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Adoption of technology interventions in paddy (*Oryza sativa*) and horse gram (*Macrotyloma uniflorum*) by the beneficiary and non-beneficiary respondents of NICRA project

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Abstract

National Innovations on Climate Resilient Agriculture (NICRA) project aims to enhance the resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. In the present study, a total sample of 140 farmers (70 beneficiaries and 70 non-beneficiaries from the Ratnagiri district of Maharashtra state) were selected. The adoption of technology interventions by the respondents was measured with the help of a structured schedule. The schedule consisted of 10 and 7 items related to improved technology in paddy and horse gram, respectively demonstrated under the Technology Demonstrations Component of NICRA in the year 2020-21. The beneficiary respondents showed a medium to high level of adoption of technology interventions about paddy and horse gram crops than those of non-beneficiary respondents. Also, beneficiary respondents showed significantly high adoption of technology interventions as compared to non-beneficiary respondents. Interventions wise adoption revealed that beneficiary respondents have adopted relatively more interventions than non-beneficiary respondents in Paddy and horse gram cultivation.

Keywords: Adoption, technology, beneficiary, interview schedule, project

Introduction

National Innovations on Climate Resilient Agriculture (NICRA) is a network project of Indian Council of Agricultural Research (ICAR) implemented in various districts of the country since 2011. The project aims to enhance the resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration.

The technology demonstration component of the project deals with demonstrating proven technologies for adaptation of crop and livestock production systems to climate variability. This component was implemented in selected vulnerable districts of the country through location-specific interventions. These districts were selected based on the drought, cyclone, flood proneness, vulnerability to heat wave and cold wave, actual incidence of floods and droughts, etc. criteria besides the strength of the KVKs. The crop production module consists of introducing drought/temperature/flood tolerant varieties, advancement of planting dates of *rabi* crops in areas with terminal heat stress, water-saving paddy cultivation methods i.e. SRI, aerobic, direct seeding, etc., frost management in horticulture through trash burning, community nurseries for delayed monsoon, custom hiring centers for timely planting, location-specific inter-cropping systems with high sustainable yield index.

Adoption is a process by which an individual or other decision-making unit puts an intervention into use. The successful adoption of an intervention could be considered as a means to achieve increased productivity and thereby an improved standard of living for the farming community. In NICRA villages production technology interventions of paddy and horse gram were selected on the basis of technologies recommended by Konkan Agricultural University for assessing their adoption level by respondents.

So, looking at the above facts the present study was undertaken to understand the adoption of technology interventions in paddy and horse gram by the beneficiary and non-beneficiary

respondents of NICRA Project.

Materials and Methods

The present study was conducted in the Ratnagiri district of the Konkan region of Maharashtra state. All the five operational villages of the NICRA Project implemented by KVK, Ratnagiri i.e. Harale, Parule, Raipatan, Whel and Talawade from Ratnagiri district were selected. From these villages, 70 farmers (14 farmers from each village) were selected as beneficiaries. For this study, 70 farmers were taken from the nearby five villages (14 farmers from each village) as non-beneficiaries on a random basis for comparison. Thus, the total sample size was 140 respondents. The adoption of technology interventions by the respondents was measured with the help of a structured schedule, which was developed in consultation with the experts. The schedule consisted of a total of 10 and 7 items related to improved technology in Paddy (*Oryza sativa*) and Horse gram (*Macrotyloma uniflorum*), respectively demonstrated under the Technological Demonstrations Component of NICRA in the year 2020-21. Scores of 2, 1 and 0 were assigned to each item for full adoption, partial adoption and no adoption, respectively. The individual raw scores of the respondents were later converted into standardized scores to get the adoption index with

the help of the following formula:

$$\text{Adoption index} = \frac{\text{Obtained adoption score}}{\text{Highest obtainable score}} \times 100$$

The categories of adoption were made by using the formula $\text{mean} \pm \text{S.D.}$. The 'z' test was used to observe significant differences between adoption of beneficiary and non-beneficiary. Frequency and percentages were calculated for statement wise adoption.

Results and Discussion

Distribution of Respondents According to Crop-wise Adoption Level of Technology Interventions

The data presented in Table 1 reveals that, in paddy majority (72.86%) of beneficiary respondents showed medium level of adoption, whereas 14.28% showed high level of adoption and the remaining 12.86% showed low level of adoption of technology interventions. In case of non-beneficiary respondents, only 10.00% of respondents showed high level of adoption, whereas, 60.00% and 30.00% respondents showed medium and low level of adoption, respectively.

