



Impact of Non-lodging Climate Resilient Rice Variety TPS 5

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ABSTRACT

Climate-resilient crops and varieties have been recommended as a way for farmers to cope with or adapt to climate change, but despite the apparent benefits, rate of adoption by smallholder farmers are highly variable. Kanyakumari being rice belt of the erstwhile Travancore State has certain indigenous varieties suitable for the high rainfall zone. The cultivation of indigenous red rice varieties like samba was the priority of the district. These tall and lodging varieties with low yield and lesser response to the inputs, was slowly replaced with high yielding new varieties ASD 16, TPS3 and TPS 5. These white bold variety with good cooking quality and high yielding ability has become the ruling variety replacing traditional samba in the district. A study on the spread effect of the climate resilient rice variety was taken up with specificity on finding the varietal acceptance and replacement pattern since the release of a new variety. The study focused on TPS 5 with respect to varietal acceptance and area expansion due to its stress tolerance in water logged conditions. This variety has replaced 69.55% of the total area cultivated. The major factor behind the sudden expansion of area was due to its non-lodging character and performance in SRI method which yielded on and average of 6 t/ ha and 5.4 t/ha in natural farming situations in the district. The crop survived the submerged condition with lesser damage in yield.

Key Words: Climate resilient, variety, rice, non-lodging, varietal replacement, horizontal spread

INTRODUCTION

Agriculture and food production are highly vulnerable to climate change. Extreme weather events such as droughts, heat waves and flooding have far-reaching implications for food security and poverty reduction, especially in rural communities with high populations of small-scale producers and leased farmers who are highly dependent on agriculture for their livelihoods and food. Climate resilient crops and crop varieties have enhanced tolerance to biotic and abiotic stresses. Soman *et al* (2016) concluded that cassava is potentially highly resilient to future climatic changes and it can become a future crop in India, where other crops would fail due to climate change. Bedeke (2023) stated that adverse climate change effects may result in a greater incidence of crop pests, loss of soil moisture content, rapid soil nutrient depletion and substantial decreases in crop productivity and

yields. These effects in combination with lack of access to improved, high-yielding crop varieties, limited agricultural extension services and poor access to irrigation infrastructure could further threaten access to food, limit export earnings and markedly lower net crop revenue.

Kanyakumari district is predominantly a rice growing district that lies in the high rainfall zone of Tamil Nadu. It frequently faces the risk of submergence and water logging conditions during monsoons that make the rice ecosystem under risks of yield loss due to flood and post harvest losses. The Rice research station at Thirupathisaram under Tamil Nadu Agricultural University has released five varieties to handle the adverse conditions in rice cultivation. Coincidence of heavy rainfall with harvesting of rice in the first season named *kanipoo*, is a regular phenomenon in the district resulting in lodging and loss due to shattering of matured

grains. Kanyakumari being rice belt of the erstwhile Travancore State, it has certain indigenous varieties suitable for the high rainfall zone. The cultivation of indigenous Red rice varieties like samba was the priority of the district. These tall and lodging varieties with low yield and lesser response to the inputs, was slowly replaced with high yielding new varieties ASD 16, TPS3 and TPS 5. Replacement of older rice variety by the newer varieties can trigger the superiority of newer varieties for major traits was stated by Saravanan *et al* (2020). A study was taken up on medium duration rice variety TPS 5 for analyzing its performance with respect to varietal acceptance and area expansion and yield.

Achieving higher productivity from under fertilized high potential areas of Kanyakumari district is an immediate need due to diminishing area under rice, through quality seed the yield improvement of 20–25% could easily be obtained was stated by Singh *et al* (2021). He added that in rainfed areas and other low input marginal environments, marginal and small farmers operate in complex, diverse and risk-prone (CDR) environments with minimum or no external inputs. To contain the water stagnation problem during rain, varieties having suitable features, is needed. Factors of yield loss and lower production were shown responsible for shifting from traditional red rice varieties to improved varieties with better yield and sturdiness.

