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# Constraints Faced by Rice Growers in Cauvery Delta Zone of Tamil Nadu in Cultivation of TNAU Modern Rice Varieties

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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

The present study was carried out to analyse the constraints faced by rice growers in Cauvery Delta Zone (CDZ) of Tamil Nadu in use of Tamil Nadu Agricultural University (TNAU) modern rice varieties and to elicit suggestions for improving the adoption of TNAU modern rice varieties. Ex-Post Facto Research Design was followed in this study since it aimed to know the constraints faced

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by the rice growers. The study was conducted during May and June 2022. The selected districts for the study were Thanjavur, Tiruvarur, Nagapattinam and Mayiladuthurai based on maximum area under rice cultivation. From each of the four districts, two blocks were selected and from the selected blocks, two villages from each block were selected for the study based on maximum area under rice cultivation. Based on proportionate random sampling technique, 160 respondents were selected for the study. The responses of the respondents were subjected to frequency and percentage analysis. More than three fourth of the respondents expressed lodging (83.10%) followed by disease infestation (81.90%) and pest infestation (80.60%) as the major constraints. Lack of awareness and knowledge in adopting TNAU modern rice varieties was expressed by around one-third (36.30%) of the respondents. Availability of non-lodging varieties (91.90%), flood tolerant varieties (91.30%), availability of disease-resistant varieties (90.00%), pest-resistant varieties (89.40%) and increasing promotional efforts (85.00%) were the major suggestions given by the rice growers for increasing the use TNAU modern rice varieties.

**Keywords:** *Rice cultivation; varieties; adoption; preference; problems; suggestions.*

## 1. INTRODUCTION

Rice is the predominant food source for majority of the human population across the world. In 2021-22, rice production at global level was estimated to be 513.00 million tonnes (mt). China and India top the ranking in rice production among all the countries in the world, as they contribute more than half of the world's rice production (Rice Outlook, April 2022).

Releasing the third advance estimates of agriculture crops, the Government of India has said that the overall food grain production will be 314.51 mt during 2021-22 crop year (July-June). It has been estimated that rice production will be 129.66 mt., which is higher than last year's output of 124.37 mt (Business Line, May 19, 2022). This was achieved through the rigorous efforts of different disciplines of crop sciences, policies undertaken by the government and the enormous efforts of the lakhs of rice farmers in the country.

In India, rice breeding has contributed in several ways to ensure food security. In the year 1946 the Central Rice Research Institute (CRRI) at Cuttack was established, which is presently called as the National Rice Research Institute (NRRI), with which a well-organized rice breeding programme started in India. During the early 1960s, there were severe drought and outbreak of pests and diseases in the country. Despite these challenges, the country achieved remarkable development in Rice production.

The discovery of the semi-dwarfing gene (sd-1) from the Chinese variety Dee Gee Woo Gen, and the release of IR 8, which is famously known as 'Wonder Rice' played a major role in increasing

rice production [1]. Success of rice breeding in the country is a result of the combined efforts of Rice Breeders working in different parts of the country in various research institutes belonging to the Indian Council of Agricultural Research (ICAR), Central Agricultural Universities (CAUs), State Agricultural Universities (SAUs), and Private sector Seed Companies.

Of the six Agricultural Colleges set up in the country during 1906, one Agricultural College was established at Coimbatore, which later became the Tamil Nadu Agricultural University (TNAU). The Department of Rice at TNAU also known as 'Paddy Breeding Station (PBS)' came into existence in the year 1912, in which one Government Economic Botanist (GEB) was appointed to initiate rice research. One of the notable rice varieties released from the PBS was 'GEB 24'.

Till 2021, TNAU has released 865 crop varieties, out of which 190 varieties are Rice. Based on discussions with Plant Breeders, Agronomists and Extension Workers, it was found out that farmers at CDZ were extensively cultivating modern rice varieties released by TNAU over a long period of time. It is also reported that besides TNAU rice varieties, farmers were also growing varieties belonging to other states and private firms.

Cultivating modern rice varieties is important to meet the increasing demand for food and availability of quality seeds and region specific rice varieties will improve the adoption decisions of rice growers [2]. Unavailability of high yielding varieties, occurrence of weeds, pests and diseases were the major constraints in adoption of rice varieties [3]. Unavailability of farm

machinery and agricultural credit were also major constraints faced by farmers [4]. Lack of technical knowledge and lack of inputs were the major limitations in adoption of High Yielding Varieties [5]. Shortage of labour, less availability of fertilizers, poor irrigation facility and lower market price for the produce were the constraints in rice cultivation [6]. The technical constraints faced by rice growers were poor skill in seed treatment, lack of technical advice for seed storage, irregular visits by extension workers, lack of knowledge and poor quality of seeds [7]. Lack of quality seeds and knowledge on cropping pattern and system, unavailability of improved implements and critical inputs, low price of product were the severe problems faced by the farmers [8]. Diseases, pests, high cost and inaccessibility to fertilizers, lack of improved varieties and poor soil fertility were the major production constraints for rice growers [9].

