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Value Chain Development of IARI Variety of Carrot: A Training Need Assessment

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HIGHLIGHTS

- The majority of the farmers (71.25%) perceived a medium to very high level of training need.
- The most sought-after training needs were using herbicides, vermicomposting, prevention of rotting, and contract negotiation skills.
- While mass media exposure and scientific orientation affected positively to training need, extension contact affected it negatively.

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ABSTRACT

The green revolution made India self-sufficient in food production. Over the years, due to technological interventions, the quantity of food production increased to new heights. However, the income of farmers did not improve proportionately. Lack of integration of farmers to sustainable value chains could be one factor contributing to it. Under this impression, the research was conducted to identify the training needs of the farmers in the area of value chain development of the Carrot commercial variety (*cv.*) *Pusa Rudhira* during 2022. A total number of 80 farmers were selected randomly from Nizampur, Delhi, and Peer Nagar Sodhana, Uttar Pradesh. A training need index was developed. The findings showed that 71.25 per cent of the farmers had medium to very high need of training in the area of value chain development. The most sought-after training needs were the use of herbicides, vermicomposting, prevention of rotting, and contract negotiation skills. The identified areas may be given due consideration while organising training programmes for farmers so that they can upgrade themselves to better value chains and earn more income.

INTRODUCTION

According to the Food and Agricultural Organization (FAO, 2008), a 'value chain' in the farm sector consists of a set of actors and activities that facilitate a basic agricultural product from production to final consumption, where at each stage value addition is being done. Case studies in the Indian context have shown that farmers who participate in value chain incur less transaction cost, face minimum market risks and realise higher remuneration (Chengappa, 2018). Gupta (2015) reported that, in the Purnia district of Bihar, farmers associated with the maize value chain receive 11 per cent higher price than what the local aggregators offer. Ramappa et al., (2016) studied the value chain of tomatoes in Karnataka and found that the value chain approach has improved the marketing system, thereby benefiting the chain actors. The value chain approach promotes market-oriented agriculture while increasing smallholder farmers' income (Sanjeev et al., 2012)

However, the value chain sector is marred by several challenges. Farmers face challenges in access to regulated markets, unavailability of effective ICT solutions for agricultural value chain, and the absence of standardised regulations, making it challenging to analyse the micro-level aspects of the value chain (Hernandez al., 2017; Lahiri et al., 2024: Jana et al., 2025). Most of the small and marginal farmers do not have knowledge on production, storage and preservation of agricultural produce and how to constantly check

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quality. Their supply competencies are also poor. Moreover, the existence of middlemen, absence of data and information about other links, and not being able to invest in the value chain led to inefficiencies. By making the production, collection, storage, and delivery of the value chain efficient, the income of the smallholder farmers can be increased (Kumar et al., 2016). Singh et al., (2021) found that most of the carrot and okra growers need training in plant protection measures. Iduku (2019) have shown that women vegetable farmers require training in pest and disease management, fertiliser application, selecting appropriate fertiliser rates, and storage techniques.

Capacity building of the farmers can be one of the means to address these challenges (Kumar et al., 2024). Training is one of the important methods of capacity building. According to Sanjeev et al., (2012), it is a process of acquiring new skills, attitudes, and knowledge that facilitates entry into a profession or enhances productivity within an organisation or enterprise. Roy et al., (2021) found that there was significant improvement in the levels of knowledge, attitude and skill as a result of training. Jors et al., (2016) found that training farmers improved and performed in all the tested variables than their neighbouring farmers. The same study also reported that, the trained farmers improved the knowledge of their neighbouring farmers and their performance was better than the control group farmers. Similarly, Rasanjali et al., (2021) have reported that there is an impact of training on farmers' technological knowledge. The study provided evidence for continuance of agricultural training. The value chain approach is gaining traction in the agriculture sector due to its potential in enhancing farmers' income. Also, the farmers require training and capacity building to participate in better value chains. Though, several studies have been conducted to identify the training needs of farmers in the areas of crop production and management, studies in the area of value chain development are lacking.

METHODOLOGY

The study was conducted during February to April 2022. The sampling area consists of Uttar Pradesh and New Delhi. Farmers growing Carrot *cv. Pusa Rudhira* were the sampling units. From the state of Uttar Pradesh district Hapur and village Peer Nagar Soodhna was selected purposively. Similarly, from New Delhi, District Khanjawla and the village Nizampurwere selected purposively. The basis for purposive selection was that IARI had undertaken a project in these villages from 2011 to 2014 to enhance the cultivation of carrot *cv.* Pusa Rudhira (Singh et al., 2018). From each of the villages, forty farmers (40) growing Carrot *cv.* Pusa Rudhira were sampled randomly. So, the total number of farmers was eighty (80). The research design followed was ex-post facto in nature. Training was operationalised as the level of knowledge and skill requirement of the farmers in the area of value chain development. Value chain development was operationalised as an activity wherein all the stakeholders, starting from production to the final purchase of the produce, are linked in such a way that its maximum potential in terms of market efficiency, value addition, increasing income, and long-term viability can be realised. The training need was measured through the development of a training need index. The dimensions of the index i.e. crop production (CP), On-farm input production (IP), On-farm input production (IP), post-harvest management (PM) and farm business management (FBM) were finalised after an extant review of literature and discussion with experts. The validity of the dimensions and statements thereof were ascertained using content validity. The weightage of the dimensions was calculated using the AHP (Analytic hierarchy processes) method. After getting the weightage of the dimensions, the training need index score for each respondent was calculated as follows:

$$\text{Training Need Index} = \frac{CP*W1+IP*W2+PM*W3+FBM*W4}{W1+W2+W3+W4} * 100$$

