Constraints Faced by the Rice Farmer Beneficiaries of Rastriya Krishi Vikas Yojana (RKVY) in Adoption of Recommended Angrau Technologies

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study aimed to assess the constraints faced by rice farmers under RKVY, their suggestions and a strategy was developed to overcome the constraints. The present study was conducted in 3 districts viz Srikakulam, Nellore and West Godavari of Andhra Pradesh. Ex post facto research design was used and data was collected through interview schedule from 240 farmers. Collected data is analyzed using Garett test and other suitable statistical tools. Multiple responses were considered to ascertain the constraints faced by the rice growers in adoption of recommended technologies of Acharya NG Ranga Agricultural University (ANGRAU). The constraints faced by the rice growers in adoption of recommended technologies are classified into 5 categories viz., Personnel constraints, Bio physical constraints, Socio-Economic Constraints, Marketing constraints and Organizational constraints. The major constraints perceived by the farmers among different

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categories were Labour scarcity & high wage rates during peak periods, less mass media exposure, interference of middlemen and Epidemics of pest & diseases. The suggestions given by the farmers were prioritization of agricultural activities in MGNREGA scheme, Conduct of hands on experience training programs on usage of ICT tools and social media for browsing information related to agriculture, Setting up of sufficient number of public purchase points at local level by the government, Conducting sufficient number of practical oriented season long training programs during crop period and Provision of timely updates regarding fluctuations in market prices. A suitable strategy was evolved addressing the various constraints which would be helpful for the policy makers, researchers, extension functionaries to plan and modify the extension programs so as to mitigate these constraints faced by the rice farmers and thereby to augment rice production.

1. INTRODUCTION

Agriculture is the life blood of Indian civilization. The scenario of agriculture over the years depicts that, it is an evergreen occupation for millions of people and feeding the entire nation. Even now, more than 60 per cent of the people engaged directly or indirectly in agriculture and it is the principle livelihood occupation for majority of the people. In agriculture sector, cultivation of cereal crops especially rice had a significant impact as it is the staple food for many nations across the globe. Almost one-fifth of the world's population depends on rice cultivation for their livelihoods. Rice is a primary food source for more than one-third of world's population and is grown in 26.18 per cent of the world's cultivated area. Rice is having its own importance in providing national food security and generating employment and income for the rural society. It has shaped the culture, diets and economic of millions of peoples. For more than half of the humanity "rice is life".

In India, rice is grown in 43.78 million ha, the production level is 168.5 million tones and the productivity is about 3.84 t/ha [1]. It is grown under diverse soil and climatic conditions. The productivity level of rice is low compared to the productivity levels of many countries in the world. China occupies first place with highest productivity of 6.91 tons per ha followed by Vietnam (5.54 t/ha), Indonesia (5.15 t//ha), Bangladesh (4.34 t /ha). In our state i.e. Andhra Pradesh which is referred as the "Rice bowl of India", occupying 8th position in area (2.21 million ha), 4th position in production (8.25 million tons) and 2nd position in rice productivity (3.73 t/ha) and contributes 7.08% of country's rice requirement [1]. The productivity levels of rice need to be improved in order to meet the ever increasing demands of growing population. Department of Agriculture and scientists of KVKs, DAATTC, Research stations are striving hard for increasing the yields of rice. They are suggesting need based, location specific recommendations for improvement of yields to the farmers. Even then, there are some constraints that hinder the farmers to adopt the recommended technologies. At this juncture, the present study was conducted to know the constraints faced by the farmers in adopting the recommended technologies and suggestions to overcome the constraints and finally a strategy is proposed for the scientists, Extension functionaries and policy makers in order to make the farmers for better adoption of recommended practices in rice crop.

2. MATERIALS AND METHODS

Ex-post-facto research design is used in the present investigation. This study was conducted in the year 2019-2020. Andhra Pradesh comprises of 6 agro climatic zones, out of these 3 zones i.e. North coastal zone, Godavari zone and southern zone were selected following purposive sampling method. From each agro climatic zone, one district was selected based upon maximum number activities carried out under RKVY project. Thus comprising a total of 3 districts i.e. Srikakulam, West Godavari and Nellore were selected. From each of the selected district, one Agricultural Research Station (ARS), one Krishi Vigyan Kendra (KVK), one District Agricultural Advisory and Transfer of Technology Centre (DAATTC) working under Acharya N.G Ranga Agricultural university (ANGRAU) were selected purposively which were successfully implementing RKVY program. From the total list of RKVY beneficiaries associated with ARS, KVK and DAATTC, a total of 80 beneficiaries from each district were selected using proportionate random sampling, thus making a total sample of 240 respondents for the present study. The selected beneficiaries were interviewed

individually with the help of well-structured interview schedule. Constraints faced by RKVY rice beneficiaries were classified into 5 categories i.e., personal, bio-physical, socio economic, marketing and organizational constraints. The collected details were analyzed by using Garrett's Ranking Technique.

