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Research Article

Study the adoption and area expansion of intervent technology through OFT and VT under Mandar block of Ranchi district

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SUMMARY : Effect on adoption and area inexpension of intervented technologies study in five village of Karge Panchyat of Mandar Block of Ranchi District, Jharkhand result showes that the demonstrating and experimenting farmers had adopted relatively a large number of technologies compared to participating farmers.Majority of the demonstrating farmers (87%), experimenting farmers (83%) and participating farmers (84%) had adoption index scores between 26 to 75 per cent. No significant differences among three categories of respondents were found with respect to their adoption scores. Out of six technologies demonstrated, four were found to be adopted by above 50 per cent of the respondents except two *i.e.* soil application of bleaching powder and lindane dust and use of wilt resistant brinjal varieties Swarnshree. However, the two technologies were found to be adopted by above 50 per cent of the experimenting farmers.The co-efficient of correlation between caste and family size with adoption score was found to be positive but non-significant with respect to the three categories of respondents. As an effect of adoption of assessed *i.e.*verified technologies under well-endowed production systems, area under tomato, cauliflower and capsicum increased to an extent of 1466.66, 2350 and 650 per cent, respectively among demonstrating farmers, whereas, 1340, 866 and 933 per cent among participating farmers, respectively. Similarly under small production systems due to effects of adoption of demonstrated refined technologies, area expansion under tomato, brinjal and cauliflower was recorded to an extent of 1300, 1200 and 966.66 per cent, respectively among experimenting farmers and 1600, 1066 and 755 per cent among participating farmers. Rate of diffusion of the refined technologies was around 30 per cent in both well-endowed and small production systems. Spread effect was relatively higher (41.85%) in well-endowed production systems compared to the small production systems (33.4%).

KEY WORDS :
Adoption, Area expension, Intervent technology, OFT, VT

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BACKGROUND AND OBJECTIVES

In this study altogether 9 technology interventions related to tomato, -brinjal, cauliflower, capsicum were assessed and refined under well-endowed production system through verification trails (VTs) and in small production system through on farm trails (OFTs). After assessment and refinement altogether 6 technologies were finally selected for their dissemination in similar environments through extension education programmes and activities like demonstrations and training. The selected technologies were wilt resistant variety of tomato "Arka Alok", wilt resistant variety of brinjal "Swarnshree", soil application as well as spraying of borax and molybdenum in cauliflower and improved variety of capsicum "California wonder". Demonstrations equipped with organization of training on related interventions and field days were conducted for popularizing the technologies in both the small and well-endowed production systems. The impact of the demonstration, therefore, were studied both in case of the demonstrating and participating farmers after completion of the project. The major findings have been presented in the following sub-heads:

- Adoption of selected vegetable production technologies.
- Effect on area expansion and spread of selected technologies.

Adoption is an important indicator for measuring the success of extension education activities like demonstration and training followed by technology assessment and refinement. In this section, an attempt was made to analyse the level of adoption of selected vegetable production technologies as well as to study the association between adoption scores and selected characteristics of the respondents.

RESOURCES AND METHODS

The villages under study :

The study was undertaken in the five purposively selected villages of Karge panchayat in Mandar Block, namely, Karge, Rege, Hatma, Chatwal and Keskani-kumbatoli. The rationale behind selection of the villages was their adoption under Institution - Village Linkage Programme of Birsa Agricultural University Center, where demonstrations and on farm trials (OFT) were conducted for assessment and refinement of technologies. A brief description on each selected village is as follows:

Karge :

Karge is situated at a distance of 5 km towards North from Mandar Block hq. It is a big village consisting of six hamlets *i.e.* Karge-Satpara, Karge-Oranotoli, Karge-Riptin, Kare-Karamdaha, Karge-Behratoli and Karge-Nayatoli. The village is having mixed population.

Rege :

Rege is relatively a small village having 62 households of different castes. Rege is situated at 1 km. from Karge village on the left side of Mandar-Burmu metalled road.