Where, W1 = Weightage for crop production; W2 =Weightage for on-farm input production; W3 = Weightage for post-harvest management; W4 = Weightage for farm business management

The participants were classified into five groups ranging from very high training need to very low training need on the training need index score using the cumulative cube root frequency method. Pearson's correlation and multiple regression analysis were done by taking age, education, family size, occupational status, farming experience, operational holding, annual income, material possession, economic motivation, scientific orientation, social participation, cosmopoliteness, Mass media exposure, and extension contacts as independent variables and training index score as dependent variable. An interview schedule was prepared, and farmers growing Carrot *cv.* Pusa Rudhira were asked to give responses to their perceived training need. Their responses were recorded in a three-point continuum ranging from mostly needed to not needed.

RESULTS

Under the dimension of crop production, high training need was perceived under all the indicators except for the adjustment of sowing and harvesting time with the changing climate (1.43). According to the mean value, the top three areas were optimum use of weedicides (2.68), Soil health management (2.66) and optimum use of fertilisers (2.32). Similarly, under the dimension of on-farm input production, training need was high in Green manuring (2.10) and vermicompost production (2.02). Under post-harvest management, the majority of the farmers, i.e. 78 per cent, expressed that they needed training in preventing the rotting of the carrots in the field. The training need for post-harvest disease management was also high. Moreover, under farm business management, high training need was perceived in the areas of contract negotiation with processors (2.13) and the selection and maintenance of farm machinery (2.16). The responses of the farmers were used to calculate the overall training need index score, which showed that, for11.25 per cent of the respondents, the perceived training need was very low, while it was low for 17.5 per cent of the respondents. At the same time, 38.75 per cent of the respondents were in the medium level category, 18.75 per cent of the respondents fell in the high and 13.75 per cent in the very high category of training need. Thus, a large number of the participants had medium to very high levels of training need in the area of value chain development.

Table 2 shows that age has a significant and negative association with perceived training need as shown by the "r" value of -0.358. This may be because the respondents belonging to the young age

Table 1. Perceived training need of the farmers growing Carrot *cv.* Pusa Rudhira

Statements	Mostly needed (%)	Needed (%)	Not Needed (%)	Mean Value	Weightage of the dimension
Crop Production					2.87
Optimum use of fertilisers	37.50	57.50	5.00	2.32	
Integrated pest management	22.50	70.00	7.50	2.15	
Optimum use of weedicides	15.00	76.25	8.75	2.68	
Optimum use of plant protection chemicals	21.25	72.5	6.25	2.06	
Integrated disease management	16.25	71.25	8.75	2.07	
Soil health management	40.00	48.75	11.25	2.66	
Adjusting sowing and harvesting time with the changing climate	15.00	13.75	71.25	1.43	
On-Farm Input Production					3.65
Vermicompost production	13.75	75.00	11.25	2.02	
Green manuring	15.00	80.00	5.00	2.10	
Production of farm compost	15.00	50.00	35.00	1.80	
Quality seed production	11.25	15.00	73.75	1.40	
Post Harvest Management					4.67
Post-harvest disease management	21.25	73.75	5.00	2.16	
Storage of the produce	11.25	7.50	81.25	1.3	
Value addition and processing activities	20.00	26.25	53.75	1.58	
Preventing the rotting of the crop in the field	78.75	21.25	0.0	2.78	
Farm Business Management					4.25
Regarding taking farm loans and crop insurance	21.25	31.25	47.5	1.88	
Contract negotiation with processors/millers	12.5	63.75	23.75	2.13	
Regarding the formation of F.P.O	23.75	66.25	10.0	1.45	
Use of e-commerce facility to sell farm produce	11.25	22.5	66.25	1.73	
Regarding the selection of farm machinery and its maintenance	21.25	73.75	5.0	2.16	
Gathering of relevant information regarding farming and market	18.75	60.0	21.25	1.97	

Table 2. Correlation and regression analysis between independent variables and perceived training need