TPS 5 is a medium duration variety. It is a derivative of the cross between ASD16 and ADT37 with the duration of 118 days. Rice TPS 5, a non-lodging short bold grain variety, is the cross between two popular and versatile varieties, ASD 16 and ADT 37 with desirable characteristics of high yield and non-lodging. Productivity per hectare surveyed and has recorded higher yield compared to ASD 16 by 30%. Rice TPS 5 recorded a mean grain yield of 6130 Kg/ha and was found to be resistant to BPH and moderately resistant to yellow stem borer. It was also found to be moderately resistant the blast, sheath rot, sheath blast. It replaced ASD 16 by 38%

since its inception from 2015. Area of expansion since 2015 was three fold (377%). This variety, a panicle-number type, tends to increase yields more easily than the old varieties when planted densely in the appropriate season with judicious fertilizer management under conditions of no drought and no inundation.

MATERIALS AND METHODS

The study was conducted in Kanyakumari district of Tamil Nadu. TPS 5 was a variety released to solve the location specific problem of lodging due to rains during harvesting. Data since the release of the variety were collected for its area expansion and preference parameters. The study was conducted in Thovalai and Agastheeswaram block which have a higher area under TPS 5 variety. A total of 60 farmers were contacted for the study. Data on area expansion were collected from the Department of Agriculture for eight years and the replacement pattern over a period was assessed. Primary data on the interventions carried out by KVK Kanyakumari since the introduction of the variety was collected. Percentage analysis and Pearson R correlation were used.

RESULTS AND DISCUSSION

Consumption pattern of the district is unique with more preference towards bold type rice varieties. TPS 5 has qualities that match with the requirements of the farmers in the district. A study conducted by Soundararaj *et al* (2015) stated that TPS 5 produces short bold white rice with intermediate amylose, soft gel consistency and moderate gelatinization temperature. It produces good quality cooked rice. The reasons behind the preference towards this variety is ranked below.

The quoted reasons for wide acceptance was due to its important feature of non-lodging(95%) and coping up with abiotic stress due to climate change (93.33%). Good cooking quality and taste (93.33%) was another important feature for acceptance. Market demand and remunerative price was another major reason for adoption of

Table 1. Varietal Acceptance of non-lodging rice variety TPS 5

N=60

Sr. No.	Particular	Percentage	Rank
1	With stand lodging during monsoons	95.00	I
2	Variety cope up with abiotic stress during harvesting	93.33	II
3	Good cooking quality and taste	91.67	III
4	Market demand and remunerative price	85.00	IV
5	Bold type	78.33	V
6	Higher productivity	76.67	VI
7	Assured high yield	73.33	VII
8	Tolerant to pest and diseases	71.67	VIII
9	Better income than traditional varieties	68.33	IX
10	Availability of quality seed	41.67	X

this variety (85%). More than half of the people go for this variety due to high productivity and assured yield. Better tolerance to pests and diseases was quoted by 71.67% and better income than in traditional varieties was opined by 68.33 per cent. Quality seed available was the reason for adoption to 41.67% of the rice growing farmers. The reason behind is that KVK provides quality seed material to farmers and government seed farm for the benefit of local farmers.

Area expansion

Due to the preferred qualities of this variety, it had already spread widely within and outside the district. After the introduction in 2014 the area under TPS 5 was in the increasing trend. The continuous effort of KVK in promoting this climate resilient variety for the flood borne tract has created its impact in the horizontal spread of the variety

throughout Tamil Nadu. The area expansion in the district is given below

Percentage replacement with TPS 5 to total area during *kanippoo* season (I season)

Rice is grown during two seasons in the district. TPS 5 is grown during the first season. Due to continuous efforts of KVK Kanyakumari, the variety slowly replaced the existing varieties which is depicted in fig 2.

Replacement of conventional practices with TPS 5 during first season showed a gradual replacement of the existing varieties. During its release the area cultivated was 2.5% of the total area under rice in 2014-15 and has replaced 69.55% of total area during 2022-23. During 2022-23 the seed procured from other districts from Agricultural Research station, Thirupathisaram from where it was released was 1500 kg which can be used for 75ha. Also an

Table 2. Area expansion of TPS 5 since its introduction to farmer's field.