Hatma :

Hatma is a medium size village having 126 households predominantly inhabited by *munda* tribe. The village is situated at a distance of 2 km from Karge panchyat hq towards north falling both sides of the Mandar-Burmu mettalled road.

Chatwal :

Chatwal is relatively a large village having mixed population of different religions, castes and tribes. The village is predominantly inhabited by the Munda tribe. It is situated at a distance of 1.5 km. from Karge panchayat hq. The total number of households in the village is 210.

Keskani-Kumbatoli :

Keskani-Kumbatoli is a very small village having 48 households of different castes and tribes. It is at about 2 km from Karge panchayat hq situated adjacent to Chatwal village.

Research design and sampling procedure :

A combination of research designs, namely, analytical and ex- post - facto was used in the study.

Three categories of respondents, namely, demonstrating farmers, experimenting farmers and participating farmers were selected from each of the five adopted villages related to demonstrations, verification trials and on-farm trials conducted on important vegetables, *viz.*, tomato, cauliflower, capsicum and brinjal. Rationale behind selecting these vegetable crops were their predominance in the study villages.

All the demonstrating farmers (60) experimenting farmers (60) and 25 per cent of the participating farmers from the selected villages (150) constituted the sample for data collection. Thus, the whole sample consisted of 270 respondents. Selection of demonstrating farmers and experimenting farmers was done on the basis of purposive sampling technique and selection of participating farmers was done on the basis of simple random sampling technique. Village-wise distribution of respondents has been presented in Table A.

Adoption of intervened technologies :

An adoption scale was developed to measure the extent of adoption of intervened technologies by the respondents. A list of intervened technologies of vegetable cultivation was prepared. Respondents were asked to indicate the intervened technologies adopted by them with their extent.

The level of adoption of respondents and overall adoption of intervened technologies were computed in the following manner:

Table A : Village-wise distribution of different categories of respondents

Sr.No.	Village	Experimenting farmers (n=60)	Demonstrating farmers (n=60)	Participating farmers (n=150)	Total (n=270)
1.	Karge	20 (33.33)	20 (33.33)	55 (36.66)	95 (35.18)
2.	Rege	10 (16.66)	10 (16.66)	30 (20.00)	50 (18.50)
3.	Hatma	15 (25.00)	15 (25.00)	25 (16.66)	55 (20.37)
4.	Chatwal	10 (16.66)	10 (16.66)	25 (16.66)	45 (16.66)
5.	Kesheskani- kumba toli	5 (8.35)	5 (8.35)	15 (10.00)	25 (9.28)
	Total	60(100.00)	60(100.00)	150(100.00)	270(100.00)

Figures in parantheses indicate percentages

The adoption score assigned to each respondent was summed up and the mean score of adoption (X = 6.98) and standard error (SE = 2.42) were computed. Adoption was categorized into three levels *i.e.* low level of adoption if the total score of an individual respondent was below X-SE (5.98), medium level of adoption if the score varied from X+SE to S+SE (5.98 to 8.62) and high level of adoption if individual score was above X+ SE (8.62).

In order to determine the overall extent of adoption of intervened technologies following procedure was adopted. Adoption quotient (AQ) was worked out for each respondent and it was taken as adoption score for individual respondents. The following procedure was followed to work out AQ :

$$\mathbf{AQ} = \frac{\textbf{Adoption score btained by respondents}}{\textbf{Maximum possible adoption score}} \textbf{x100}$$

Overall adoption level was worked out by calculating the arithmetic mean of the adoption quotients of all the respondents as given below:

$$\textbf{Overall adoption level} = \frac{\sum_{\mathbf{I=1}}^{\mathbf{N}} \mathbf{AQ}}{\mathbf{N}}$$

where,

AQ = Adoption quotient for 1th respondents

N = Total number of respondents

Spread of assessed/refined technologies :

Spread of technology refers to adoption of intervened technologies by the target clientele through demonstration and on-farm trials in a particular area. It was computed in two terms *i.e.* percentage of families adopted and percentage of area covered under a particular technology in the villages under study.