2.1 Garrett's Ranking Technique

Garrett's ranking technique is employed for ranking the preferences of respondents on different factors. This method helps to identify the most significant variable influencing the respondent. By this method the respondents are asked to rank their preference for all the factors. The resultant outcomes of such rankings are converted to per cent position using the formula:

$$\text{Percent position} = \frac{100(\text{R}ij - 0.5)}{\text{N}j}$$

Where,

R$_{ij}$ = Rank given for the ith variable by jth respondents.
N$_j$ = Number of variable ranked by jth respondents.

After calculating percentage positions their corresponding Garrett values are taken from the Garrett's ranking table for each rank. Then, for each factor the total score and mean score has been calculated based on frequency of rank given to each factor and total number of members. Total score is calculated by multiplying the number of members ranking each factor by their respective table values. Mean score is calculated by dividing the total score by the number of members. Based on highest mean score, the ranks were given to each factor

3. RESULTS AND DISCUSSION

The findings on the personal constraints experienced by RKVY beneficiaries in adoption of recommended practices were illustrated in Table 1. The data in the Table 1 revealed that, majority of the respondents (mean score = 72.48) reported "Less mass media exposure" as their first and foremost constraint followed by "Difficulty in remembering ETLs & Chemical doses" as their second constraint (mean score = 58.98). "Difficulty in remembering pest and diseases symptoms" was the third important constraint experienced respondents having the mean score value of 51.08. "Less awareness

about government schemes", and "Inadequate decision making ability" were found to be the fourth and fifth constraints expressed by the respondents with mean score values 44.05 and 33.57, respectively. These results are in line with the findings of Hareesh [2].

The data in the Table 2 pertaining to Bio physical constraints revealed that Weed infestation with Mean score = 66.75 was the first major constraint perceived by the farmers, the second constraint was Epidemics of pest and diseases (Mean score = 62.52) and the third one was Non availability of organic matter, bio fertilizers and bio pesticides with Mean score = 55.26 followed by Rodent damage (Mean score = 49.78), Storage pest damage (Mean score = 45.75), Drought or intermittent water stress (Mean score = 39.96) and Unexpected rains during crop harvest with Mean score value 39.77. These results are in line with the findings of Sriharinarayana [3].

An overview of Table 3 indicated that majority of the respondents reported that among all the socio economic constraints, Labour scarcity & high wage rates during peak periods was the major constraint and it ranked first with mean score = 74.98, Untimely availability of irrigation water with mean score = 58.04 ranked second, Lack of credit/finance (mean score =57.31) ranked third followed by Irregular supply of electric power (mean score 55.84), Insufficient subsidy by government (mean score = 55.28), High rental charges over borrowed agricultural machinery (mean score = 49.38), Unavailability of quality seed (mean score = 47.31), High price of fertilizers and counterfeiting issues (mean score = 40.70), Lack of seed godowns for storage (mean score = 33.85) and High cost of machineries (mean score = 27.20). The results are in accordance with Kiran and sandhya shenoy [4], Nalini et al. [5] and Tengli et al. [6].

A critical look at Table 4 revealed the perceived marketing constraints of rice farmers of RKVY with mean score values in rank order of their importance as Less selling price of produce (I rank), with mean score = 71.87 , Delay in payment in the market (II rank), with mean score = 61.04, Dominance of millers in marketing the produce (III rank) with mean score = 53.46, Interference of middleman (IV rank) with mean score = 49.26, Fluctuations in the market price (V rank) with mean score = 43.15, Unaware of market price (VI rank) with mean score = 35.56, Poor transport facilities (VII rank) with mean score = 33.42. The results are in accordance

with Jayasankar and Thyagarajan [7], Mehriya et al. [8] and Affia phenica et al. [9].

The data in Table 5 depicted that Inadequate conduct of season long training programs (Mean score = 69.92) , Less number of exposure visits (Mean score =56.98) , Training timings are not convenient (Mean score = 55.36) , Location of training centers are far away from the villages (Mean score = 47.42) , Training programme is more of theory rather than practical oriented (Mean score = 40.03), Less number of field days (Mean score = 31.18) were the Organizational constraints expressed by rice farmers in order of priority. The results are in accordance with Hareesh [2].