Rice growers having access to surface irrigation likely to adopt new varieties than with no access to irrigation and their preference for rice characteristics were more towards characteristics which reduces production rather than yield [10]. Considering farmers preferences in developing new rice varieties would increase the adoption of the varieties [11]. Developing high yielding varieties which perform well in unpredictable environment with preferred characteristics of farmers will increase the adoption of those varieties [9].

The farmers in the CDZ are widely cultivating TNAU modern rice varieties. The constraints in adoption of those varieties released by TNAU were not known. Hence the study has been carried out to know the constraints of rice growers in using TNAU modern rice varieties for providing recommendations and to develop farmers preferred rice varieties. The results will be helpful for increasing the adoption rate of TNAU modern rice varieties.

## 2. METHODOLOGY

The Cauvery Delta Zone (CDZ) consists of eight districts viz., Thanjavur, Tiruvarur, Nagapattinam, Mayiladuthurai, Trichy, Perambalur, Pudukkottai (Part), and Cuddalore (Part). Rice is the major crop in this region. Based on the highest area under rice cultivation Thanjavur, Tiruvarur, Nagapattinam and Mayiladuthurai districts were selected for the study. Ex-Post Facto Research Design was followed in this study since it aimed to know the constraints faced by the rice growers. The number of blocks in Thanjavur,

Tiruvarur, Nagapattinam, and Mayiladuthurai districts are fourteen, ten, six, and five respectively. From each of the four districts, two blocks were selected for the study based on maximum area under rice cultivation. The selected blocks were Orathanadu and Ammapettai from Thanjavur, Needamangalam and Mannargudi from Tiruvarur, Tirumarugal and Kilvelur from Nagapattinam, Mayiladuthurai and Sembanarkoil from Mayiladuthurai.

Among the selected blocks, two villages from each block were selected for the study based on maximum area under rice cultivation. The selected villages were Kattukurichi and Thennamanadu from Orathanadu block, Milattur and Vadapathy from Ammapettai block, Royapuram and Kovilvenni from Needamangalam block, Moovanallur and Painganadu from Mannargudi block, Vadagarai and Okkur from Kilvelur block, Thirukannapuram and Iravanchery from Tirumarugal block, Anantha Thandavapuram and Dharmadanapuram from Mayiladuthurai block, Memathur and Semangalam from Sembanarkoil block. Based on proportionate random sampling technique, 160 respondents were selected for the study. Respondents were asked to express the constraints in using TNAU modern rice varieties and the responses were grouped and percentage analysis was carried out to analyse the constraints. Similarly, suggestions from the respondents were also recorded and analysed using percentage analysis.

## 3. RESULTS AND DISCUSSION

### 3.1 Constraints Faced by Rice Growers in CDZ in Adoption of TNAU Modern Rice Varieties

The constraints reported by the respondents in adoption of TNAU modern rice varieties are given in Table 1. It is observed that more than three-fourth (83.10%) of the respondents expressed lodging as their primary constraint in adoption of TNAU modern rice varieties, followed by disease infestation which was mentioned by 81.90 per cent of the respondents.

Lodging was their major constraint because during Samba and Thaladi seasons the rice crop might be affected by heavy rainfall in the region. As observed, the soil and land type of the respondents were mostly clay and lowland respectively, drainage was a problem if heavy rainfall occurred. So, if the crop lodges the grains

would shed and then the yield would be affected and also it would be difficult for mechanical harvesting too. Diseases like sheath rot, rice tungro, sheath blight and false smut were occurring frequently in the region which affect the yield and increase the input cost for spraying chemicals.

However, 16.90 per cent of the respondents expressed lodging was not a constraint for them because their land was upland. So if heavy rainfall occurred, the water would easily drained off. Disease infestation was not a constraint for 18.10 per cent of the respondents because they used to spray fungicides and bactericides even if there were no symptoms in the field.

Pest infestation was a major constraint conveyed by 80.60 per cent of the respondents and less than two-fifth (36.30%) of the respondents expressed lack of awareness and knowledge on TNAU modern rice varieties was a constraint in adopting TNAU modern rice varieties. Pests like stem borer, leaf folder, rice earhead bug, brown plant leaf hopper and gall midge were mentioned by the respondents as major pests. Lack of awareness and knowledge of the respondents may be as a result of inadequate extension programmes and inadequate visits by the extension workers.

However, 19.40 per cent of the respondents mentioned pest infestation was not a constraint because they used to spray pesticides even before the pest attack. Minimum two sprays were done at thirty days after transplanting and also after sixty days. If any symptoms occurred after two sprays, they were ready to go for third and fourth spray. Around two-third (63.70%) of the respondents conveyed lack of awareness and knowledge was not a constraint due to having frequent contact with other farmers, input

dealers, extension workers and also having exposure to mass media and social media.

Of the total respondents, 28.70 per cent mentioned lack of availability of seeds was a constraint. Lack of availability of seeds at the time of crop season from the State Department of Agriculture led the farmers to go for other varieties.