Effect of demonstrations and OFT on adoption by farm families :

It was computed in terms of number of families adopted the technology out of total number of families in the project village. The percentage spread was calculated as per the following method:

$$\textbf{Spread (\%)} = \frac{\textbf{Number of families adopted the technologies in project villages}}{\textbf{Total number of families in project villages}} \textbf{x100}$$

Effect on expansion of area under intervened technologies:

Effect of expansion of area was computed in terms of area under intervened technology out of total area under cultivation of related crops. The following formula was used for computation:

OBSERVATIONS AND ANALYSIS

The results of the present study as well as relevant discussions have been presented under following sub heads:

Adoption of selected vegetable production technologies by the respondents :

Adoption is an important indicator for measuring the success of extension education activities like demonstration and training followed by technology assessment and refinement. In this section, an attempt was made to analyse the level of adoption of selected vegetable production technologies as well as to study the association between adoption scores and selected characteristics of the respondents.

Level of adoption :

The respondents were classified into three categories *i.e.* high, medium and low on the basis of their level of adoption of intervened vegetable production technologies. The data have been presented in Table 1.

It appears from Table 1 that majority of the demonstrating farmers (66.66%), experimenting farmers (68.34%) and participating farmers (72%) had medium level of adoption. Table further indicated that 13.34 per cent of demonstrating farmers (20%) of experimenting farmers and (12.67%) of participating farmers had high level of adoption, where age of (20%) demonstrating farmers, 11.66 per cent of experimenting farmers and 15.33 per cent of participating farmers had low level of adoption.

Pooled data indicated that 70 per cent of the respondents had medium level of adoption followed low level of adoption (15.55%) and high level of adoption (14.45%).

The value of f (F=0.7942) was non significant at 5 per cent level which indicated that there were no significant differences in mean adoption scores of demonstrating, experimenting and participating farmers.

Table 1: Frequency distribution of respondents according to their level adoption of intervened vegetable production technologies

Adoption level	Demonstrating farmers (n=60)	Experimenting farmers (n=60)	Participating farmers (n=150)	Pooled (n=270)	F-value
Low < 5.98	12 (20)	7 (11.66)	23 (15.33)	42 (15.55)	
Medium 5.99-8.62	40 (66.66)	41 (68.34)	108 (72)	189 (70.00)	0.7942 NS
High > 8.62	8 (13.34)	12 (20.00)	19 (12.67)	39 (14.45)	
Mean	6.88	7.30	6.66	6.98	

Figures in parentheses indicate percentages, NS= Non significant 5% level

A very low percentage of the three categories of respondents had low level of adoption due to unavailability of related inputs in local markets.

Adoption quotient :

The respondents were classified into five categories *i.e.* no adoption, between 1 to 25 per cent, 26 to 50 per cent, 51 to 75 per cent and 76 to 100 per cent. The data have been presented in Table 2.

It appears from Table 2 that majority of the demonstrating (86.66 %), experimenting farmers (80.33 %) and participating farmers (84.0 %) fell into the category between 26 to 75 per cent of adoption index score. Table further indicated that 13.33 per cent of demonstrating farmers, 20 per cent of experimenting farmers and 11.33 per cent of participating farmers possessed adoption score between 76 to 100 per cent.

Table 2 further revealed that the mean adoption index score was highest (59.78) among the experimenting farmers followed by demonstrating farmers (56.72) and participating farmers (54. 37).

F value showed that there was no significant difference between adoption score of demonstrating, experimenting and participating farmers as the selected technologies were adopted by all the three categories of farmers on same footing.

Component-wise adoption of improved technologies :

Frequency distribution of respondents according to adoption of different components of improved vegetable production technologies have been presented in Table 3.