Table 1. Personal constraints encountered by the respondents

S. No.	Personal constraints	Garrets mean score	Rank
1.	Less awareness about government schemes	44.05	IV
2.	Difficulty in remembering ETLs & Chemical doses	58.98	II
3.	Difficulty in remembering pest and diseases symptoms	51.08	III
4.	Inadequate decision making ability	33.57	V
5.	Less mass media exposure	72.48	I

Table 2. Bio physical constraints perceived by the respondents

S. No.	Bio physical constraints	Garrets mean score	Rank
1.	Drought or intermittent water stress	39.96	VI
2.	Unexpected rains during crop harvest	39.77	VII
3.	Weed infestation	66.75	I
4.	Epidemics of pest and diseases	62.52	II
5.	Non availability of organic matter, bio fertilizers and bio pesticides	55.26	III
6.	Rodent damage	49.78	IV
7.	Storage pest damage	45.75	V

Table 3. Socio-economic constraints faced by the respondents

S. No.	Socio economic constraints	Garrets mean score	Rank
1.	Unavailability of quality seed	47.31	VII
2.	High price of fertilizers and counterfeiting issues	40.70	VIII
3.	Untimely availability of irrigation water	58.04	II
4.	Irregular supply of electric power	55.84	IV
5.	Labour scarcity & high wages during peak periods	74.98	I
6.	High cost of machineries	27.20	X
7.	High rental charges over borrowed agricultural machinery	49.38	VI
8.	Insufficient subsidy by government	55.28	V
9.	Lack of credit/finance	57.31	III
10.	Lack of seed godowns for storage	33.85	IX

Table 4. Marketing constraints encountered by the respondents

S. No.	Marketing constraints	Garrets mean score	Rank
1.	Unaware of market price	35.56	VI
2.	Fluctuations in the market price	43.15	V
3.	Delay in payment in the market	49.26	IV
4.	Interference of middleman	71.87	I
5.	Dominance of millers in marketing the produce	53.46	III
6.	Less selling price of produce	61.04	II
7.	Poor transport facilities	33.42	VII

Table 5. Organizational constraints perceived by the respondents

S. No.	Organizational constraints	Garrets mean score	Rank
1.	Location of training centers are far away from the villages	47.42	IV
2.	Inadequate conduct of season long training programs	69.92	I
3.	Training timings are not convenient	55.36	III
4.	Training program is more of theory rather than practical oriented	40.03	V
5.	Less number of exposure visits	56.98	II
6.	Less number of field days	31.18	VI

The following suggestions were given by the rice farmers for better adoption of recommended practices which in turn helps in increasing their productivity levels and ultimately their standard of living can be improved.

An overview of Table 6 indicates various suggestions given by farmers. Among the suggestions given by the farmers, Prioritization of agricultural activities in MGNREGA scheme (Mahatma Gandhi National Rural Employment Guarantee Act) to avoid labour shortage (96.67%) was ranked first followed by Conduct hands on experience training programme on usage of ICT tools & mass media for browsing information related to agriculture (94.17%), Setting up of sufficient number of public purchase points at local level by the government (90.83%), Conduct sufficient number of practical oriented season long training programmes during crop period (87.08%), Provision of timely updates regarding fluctuations in market prices (84.58%) were the top five suggestions and the last five ranks were Strengthening rodent management as mass approach (58.75%) ranked 16, Generic agriculture stores should be made available at RBKs where quality inputs are sold at higher subsidized price ranked 17 (56.67%), Wide publicity on seed treatment benefits (55.00%) ranked 18, Imposing stringent disciplinary measures on dealers for adulteration of inputs (seed, fertilizers and pesticides etc) ranked 19 (52.50%). Ensure public warehousing facilities in the vicinity of farmer's villages (48.75%) ranked 20. These results corroborate with the findings of Affia Phenica et al. [9].

A vivid inference that could further be divulged from the study was that, there existed a wide gap between technologies developed and their transfer to actual farming situations. Hence, these constraints perceived by the farmers can be mitigated by following proper strategies like prioritization of agricultural works through MGNREGA, direct marketing, creation of proper storage facilities at panchayat or mandal levels,

establishment of Custom Hiring Centres at RBKs, rice varieties resistant to pests and diseases and conducting on farm testing at different sites in order to develop effective adaptive research and technology verification capability. Apart from these providing credit facilities with low interest will encourage the farmers for extensive cultivation in Andhra Pradesh.

