significant among all the variables. Nagelkerke's R square is 0.249, indicating that the explanatory variables explain about 25 per-cent of the variation in utilization behaviour regarding IPM.

Keywords: Utilization, behaviour, extent, onion, IPM, growers and practices

1. Introduction

Onion is one of the most important vegetable and spice crops grown throughout India. Like any other vegetables, the full yield potential is not realized due to a number of constraints. Numerous factors, including pests, pose a challenge to achieving the goal of increasing food production. In terms of accelerated crop production, pests and diseases are significant restraining factors (Wilson, 2001) [19]. Onion is susceptible to various pests such as mites, thrips and diseases. Pest and disease may occur simultaneously, while pest may even aggravate the disease severity. This warrants an integrated approach to minimize the yield loss and to obtain good quality marketable product. Integrated pest management (IPM) is a combination of techniques such as biological control, habitat manipulation, agronomical modification and use of resistant varieties. A system of IPM emphasizes non-chemical approaches to control pests, and chemicals are only used if no other means are available (Kabir & Rainis, 2013c) [14].

In spite of the fact that pesticides are a remarkable innovation for modern agriculture and are needed to minimize crop losses due to pest infestation, their frequent use results in resistant pests that appear as new pests. Furthermore, the frequent use of pesticides pollutes the

environment. (Kabir & Rainis, 2012) [11]. Pests are responsible for the majority of the crop losses in Africa (Bonabana-Wabbi *et al.*, 2006) [5]. Additionally, the way and how pesticides are applied in developing countries causes several diseases (Cuyno, 1999) [7]. Due to these issues, it is assumed that a certain approach is needed through which pests can be controlled by organic farming without using chemicals.

Hence, IPM system is better in social (health) and environmental aspects, but has limitations as it relates to productivity (Rattanasuteerakul, 2009) [18]. IPM is preferred to conventional and organic agriculture in countries that need to increase food production sustainably (DAE, 2012) [8]. In Bangladesh, 25 percent of vegetables, 20 percent sugarcane, 16 percent rice, 15 percent jute and 11 percent wheat are lost to pest infestations, annually (MoA, 2010; Kabir & Rainis, 2013a) [15, 12]. The loss is presumed to be higher than those caused by various natural disasters, such as floods, droughts etc. (Kabir & Rainis, 2013b) [13]. Gupta *et al.*, (2020) [10] reported among the various types of constraints faced by vegetable growers regarding the adoption of IPM technologies included lack of knowledge of IPM technology followed by the lack of knowledge regarding pesticides and their application pattern.

Research on Onion production is progressing rapidly, as evidenced by the current state of vegetable technology, which has resulted in an increase in onion production to a remarkable extent through research carried out in the country. Despite rapid advances in knowledge, research findings have little practical application. It depends on the source and channel of information whether farmers respond differently. Research has shown that the variability in the knowledge acquired by the farmers through different sources and channels is a function of their age, education, family background, and farming experience. It is most likely to sustain long term crop protection when multiple pest suppression methods are integrated.

Methodology

The present study was conducted in Jodhpur district of Rajasthan which was selected purposively for investigation. Jodhpur district consists of sixteen panchayat samitis, out of which two panchayat samitis, namely: Tinwari and Osian, were selected for study on the basis of highest area production of Onion cultivation. A complete list of villages along with area and production of Onion cultivation was obtained from the Department of Agriculture Jodhpur, Rajasthan. From the selected panchayat samitis, 10 villages having the highest production and area under Onion crop were selected. Out of these selected villages 6 villages were from Tiwari and four from Osian panchayat samiti. Through proportionate random method of sampling, ten respondents were selected from each village under the consideration of this study. Thus, making a total sample size of 120 respondents. The study was conducted in the year 2022 and data was collected by personal interview using a well-structured interview schedule. The pre testing of interview

schedule was done on a non-sample population outside the locale of study. Necessary modifications were done based on pre testing. It was developed with the provisions for all the relevant variables in keeping with the objectives of the investigation. Before administering the interview schedule, the objectives of study were explicitly explained to them in their dialect, ensuring that they perceived the questions correctly. The data gathered, was analyzed for statistical treatments in the light of objectives. The mean percent score was obtained by total scores of each item divided by total numbers of respondents. In order to assess the extent of relationship between the selected dependent variable and the independent variables, the data was subjected to Pearson's correlation analysis. Moreover, to done the predictive analysis of variables a multinomial model of logistic regression was applied to data. This kind of analysis was applied because the dependent variables were nominal with more than two levels. This model also explained about per cent of the variation in utilization behaviour

Results and Discussion

The component wise extent of utilization of IPM practices by the farmers is presented in Table 1. There were 17 components of IPM practices and the respondents were ranked according to mean per cent score of each practice. In context to cultural practices the highest mean per cent score of utilization was found in the case of application of summer ploughing followed by crop rotation, whereas the least score was found regarding seed treatment and trap crop. Among mechanical and physical practices, the highest mean per cent score of utilization was noted in of mass trapping of pests followed by destruction of crop residues and use of Pheromone traps.