(Area in hectares)

Rice Variety	2022-23	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	Year of introduction
ASD 16	3128	4100	4000	3980	4700	3217	6339	6407	6236	1986
TPS 5	2170	1570	1477	1230	1262	420	65	65	329	2014

Source: Department of Agriculture

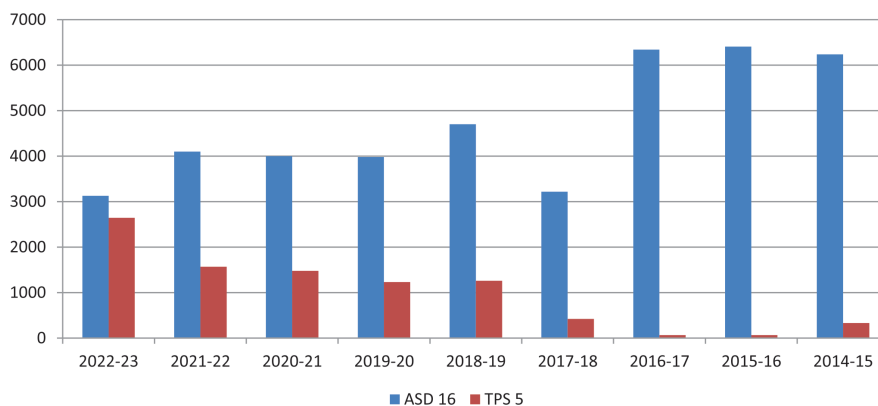


Fig. 1. Comparison of area under TPS 5 and ASD 16

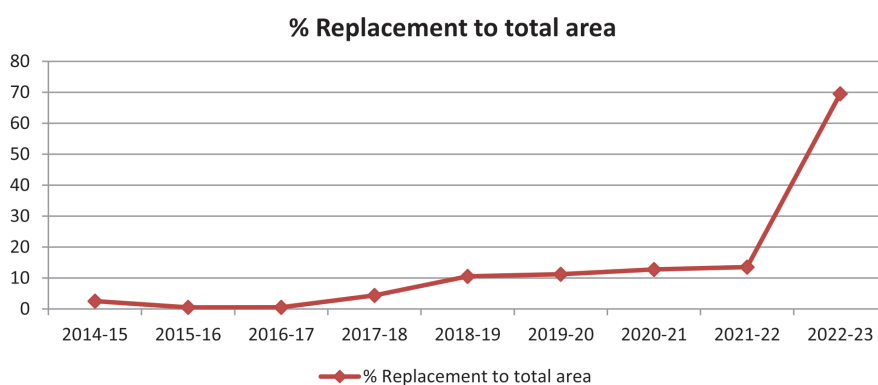


Fig. 2.

area of 145 ha was cultivated under TNIAMP project in Nambiyar basin area of Tirunelveli district which recorded an average yield of above 6 t/ ha. The area under TPS 5 with the sale of seed through other sources from the district was estimated to be able to cultivate 5677 ha during the first season. The major factor behind the sudden expansion of area was due to the flood that occurred during 2021. The crop survived the submerged condition with lesser damages in yield. This created a huge market demand for the variety in nearby and other districts like Vellore, Tanjore and Nagapattinam districts.

The major factor behind the sudden expansion of area was due to its non lodging character during flood that occurred during 2021 and due to its performance in SRI method which yielded on and average of 6 t/ ha and 5.4t/ ha in natural farming situations in the district. The crop survived the submerged condition with lesser damage in yield.

CONCLUSION

This study shows a gradual rise in area under TPS 5 which indicated wider acceptance by farmers. Moreover the supply chain has been extended to other districts in Tamil Nadu due to increase in market demand caused by discrepancies in climate. The efforts taken by KVK Kanyakumari has impacted the farmers of the district through its interventions in promoting this variety among farmers.

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Impact of Non-lodging Climate Resilient Rice Variety TPS 5

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