Extension personnel and scientists should organize more number of diagnostic field visits, exposure visits to educate the farmers for easy identification of different symptoms of pests and diseases. Researchers have to develop pest and disease resistant high yielding varieties specific to area. Crop insurance scheme should be provided to all farmers and demonstrations must be organized on farm yard manures. Similar findings are observed by Praveen et al. [10]. More number of extension personnel per Mandal is required to educate the large number of farmers simultaneously to create awareness among the rice farmers about bio-fertilizers and mass media such as newspapers, T.V. and Radio and social media can be used. The responsibility of State Department of Agriculture, State Agricultural Universities and Government of India is to see that the above suggested facilities are provided to the respondents to overcome the constraints in adoption of recommended practices in rice cultivation.

4. STRATEGY TO OVERCOME THE VARIOUS CONSTRAINTS FACED BY THE RICE FARMERS

Keeping the constraints faced by the rice farmers in view, a suitable strategy was developed to alleviate the constraints faced by the Rice farmers of RKVY. The strategy encompasses the integrated role of scientists, extension functionaries and policy makers. The effective performance of specified roles will definitely mitigate the various constraints faced by the rice farmers.

Table 6. Suggestions given by the rice farmers to overcome the production constraints

S. No.	Suggestions	Respondents		
		Frequency	Percentage	Rank
1.	Provision of good quality of seeds at subsidized rates	164	68.33	XI
2.	Wide publicity on seed treatment benefits	132	55.00	XVIII
3.	Development of pest and disease resistant varieties having higher yield potential	161	67.08	XII
4.	Cluster demonstrations on importance of green manure crops and FYM	152	63.33	XIV
5.	Production of bio-fertilizers and bio-control agents on large scale and making them available in local markets	169	70.42	X
6.	Conduct hands on experience training programme on usage of ICT tools and mass media for browsing information related to agriculture	226	94.17	II
7.	Strengthening rodent management as mass approach	141	58.75	XVI
8.	simple procedure to remember ETLs, pest & disease symptoms and recommended chemical doses for their management	198	82.50	VI
9.	Prioritization of agricultural activities in MGNREGA scheme (Mahatma Gandhi National Rural Employment Guarantee Act) to avoid labour shortage	232	96.67	I
10.	Timely provision of credit facility at low interest rates by government institutions	179	74.58	VIII
11.	Generic agriculture stores should be made available at RBKs where quality inputs are sold at higher subsidized price	136	56.67	XVII
12.	Farmer friendly insurance schemes from the government at the time of adverse climatic conditions.	158	65.83	XIII
13.	Bringing awareness to the head and middle reach farmers about judicious use of irrigation water.	186	77.50	VII
14.	Establishment of custom hiring centers at Rythu Bharosa Kendras (RBKs)	146	60.83	XV
15.	Provision of timely updates regarding fluctuations in market prices	203	84.58	V
16.	Conduct of sufficient number of practical oriented season long training programmes during crop period	209	87.08	IV
17.	Setting up of sufficient number of public purchase points at local level by the government.	218	90.83	III
18.	Ensure public warehousing facilities in the vicinity of farmers villages	117	48.75	XX
19.	Organize ample field visits and field days on successful technologies	174	72.50	IX
20.	Imposing stringent disciplinary measures on dealers for adulteration in inputs (seed, fertilizers and pesticides etc)	126	52.50	XIX

4.1 Revitalized Strategy for Scientists

- Rice varieties with shorter duration, higher yielding, resistant to lodging, pests and disease should be developed.

- Varieties with less water consumption, tolerant to drought, saline conditions and weeds suppressing characters need to be developed.

- Smart, Multipurpose and small farm machinery should be designed in such a way that, they should carry out the entire farm operations like transplanting, weeding, harvesting etc. at affordable price so that small and marginal farmers can utilize.
- In order to mitigate labour problem, extensive research should be conducted on drone technology for effective application of fertilizers and pesticides
- Ample research must be conducted in the field of Nanotechnology for cost reduction cultivation viz., Nanofertilizers, Nanopesticides and Nanosensors for diagnosing pest and diseases.
- Vast research need to be carried out for the management of rodents and stored grain pest.

4.2 Revitalized Strategy for Extension Functionaries

- Utmost care should be taken for suppling good quality seed to the farmers. Stringent disciplinary measures should be taken by the government against the default distributors who are involved in adulteration of seed.
- Motivate and do habituate the farmers in adopting soil test based fertilizer application.
- The input dealers involved in black marketing, stocking of fertilizers and selling at higher prices during peak requirement should be blacklisted, deny the license and punishment should be imposed on them.
- The power of information communication technology (ICT) has to be harnessed for the benefit of rice farming community by establishing kiosks at all the Rythu bharosa kendras (RBKs) to quench the thirst of the information needs of the rice farmers
- Popularize the agricultural schemes, varieties and new technologies by displaying the hoardings at public places, Rythu bharosa kendras (RBKs), KVKs and at research stations
- Document the success stories of farmers on innovative technologies and showcasing the technologies to the farmers for motivation and adoption.
- Distress sale should be avoided by making the farmers aware of the demand to their produce and market rates at different markets.