Table 1: Distribution of the respondents according to utilization of different IPM practices n=120

S. No.	Practices	MPS	Rank
1.	Cultural practices		
a.	Summer ploughing	75.00	I
b.	Crop rotation	71.72	II
c.	Trap crop	59.39	VIII
d.	Clean cultivation	69.39	IV
e.	Weed management	70.50	III
f.	Timely sowing	67.11	V
g.	Proper water management	65.78	VI
h.	Seed treatment	63.22	VII
2.	Mechanical and physical practices		
a.	Destruction of crop residues	59.39	II
b.	Mass trapping of pests	65.44	I
c.	Use of Pheromone traps	50.28	III
3.	Biological practices		
a.	Use of predators	48.33	III
b.	Use of parasitoids	51.11	II
c.	Conservation of natural enemies	51.39	I
d.	Use of beneficial insects	45.56	IV
4.	Chemical practices		
a.	Use of pesticides	63.72	I
b.	Safe application of pesticides	59.89	II

Regarding biological practices, conservation of natural enemies was found to have highest score of utilization which was followed by use of parasitoids and the least score was found in use of beneficial insects. Out of two selected chemical practices, use of pesticides retained the higher

mean per cent score of utilization in comparison to safe application of pesticides. The findings are in conformity with the findings of Rathod & Chauhan (2012) ^[17] and Badhala *et al* (2025) ^[4].

Distribution of Onion growers according to different levels of utilization behaviour regarding IPM practices

After going through the practice-wise and aspect-wise utilization of various IPM practices, the utilization scores of all the practices were computed. There were 17 components of IPM practices and the farmers were categorized into three categories viz, (low, medium, and high) as per the utilization of a particular component using mean $\pm$ standard deviation method. The maximum and minimum possible scores of IPM practices could be obtained 32.5 and 38.5, respectively. From the utilization scores obtained by all the IPM practices, the mean score and standard deviation were calculated to classify these practices into three different level of utilization namely “High utilization practices” “Medium utilization practices” and “low utilization practices”.

The IPM practices which obtained utilization scores of more than 38.5 score were classified as “High utilization practices” by the farmers. The IPM practices which obtained the utilization scores from 32.5 to 38.5 score to were categorized as “Medium utilization practices by the farmers and the practices which obtained utilization scores below 32.5 scores were classified as “low utilization practice” by the farmers.

It is evident from Figure 1 that 65.83 per cent of IPM practices were moderately utilized by the farmers, whereas 19.17 per cent IPM practices were highly utilized practices by the farmers.

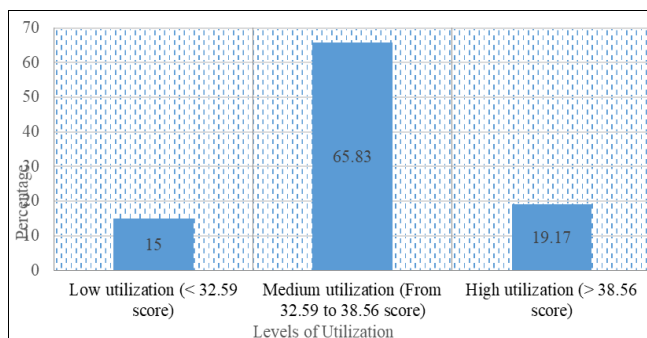


Fig 1: Distribution of Onion growers according to different levels of utilization behaviour regarding IPM practices

Only 15.00 per cent IPM practices were low utilized by the farmers. Similar results were reported by Choudhary *et al.*, (2022) ^[6] that 80.00 percent of IPM practices were moderately utilized by the farmers, whereas 11.67 percent IPM practices were highly utilized practices by the farmers. Only 8.33 percent were lower utilized by the farmers. Ghanghas *et al.*, (2017) ^[9] also revealed that majority of the respondents (51.7%) belonged to 'moderate' category of awareness pertaining to IPM practices.