It is evident from Table 3 that application of boron @ 8 kg/ha along with molybdenum @ 1.5 kg in soil was adopted by 63.33 per cent demonstrating farmers, 70 per cent of experimenting farmers and 60.66 of participating farmers. Due to low cost, micronutrient management technologies *i.e.* spraying of boron 2 g/lit. with 1 gram of molybdenum in 1 litre of water during different stages of growth period of cauliflower was adopted by relatively a large percentage of farmers *i.e.* 86.66 per cent of demonstrating, 93.33 per cent of experimenting and 69.33 per cent of participating farmers. The wilt resistant variety of tomato (Arka Alok) was adopted by only 51.66 per cent of demonstrating, 56.66 per cent of experimenting and 52.00 per cent of participating farmers. The wilt resistant Swarnshree variety of brinjal was 46.66 per cent of demonstrating farmers, 53.33 per cent of experimenting farmers and 45.33 per cent of participating farmers.

Table 3 further shows that soil treatment practices for control of wilt were found to be adopted by 48.33 per cent of demonstrating farmers, 51.66 per cent of experimenting farmers and 47.33 per cent of participating farmers. Table further shows that improved variety of capsicum *i.e.* California wonder was found to be adopted by 88.33 per cent of demonstrating farmers, 81.66 per cent of experimenting farmers and 78.66 per cent of participating farmers.

Table 2: Frequency distribution of respondents by their adoption index scores

Adoption index score	Demonstrating farmers (n=60)	Experimenting farmers (n=60)	Participating farmers (n=150)	Pooled (n=270)	F-value
No adoption	-	-	-	-	
1 to 25	-	-	7 (4.66)	7 (2.57)	
26to 50	28 (46.66)	26 (43.33)	64 (42.66)	118 (43.70)	0.8186 N.S.
51 to 75	24 (40.00)	22 (40.00)	62 (41.33)	108 (40.00)	
76 to 100	8 (13.33)	12 (20.00)	17 (11.33)	37 (13.71)	
Mean	56.72	59.78	54.37	57.28	

Figures in parentheses indicate percentages, * Indicate singnificance of value at P=0.05, NS=Non-significant

Table 3: Frequency distribution of respondents according component-wise adoption of selected vegetable production technologies

Sr. No.	Name of intervened technology	Demonstrating farmers (n=60)	Experimenting farmers (n=60)	Participating farmers (n=150)
1.	Soil application of 8 kg borax + 1.5 kg molybdenum during land preparation	38 (63.33)	42 (70.00)	91 (60.66)
2.	Spraying of 2 gram borax/litre of water + 1 gram of molybdenum/litre of water thrice during different growth stage	52 (86.66)	56 (93.33)	104 (69.33)
3.	Use of wilt resistant tomato variety Arka Alok	31 (51.66)	34 (56.66)	78 (52.00)
4.	Use of wilt resistant brinjal variety Swarnshree	28 (46.66)	32 (53.33)	68 (45.33)
5.	Soil application of 6 kg bleaching powder + 12 kg Lindane dust/ ha before 15 days of tomato transplantation	29 (48.33)	31 (51.66)	71 (47.33)
6.	Use of improved variety of capsicum california wonder	53 (88.33)	49 (81.66)	118 (78.66)

Figures in parentheses indicate percentages, * Indicate significance of value at P=0.05

The preceding findings revealed that the demonstrating experimenting and participating farmers adopted the selected technologies on similar footing because the three categories of farmers were given proper training and chances to observe the practices.

Association between selected characteristics of the respondents with adoption scores :

The co-efficients of correlation between selected characteristics of demonstrating, experimenting and participating farmers and their adoption scores are presented in Table 4.

It appears from Table 4 that co-efficient of correlation between age and adoption scores of demonstrating, experimenting and participating were negative and significant. This indicated that with increase in age, adoption of improved vegetable production technologies decreased significantly.

This finding is in accordance with the findings of Katarya (1989) that age of the farmers reflected negative and significant association with adoption of wheat production technologies. This might be due to the fact that the older age people are generally traditional and conservative. They think that they do not require any further knowledge. They are also suspicious of new ideas and practices. Therefore, the older age people might have adopted improved vegetable production technologies to relatively a lesser extent than the younger people.