Table 1: Distribution of respondents according to crop-wise adoption level of technology interventions

Crops	Adoption level							
	Beneficiary (n=70)				Non-beneficiary (n=70)			
	Low	Medium	High	Mean/S.d.	Low	Medium	High	Mean/ S.d.
Paddy	9 (12.86)	51 (72.86)	10 (14.28)	61.07/13.13	21 (30.00)	42 (60.00)	7 (10.00)	29.71/14.44
Horse gram	8 (11.43)	42 (60.00)	20 (28.57)	75.92/ 13.22	10 (14.28)	55 (78.58)	5 (7.14)	52.86/10.28

(Figures in the parenthesis indicates percentages)

In case of horse gram, 28.57% of beneficiary respondents showed high level of adoption, whereas, 60.00% showed medium level of adoption and 11.43% showed low level of adoption. So far as the non-beneficiaries are concerned, 78.58% respondents showed medium level of adoption, while, 14.28% and 7.14% showed low and high level of adoption, respectively. Similar observations were also made by Yadav and Khan (2012)

[8], Ranawat (2013) [5], Rekha Parmar *et al.* (2018), Kalyan Babu (2019) [3], Anil Singh *et al.* (2021) and Sangita Yadav *et al.* (2022) [9].

Difference in Adoption of Technology Interventions by Beneficiary and Non-beneficiary Respondents

Table 2: Difference in adoption of technology interventions of different crops

Crops	Mean score		'z' value
	Beneficiary (n =70)	Non-beneficiary (n =70)	
Paddy	60.85	29.71	13.16**
Horse gram	75.91	52.85	11.52**

** Significant at 0.01 level

The results in Table 2 indicate that, mean score pertaining to adoption of technology interventions on paddy and horse gram by beneficiary respondents were 60.85 and 75.91, respectively. Whereas, the mean score of non-beneficiary respondents were 29.71 and 52.85 for the crop's paddy and horse gram, respectively. The calculated 'z' value for adoption of technology for both the crops found highly significant at 0.01 level. This indicates that beneficiary respondents showed significantly high adoption of technology interventions as compared to non-beneficiary respondents.

Technology Interventions wise Adoption by Beneficiary and Non-beneficiary Respondents

Data presented in Table 3 about technology interventions in paddy reveals that, flood tolerant and lodging resistant variety Ratnagiri-6 was adopted by cent% beneficiary respondents, whereas, 20.00% non-beneficiary respondents adopted this

variety. Further, the intervention of recommended seed rate i.e. @40kg/ha was adopted by 91.43% of beneficiary respondents and 44.29% of non-beneficiary respondents. Regarding seed treatment with Thiram @ 2.5 gm/ kg of seed it was observed that more than fifty (54.29%) beneficiary respondents followed this intervention, whereas, 71.43% non-beneficiary respondents not followed this intervention. Weed control by spraying pre-emergence weedicide pendimethalin @5.5 ml/lit of water was not adopted by 71.43% and 97.14% beneficiary and non-beneficiary respondents, respectively. The reason was most of respondents follow local *rabbing* technique (burning of grass/paddy straw in plant nursery area) and also non-availability of weedicide in affordable quantity at tehsil level. Further, the intervention of recommended spacing of seedlings at 20 cm x 15 cm distance was not adopted by 60.00% beneficiary and 82.86% non-beneficiary respondents of the study area.

The intervention of transplanting of the seedlings @21 to 30 DAS was adopted by majority of beneficiary respondents (97.14%) and non-beneficiary respondents (88.57%). Regarding recommended fertilizer dose @100:50:50 NPK kg/ha, it was found that more than eighty% (81.43%) beneficiary respondents adopted it partially whereas, 81.43% of non-beneficiary respondents not adopted this recommendation. With respect to timely availability of machineries through Custom Hiring Center in village, it was observed that majority (62.86%) beneficiary respondents had taken advantage partially, whereas, 75.52% non-beneficiary respondents had not taken advantage.

Control of blue beetle by 2 to 3 sprayings of quinalphose (25% a.i.) @4 ml/lit of water at 15 days interval was followed by 20.00% beneficiary respondents, whereas, 47.14% respondents not followed recommended interval sprays. However, 97.14% non-beneficiary respondents not followed this practice. The intervention of protecting harvested paddy crop by covering during return monsoon was fully adopted by 62.86% beneficiary respondents and 42.86% non-beneficiary respondents.

The data presented in Table 4 with respect to horse gram technology interventions indicate that, all beneficiary respondents used drought tolerant and non-shattering type variety Dapoli-1, whereas, 80.00% non-beneficiary respondents had not used this variety. However, 20.00% non-beneficiary respondents used this variety. Regarding the recommended seed

rate @20 kg/ha, it was observed that 70.00% beneficiary respondents and 92.86% non-beneficiary respondents fully adopted this recommendation. In case of seed treatment with thiram@2.5 gm/kg of seed followed by *Rhizobium* culture @25 gm/kg of seed, it was seen that 38.57% of beneficiary respondents followed it fully and 40.00% partially as *Rhizobium* culture unavailable in market. Whereas, 77.14% of non-beneficiary respondents not followed this intervention.