Logit regression model of utilization behaviour regarding IPM practices

The results of the multinomial logit model presented in Table 3, depicted that age and land holding were two variables which were statistically significant at the 0.05 and 0.01 levels in the model. Both these variables were

negatively and positively significant, respectively. The age of the farmers had a significant and negative effect on their utilization behaviour regarding IPM at the 1 per cent level of significance. It might be possible that the elderly aged farmers were not interested in increasing their knowledge. They believe in their traditional knowledge to prevent their crop from insect pests and other obstacles. It is another possibility that the sampled farmers have a secondary occupation to maintain their livelihood. The land holding of the farmers had a significant and positive effect on their utilization behaviour regarding IPM at the 5 per cent level of significance. It might be due the fact that farmers with comparatively larger land holdings had more risk bearing ability and were ready to adopt new practices regarding the pest management which is in the form IPM practices in the present study.

Table 2: Logit regression model of utilization behaviour regarding IPM (dependent variables) n=120

Explanatory Variable	β	S.E.	Wald
Age	-0.116**	0.035	7.841
Caste	0.437 ^{NS}	0.251	2.879
Occupation	0.431 ^{NS}	0.321	1.801
Education	0.318 ^{NS}	0.191	2.744
Type of Family	0.361 ^{NS}	0.201	1.432
Family Income	-0.010 ^{NS}	0.210	0.001
Land Holding	0.105*	0.047	4.081
Social Participation	-0.097 ^{NS}	0.321	0.085
Extension Contacts	0.210 ^{NS}	0.303	1.532
Mass Media Exposure	0.315 ^{NS}	0.451	1.896
Constant	-2.352	2.491	0.961

Dependent variable: Total utilization behaviour regarding IPM; 1 = acceptable (above the mean), 0 = low (below the mean), -2 Log likelihood: 141.054, Nagelkerke R Square:0.259, Level of significance: ** ($P < 0.01$); * ($P < 0.05$), NS = not significant.

Badhala (2012) ^[1], Badhala and Bareth (2014) ^[2], Badhala and Jat (2014) ^[3] and Mubushar *et al* (2019) ^[16], also conducted a similar study. The results showed that farming experience has a significant and positive effect on their utilization behaviour regarding IPM 5 per cent level of significance. It can be understood that the professional type of farmers who are gaining experience year to year and observing the better practice as utilization behaviour regarding IPM. Nagelkerke's R square is 0.249, indicating that the explanatory variables explain about 25 per cent of the variation in utilization behaviour regarding IPM.

Relationship between selected independent variables with utilization behaviour of onion growers

The data presented in Table 3 convey the relationship between respondent's personal antecedents and their utilization behaviour regarding IPM practices. The variables such as, occupation ($r = 0.240^{**}$), education ($r = 0.213^{*}$), family income ($r = 0.195^{*}$), land holding ($r = 0.225^{*}$), social participation ($r = 0.259^{*}$), extension contact ($r = 0.209^{*}$) and mass media exposure ($r = 0.249^{**}$) were found to be significantly and positively correlated with utilization behaviour of IPM practices.

Table 3: Relationship between selected independent variables with utilization behaviour of onion growers n=120

S. No.	Selected independent variables	Correlation coefficients ('r' value)
1	Age	0.123 ^{NS}
2	Caste	0.135 ^{NS}
3	Occupation	0.240**
4	Education	0.213*
5	Type of Family	0.026 ^{NS}
6	Family Income	0.195*
7	Land Holding	0.225*
8	Social Participation	0.259*
9	Extension Contacts	0.209*
10	Mass Media Exposure	0.249**

**= significant at 1% level, *= significant at 5% level, NS = non-significant

However, age, caste, and type of family had no association with extent utilization of IPM practices by Onion growers.

Conclusion

The highest level of utilization was found regarding practices such as summer ploughing, mass trapping of pests, conservation of natural enemies and use of pesticides in their respective categories. Age and land holding have been found to influence utilization behaviour regarding IPM practices. The socio-economic factors like, occupation, education, family income, land holding, social participation, extension contact and mass media exposure were positively significantly correlated with utilization behaviour of IPM practices. The variables such as age, caste, and type of family had no association with utilization of IPM practices. Further research is recommended to identify the issues and concerns that impact behavioural patterns in utilizing the practices among farming community and to develop strategies to improve it. It is, therefore, suggested to extend the study in other part of state with more sample size, other sampling procedure and more possible way to find gap between technology recommended and its utilization.

Acknowledgement

The authors are grateful to all those with whom they had the pleasure to work during this research. Each of the authors provided valuable personal and professional guidance that greatly assisted in the completion of this research work.

Conflict of Interest

The authors declare that they have no conflict of interest. All co-authors have read and approved the contents of the manuscript, and there is no financial interest to report. We certify that this submission is original work and is not under consideration for publication elsewhere.

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