The co-efficient of correlation between size of holding, caste and family size with adoption scores were found to be positive but non-significant for the three categories of respondents.

This finding is in conformity with those of Saxena *et al*. (1990) who also found that size of family had non-significant association with acceptance of technology.

The co-efficient of correlation between education, social participation, socio-economic status, annual family income, knowledge and attitude towards intervened vegetable technologies with adoption scores were found to be positive and significant. This indicated that with increase in educational level, social participation, annual family income, socio-economic status, knowledge about and positive attitude towards intervened vegetable production technologies, there was increase in level of adoption in a positive and significant direction.

These findings are in accordance with those of Saxena *et al.* (1990) and Supe *et al.* (1990) who also reported that educational status and adoption were found to be positively and significantly correlated. Katarya and Singh (1987) reported that social-participation was positively and significantly associated with the adoption. Rajendra (1990) reported that persons with higher socio-economic status were good adopters. Cander *et al.* (1990) reported that co-efficient of correlation between knowledge and adoption indices was found to be highly correlated. Katarya (1989) reported that attitude and knowledge about technology was positively and significantly correlated with adoption.

Table 4 : Co-efficient of correlation between selected characteristics of demonstrating, experimenting and participating farmers and their adoption scores

Sr. No.	Variable	Value of co-efficient correlation (r)		
		Demonstrating Farmers	Experimenting farmers	Participating farmers
1.	Age	- 0.3516*	- 0.362*	- 0.368*
2.	Education	- 0.641**	0.582**	0.612**
3.	Caste	- 0.174 NS	0.162 NS	0.158 NS
4.	Size of holding	- 0.276 NS	0.122 NS	0.174 NS
5.	Family type	0.795 NS	0.242 NS	0.261 NS
6.	Social participation	0.234*	0.286*	0.264*
7.	Socio-economic status	0.394*	0.279*	0.286*
8.	Annual family income	0.316*	0.274*	0.294*
9.	Knowledge about intervened technology	0.674**	0.566**	0.487**
10.	Attitude towards intervened vegetable production technologies	0.346*	0.278*	0.286*

* and ** Indicate significance of value at P=0.05 and 0.01, respectively, NS = Non-significant

Table 5: Effect of demonstrations on selected technology on area expansion under different crops in well endowed production system

(Area in ha)

Crop	Average area of three year ha of demonstrating farmers (n=60)			Average area of three year in ha of participating farmers (n=150)		
	Before demonstration	After demonstration	% increase	Before demonstration	After demonstration	% increase
Tomato	3.00	44.00	1466.66	2.50	33.50	1340.00
Cauliflower	2.00	47.00	2350.00	3.00	26.00	866.66
Capsicum	4.00	26.00	650	3.00	28.00	933.33

Effects on area expansion and spread of selected technologies :

The effect of demonstrations on technologies refined through on-farm trials under small production systems and technologies assessed through the verification trials in well-endowed production systems were studied in terms of area expansion and spread effect.

Data on effect of demonstrations on selected technologies on area expansion in well-endowed production systems have been presented in Table 5.

Table 5 shows that use of soil treatment practice in tomato *i.e.* soil application of 6 kg bleaching powder + 12 kg lindane dust/ha before 15 days of transplanting increased area under tomato cultivation from a tune of 3 ha to 44 ha among demonstrating farmers and from 2.5 ha to 33.5 ha among participating farmers with an increase of 1466.66 per cent and 1340 per cent, respectively. Soil application of 8 kg borax+1.5 kg molybdenum/ha during land preparation increased area under cauliflower from 2 ha to 47 ha among demonstrating farmers and 3ha to 26 ha among of participating farmers with an increase of 2350 per cent and 866.66 per cent, respectively. Due to use of improved variety of capsicum (California wonder) area under capsicum increased from 4 ha to 26 ha among demonstrating farms 3 ha to 28 ha among participating farmers with an increase of 650 per cent and 933.33 per cent, respectively.