The intervention of cultivation of horse gram on conserve moisture and recommended sowing time 15th October to 30th November was fully followed by both beneficiary and non-beneficiary respondents. In the case of recommended fertilizers dose @ 25:50:60 NPK kg/ha at sowing time, the data reveals that 57.15% and 35.71% beneficiary respondents had no and partial adoption, respectively. Whereas, 81.43% and 18.57% of non-beneficiary respondents had no and partial adoption of recommended fertilizer dose. Protective irrigation management at pod formation stage was the intervention given for protection of crop due to water stress and getting more yield which resulted that 78.57% beneficiaries and 57.14% of non-beneficiary respondents followed this practice fully. However, 42.86% of non-beneficiary respondents not followed this and the reason was a lack of resources for irrigation.

Similar observations were recorded by Etwire *et al.* (2013) [2], Sharma and Choudhari (2014) [7] and Pandey *et al.* (2021).

Table 3: Distribution of respondents according to adoption of paddy (*Oryza sativa*) technology interventions

Sr. No.	Interventions	Adoption											
		Beneficiary (n=70)						Non-beneficiary (n=70)					
		Full		Partial		No		Full		Partial		No	
		f	%	f	%	f	%	f	%	f	%	f	%
1.	Use of flood tolerant and lodging resistant variety (i.e. Ratnagiri-6)	70	100	0	0.00	0	0.00	14	20.00	0	0.00	56	80.00
2.	Recommended seed rate (@40kg/ha)	64	91.43	6	8.57	0	0.00	31	44.29	0	0.00	39	55.71
3.	Seed treatment with Thiram (@ 2.5 gm/ kg of seed)	38	54.29	24	34.28	8	11.43	7	10.00	13	18.57	50	71.43
4.	Weed control by spraying pre-emergence weedicide (pendimethalin @5.5 ml/lit of water)	12	17.14	8	11.43	50	71.43	0	0.00	2	2.86	68	97.14
5.	Recommended spacing of seedlings (20cm x 15cm)	14	20.00	14	20.00	42	60.00	2	2.86	10	14.28	58	82.86
6.	Transplanting of the seedlings (@21 to 30 DAS)	68	97.14	2	2.86	0	0.00	62	88.57	8	11.43	0	0.00
7.	Recommended fertilizer dose (@100:50:50 NPK kg/ha)	11	15.71	57	81.43	2	2.86	2	2.86	11	15.71	57	81.43
8.	Timely availability of machineries through Custom Hiring Center in village	20	28.57	44	62.86	6	8.57	7	10.00	10	14.28	53	75.72
9.	Control of blue beetle (2 to 3 sprayings of quinalphose 25% a.i. @4 ml/lit of water at 15 days interval)	14	20.00	33	47.14	23	32.86	0	0.00	2	2.86	68	97.14
10.	Protect harvested crop by covering during return monsoon	44	62.86	10	14.28	16	22.86	30	42.86	16	22.86	24	34.28

Table 4: Distribution of respondents according to adoption of horse gram (*Macrotyloma uniflorum*) technology interventions

Sr. No.	Interventions	Adoption											
		Beneficiary (n=70)						Non-beneficiary (n=70)					
		Full		Partial		No		Full		Partial		No	
		f	%	f	%	f	%	f	%	f	%	f	%
1.	Use of drought tolerant and non-shattering type variety (i.e.Dapoli-1)	70	100.00	0	0.00	0	0.00	14	20.00	0	0.00	56	80.00
2.	Recommended seed rate (@20kg/ha)	49	70.00	16	22.86	5	7.14	65	92.86	0	0.00	5	7.14
3.	Seed treatment (thiram@2.5gm/kg of seed followed by <i>Rhizobium</i> culture @25 gm/kg of seed)	27	38.57	28	40.00	15	21.43	0	0.00	16	22.86	54	77.14
4.	Cultivation on conserve moisture	70	100.00	0	0.00	0	0.00	70	100.00	0	0.00	0	0.00
5.	Recommended sowing time (15 th October to 30 th November)	70	100.00	0	0.00	0	0.00	70	100.00	0	0.00	0	0.00
6.	Recommended fertilizers dose (@ 25:50:60 NPK kg/ha at sowing time)	5	7.14	25	35.71	40	57.15	0	0.00	13	18.57	57	81.43
7.	Protective irrigation management at pod formation stage	55	78.57	9	12.86	6	8.57	40	57.14	0	0.00	30	42.86

Conclusion

It was concluded that, beneficiary respondents showed a medium to high level of adoption of technology interventions pertaining to crops paddy and horse gram than those of non-beneficiary respondents. Thus, beneficiary respondents showed an increasing trend in the use of improved technologies. Also, beneficiary respondents showed significantly high adoption of technology interventions as compared to non-beneficiary respondents. Interventions wise adoption revealed that beneficiary respondents have adopted relatively more interventions than non-beneficiary respondents in Paddy and horse gram cultivation. This could be due to use of extension teaching methods i. e. result demonstrations, trainings and exposure tours, etc. under the NICRA project. The non-beneficiary respondents lacked these opportunities, and hence showed a lower level of adoption in these technologies.

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