However, 71.30 per cent of the respondents expressed lack of availability of seeds was not a constraint because they purchased seeds from input dealers in advance before the starting of the season. Even if the seeds were not available with the local input dealers, they used to move to other places to get seeds from other input dealers.

Other constraints like lack of availability of seeds of preferred varieties, germination and vigour problems, poor quality seeds, lack of knowledge on package of practices, inadequate communication between farmers and extension functionaries, delay in diffusion of new varieties among farmers, lack of updates in marketing grade of rice varieties were also quoted by farmers.

Even if the preferred varieties were available, there was a limitation to distribute seeds of up to only twenty kg of seeds per farmer through seed village programme. Due to this, farmers having large acres of land could not get enough seeds of the preferred variety for cultivation.

Lack of clarity and updates in determining the marketing grades of rice varieties caused confusion in cultivating particular varieties by not knowing whether it comes under fine grain or bold grain.

**Table 1. Constraints in adopting TNAU Modern Rice Varieties in CDZ n=160**

S. No.	Constraints	Response			
		Yes		No	
		F	%	F	%
1.	Lodging	133	83.10	27	16.90
2.	Disease infestation	131	81.90	29	18.10
3.	Pest infestation	129	80.60	31	19.40
4.	Lack of awareness/knowledge	58	36.30	102	63.70
5.	Lack of availability of seeds	46	28.70	114	71.30
6.	Others	94	58.80	66	41.30

**Table 2. Suggestions for promoting TNAU modern rice varieties in CDZ n=160**

S. No.	Suggestions	Response	
		F	%
1.	Availability of non-lodging varieties	147	91.90
2.	Availability of flood tolerant varieties	146	91.30
3.	Availability of disease resistant varieties	144	90.00
4.	Availability of pest resistant varieties	143	89.40
5.	Increasing promotional efforts (publicity)	136	85.00
6.	Availability of drought tolerant varieties	133	83.10
7.	Increasing yield potential	127	79.40
8.	Availability of varieties preferred by farmers though de-notified by government	95	59.40
9.	Promoting seed villages	76	47.50
10.	Improving availability of seeds	69	43.10
11.	Timely access to seeds	53	33.10
12.	Others	29	18.10

### 3.2 Suggestions for Promoting TNAU Modern rice Varieties in CDZ

The suggestions given by the respondents for promoting TNAU modern rice varieties in CDZ is presented in the Table 2.

The data presented in Table 2. shows that majority of the respondents (91.90%) suggested availability of non-lodging varieties will increase the adoption level of TNAU modern rice varieties, followed by availability of flood tolerant varieties (91.30%), availability of disease resistant varieties (90.00%), pest resistant varieties (89.40%), increasing promotional efforts (85.00%), availability of drought tolerant varieties (83.10%) and increasing the yield potential (79.40%), availability of varieties preferred by farmers though de-notified by the government (59.40%), promoting seed villages (47.50%), improving the availability of seeds (43.10%) and timely access to seeds (33.10%).

Availability of non-lodging and flood-tolerant rice varieties will help farmers during heavy rainfall especially in Samba and Thaladi seasons. As rice growers in the research area used to spray fungicides, bactericides and pesticides even before the symptoms occur, the availability of disease resistant and pest resistant varieties will help them to reduce the input cost used for spraying those chemicals.

Increasing the promotional effort by extension workers by conducting regular meetings, Farmers Field School, trainings and awareness campaigns at starting of each crop season with proper intimation on date and time of meetings

and training programmes in advance was also suggested by the respondents.

Availability of drought tolerant varieties was suggested by the respondents because during summer less availability of water and electricity problem were faced by them. Varieties with high yielding potential was suggested so as to increase net income of the farmers.

Increasing the supply of seeds of varieties though de-notified by the government will be helpful for them because the respondents prefer those varieties. Increasing the quantity of seeds to more than twenty kg per farmer through seed villages before starting of the season will also increase the adoption level. Improving the availability of seeds and timely access to seeds for new and old varieties is in need because the varieties preferred by farmers were not available at the time with the State Department of Agriculture.

Other suggestions such as availability of saline tolerant varieties, availability of preferred varieties, availability of quality seeds, quality check-up at seed production by the government, updating the marketing grades of varieties before the starting of the season, exclusive TV channel for agriculture with region-specific programmes, and increasing the distribution of agricultural magazines from the government to at least one per village and maintaining it in a village library and constant support from the government in marketing the produce by procuring it immediately after harvest were also elicited by the respondents to increase the adoption level of TNAU modern rice varieties.

## 4. CONCLUSION

The major constraints in growing TNAU modern rice varieties at CDZ were lodging, disease and pest infestation. This could be solved by developing new rice varieties with non-lodging, flood tolerant, disease and pest resistant characteristics. Plant Breeders need to take note of this and accordingly design their rice breeding programmes. More extension programmes and regular visits of extension workers to their respective villages will help the rice growers in increasing their knowledge and awareness on TNAU modern rice varieties. More promotional activities of extension workers by conducting regular trainings, Farmers Field School, awareness campaign etc., will also help the rice growers in increasing adoption of TNAU modern rice varieties.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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