Table 6 shows that under small production systems due to use of wilt resistant variety of tomato (Arka Alok) area under tomato increased from 1 ha to 13 ha among demonstrating farmers and from1 ha to 16 ha among participating farmers with an increase of 1300 per cent and 1600 per cent, respectively.

Similarly due to use of wilt resistant variety (Swarnshree) increase in area of brinjal was recorded from a tune of 1.50 ha to 18 ha among demonstrating farmers and from 1.50 ha to 16 ha among participating farmers with an increase of 1200 per cent and 1066 per cent, respectively. In case of cauliflower due to use of spraying of 2 gram borax/ litre of water +1 gram molybdenum/litre of water thrice during different growth stages, increase in area under this crop was worked out from 3 ha to 29 ha among demonstrating farmers and from 4.50 ha to 34 ha among participating farmers. The percentage increase in area of intervened technology among cauliflower growers found to be 966 per cent and 755 per cent, respectively.

The findings presented in preceding paragraphs lead to conclude that area under cultivation of crops concerned was increased due to the fact that respondents were satisfied with the technologies in terms of their productivity and profitability.

Spread effect of intervened technologies :

Effect of demonstrations on spread of intervened technologies was studied in terms of adoption of the technologies by the households in project villages.

Table 7 shows that out of 982 farm families under project villages, soil treatment practices in tomato *i.e.* soil application of 6 kg bleaching powder + 12 kg lindane dust/ha before 15 days of transplanting and wilt resistant varieties of tomato (Arka Alok) were adopted by 382 farm families (38.90%) among well-endowed production systems and 297 farm families under small production system and (30.24%).

In case of cauliflower soil application of 8 kg borax + 1.5 kg molybdenum/ha during land preparation and spraying of 2 gram borax/litre of water + 1 gram molybdenum/litre of water thrice during different growth stages were adopted by 382 farm families (38.09%) among well-endowed production systems and 322 farm families (32.79%) among small production systems.

In capsicum improved variety (California wonder) was adopted by 489 farm families (50.71%) among well-endowed production systems and 322 farm families (37.78%) among

Table 6: Effect of demonstrations on selected technology on area expansion in small production system (Area in ha)

Crop	Average area of three year in ha of experimenting farmers (n=60)			Average area of three year in ha of participating farmers (n=150)		
	Before experiment	After experiment	% increase	Before experiment	After experiment	% increase
Tomato	1.00	13.00	1300.00	1.00	16.00	1600.00
Brinjal	1.50	18.00	1200.00	1.50	16.00	1066.00
Cauliflower	3.00	29.00	966.66	4.50	34.00	755.00

Table 7 : Effect of demonstrations on technology interventions on spread of technologies according to their adoption by the households in project villages

Crop	Total number of household in intervened village	No of households adopted the technology	
		Well-endowed production system	Small production system
Tomato	982	382 (38.90)	297 (30.24)
Cauliflower	982	382 (38.90)	322 (32.79)
Capsicum	982	489 (50.71)	371 (37.78)
Brinjla	982	382 (38.9)	322 (32.79)

small production system.

Wilt resistant variety of brinjal (Swarnshree) was adopted by 382 farm families (38.90%) among well-endowed production systems and 322 farm families (32.79%) among small production systems.

The findings presented in preceding paragraphs led to concluded that rate of diffusion of the intervened technologies was around 30 per cent in both production systems. However, spread effect was higher in well-endowed production systems due to the fact that the required bio-physical factors for vegetable cultivation was favourable as compared to the small production system.

Conclusion :

The demonstrating and experimenting farmers in comparison to the participating farmers had relatively higher adoption scores in respect of majority of vegetable production technologies. Since the demonstrating farmers and experimenting farmers acquired significantly higher level of knowledge, higher degree of favourable attitude and higher level of adoption of the intervened technologies in comparison to the participating farmers, it is impetrative that large scale extension activities like demonstrations, training programmers, exposure visits and field days be carried out for quick dissemination of the technologies.

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