- The market intelligence of the farmers has to be enriched with information on price fluctuations, supply-demand status and marketing opportunities.
- Conducting capacity building programmes to strengthen and update the knowledge of not only middle, gross root level extension workers but also input dealers
- Conducting training programmes to the farmers on recommended usage of fertilizers, chemicals, farm machinery and post-harvest management practices.
- Farmers should be trained on value addition like processing of rice bran oil, ready to eat products, vitamin, iron or calcium enriched rice flakes or puffed rice, flavoured rice and also on cultivation of scented rice, golden rice etc.
- Innovative, decentralized institutional arrangements need to be promoted to make the extension system farmer responsive and farmer accountable.
- Ensure greater farmer participation in determining research and extension agendas, strengthen research extension linkages and allow greater location specificity in both technology generation and dissemination.

4.3 Revitalized Strategy for Policy Makers

- Incorporation of agricultural works in MGNREGA scheme
- Procurement of quality seed only after rigorous quality checks and grading by national seed corporation officials.
- Establishment of custom hiring centres (CHCs) at all the Ryhtu barosa kendras (RBKs) and necessary steps should be taken in arranging all the machinery at CHCs especially rotovators, combine harvestors and paddy reapers
- Establishment of canal regulatory authority
- Strengthening of water users association (WUA)
- Provision of loans at low interest rates to small, marginal and tenant farmers and loan procedures should be made simple
- Establishment of warehouses, storage godowns and other processing facilities
- Minimum Support Price (MSP) should be fixed considering various parameters that determines the cost of cultivation like inputs, labour wages, transportation facilities and natural calamities. More over necessary steps must be taken in a way that every farmer should get the same

MSP amount as decided by government without any deviations.

- Government should give wide publicity about the benefits of farmer interest groups and farmer producer organizations and encourage them to form groups so that the involvement of middlemen can be curtailed during marketing their produce.
- Crop loans as initial investment for farming operations prior to the onset of monsoons should be sanctioned to farmers in order to protect them out from the vicious cycle of indebtedness
- In the areas where the fields are below sea level free electricity should be provided to farmers for at least four hours a day to pump out the water through motors.
- Dominance of millers in the market should be minimized through the recently introduced formulas and government ordinances in favour of farmers.
- The Ryhtu barosa kendras (RBKs) should develop a procurement, processing and marketing mechanism to reduce the influence of millers in rice market.
- Food Corporation of India should take measures to purchase rice to the maximum possible extent from farmers. Public-private partnerships to be promoted to set up the processing units by the Government.
- Launching crop insurance schemes like PMFBY.
- Facilitate direct marketing, post-harvest technology and value addition.
- Encourage private investment in production, quality, grading, storage, processing and market led infrastructure to accelerate integration of small holder farmers into value chain.
- Farmers should be encouraged to diversify their farming and farm activities to reduce the risk they may incur instead of spending everything on one single risky crop.
- The rice mills should be made farmer friendly by making new ordinance by the state government. The functioning of rice mills should be transparent. Farmers should be made aware of export procedures and policies.

5. CONCLUSION

The constraints faced by the rice growers in adoption of recommended technologies were classified into 5 categories viz., Personnel constraints, Bio physical constraints, Socio-Economic Constraints, Marketing constraints and Organizational constraints. The major constraints perceived by the farmers among different categories were Labour scarcity & high wage rates during peak periods, less mass media exposure, interference of middlemen and Epidemics of pest & diseases. The suggestions given by the farmers were prioritization of agricultural activities in MGNREGA scheme, Conduct of hands on experience training programs on usage of ICT tools and social media for browsing information related to agriculture, Setting up of sufficient number of public purchase points at local level by the government, Conducting sufficient number of practical oriented season long training programs during crop period and Provision of timely updates regarding fluctuations in market prices. The thorough analysis of the various constraints faced by the rice farmers pave way to develop a suitable strategy which would aptly be suitable to the conditions of the rice farmers. The strategy developed would also be helpful for the policy makers, researchers, extension functionaries to plan and modify the extension programmes so as to mitigate the constraints faced by the rice farmers and thereby to augment rice production

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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