Model	Unstandardised Coefficients		Standardised Coefficients	T	p-value	Pearson Correlation	p-value
	B	Standard error	Beta			Coefficient	
Constant	0.675	0.123		6.601	0.000		
Age	-0.050	0.003	-0.187	-0.097	0.223	-0.358*	0.001
Education	-0.004	0.021	-0.098	-0.291	0.365	0.513*	0.016
Family size	0.000	0.007	-0.005	-0.329	0.441	0.010	0.010
Occupational status	-0.001	0.012	-0.021	-0.098	0.397	-0.119	0.293
Farming experience	-0.001	0.028	-0.007	-0.214	0.481	0.167	0.140
Operational holding	0.075	0.003	-0.005	-0.122	0.517	0.204	0.069
Annual income	-0.002	0.019	-0.001	-0.076	0.965	0.139	0.219
Material possession	-0.001	0.007	-0.010	-0.320	0.659	0.064	0.572
Economic motivation	0.004	0.009	0.070	0.029	0.392	0.198	0.324
Scientific orientation	0.001	0.005	0.020	2.513*	0.003	0.356*	0.003
Social participation	-0.008	0.021	-0.065	-0.074	0.320	-0.101	0.372
cosmopoliteness	0.002	0.012	-0.003	-0.291	0.197	-0.161	0.155
Mass media exposure	0.000	0.026	0.657	2.927**	0.001	0.374**	0.003
Extension contacts	0.000	0.013	-0.395	-3.139*	0.006	-0.418**	0.001

Level of significance 0.05(*) and 0.01(**) F ratio=10.790, R^2=0.811, Adjusted R^2=0.7704

category have more curiosity towards learning than older ones. Similarly, education has a positive and significant association with the training need needs of the respondents with an "r" value of 0.513. Furthermore, scientific orientation was positively and significantly related to training need. Similarly, mass media exposure was found to have a positive and significant association with the training needs of the farmers with an "r" value of 0.374. Similarly, extension contact had a negative and significant association with the training needs of the farmers.

Multiple regression analysis was done to find out the predictors of the perceived training need. To do this, a regression equation was fitted, keeping the training need index score as the

dependent variable with all other independent variables of the study. The training need index score was measured on a continuous, interval-level scale, making it suitable for parametric tests. The data shows that 77.04 per cent of the variance in the dependent variable can be attributed to the independent variables of the study, as shown by the "adjusted R^2" value of 0.7704. Three variables were found to be significantly contributing towards the perceived training need of the respondents. Scientific orientation (β=0.020) and mass media exposure (β=0.657) were found to positively affect the training need, and extension contact (β=-0.395) negatively affected the training need of the respondents.

DISCUSSION

Post-harvest management and farm business management got the highest weightage from the experts out of all four dimensions taken for the study. This may be because these components are very crucial for effective value chain development. In a study conducted by Kiran et al., (2010) on the post-harvest training needs of farm women in the Junagadh district of Gujarat, it was found that farm women desired training in areas such as selecting selling locations, pest control, timing of spraying, rodent control, storage pest management, seed bin information, threshing, and winnowing. Similarly, the significance of marketing has also been emphasised in various studies (Barman et al., 2013; Poonia, 2010; Kiran et al., 2016). Under the dimension of crop production, the training need was sought in the optimum use of weedicides and fertilisers and soil health management. In a study by Pandey et al., (2015) on the training needs of farmers regarding mustard production technology, it was reported that the majority lacked knowledge about plant protection measures and the application and use of manures and fertilisers. Similarly, Sajeev et al., (2021) studied the training needs of farmers and rural youth in the Nagaland district and reported that training is needed in soil fertility management. This may be because most of the farmers did not have access to immediate extension advisory in this regard. Similarly, under on-farm input production, farmers need training in vermicompost production and green manuring. Chhodavadia et al., (2018) reported that farmers mostly need training in the areas of getting subsidies and loans, control of disease and vermicomposting. When it comes to post-harvest management, most of the farmers needed training to deal with the prevention of rotting of the crop in the field. Rotting of carrot is a common problem faced by the farmers. Papparella et al., (2024) reported that faulty cultural practices can cause the rotting of carrots. Under the dimension of farm business management, farmers expressed their perceived training need for the selection of farm machinery and its maintenance and contract negotiation with processors. The overall training need was found to be very high in the area of value chain development. Age and extension contact were found to have a negative association with training need. Viva et al., (2005) also found that extension contact was negatively and significantly associated with the training needs of paddy growers. Additionally, education, scientific orientation, and exposure to mass media are positively and significantly correlated. This may be because farmers with high scientific orientation were more oriented towards applying the new farm technologies than farmers with low scientific orientation. The finding confirmed to Raghuvanshi (2014), who discovered that there was a significant relationship between farmers' scientific orientation and their training needs.

CONCLUSION

Given the importance of value chain in enhancing farmers' income, it is important to integrate them with a better and sustainable value chain. They must be equipped with the necessary skills and competencies. The current study found out their training need in the area of value chain development. The empirical findings show that majority of the farmers had medium to very high training needs. Training intervention should be carried out with a value chain orientation to improve the income and livelihood. Areas of training need that emerged in the study were; optimum use of herbicides, soil health management, green manuring, preventing rotting due to untimely rain, formation of farmers' organisations, contract negotiation skills, and purchase of farm machineries etc. These areas must be given due consideration by policymakers while designing effective value chain intervention programmes.

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