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RESEARCH ARTICLE

Yield Gap and Constraints Limiting Rice Productivity in Cauvery Delta Zone of Tamil Nadu

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ABSTRACT

India has recorded an average rice productivity of 2.4. t/ha and Tamil Nadu has an yield level of over 3.0 t/ha exceeding national level. Keeping in view of the production and productivity of rice at the national and state levels, and an in depth analysis of production and yield gap at Cauvery delta zone were studied. The productivity ranged from 3630 Kg/ha in Nagappattinam district to 5019 Kg/ha in Ariyalur district with the mean productivity of 4420 Kg/ha in the Cauvery Delta Zone. The mean yield gap in Cauvery delta Zone was 26.33%.The constraints to rice productivity included shrinking labour availability (99.16%), late planting due to delayed water supply from canals (93.75%), water scarcity (91.67%), salinity/alkalinity, and incidence of pests and diseases (76.67%).

Key Words: Yield Gap, Constraints, Rice, Cauvery Delta Zone.

INTRODUCTION

India has an area of about 44 million ha of rice cultivation producing 105 million tonnes of rice and the average yield level is 2.40 t/ha. Punjab and Tamil Nadu are considered as high productivity states registering yield levels exceeding 3 t/ha. Tamil Nadu has an area of 1.8 million ha of rice cultivation with the production of 7.9 million tonnes and the average yield level is 3.9 t/ha. More than 85.00 per cent of the districts of Tamil nadu have a yield level of >2.5 t/ha .However, the Yield gap is around 2.1 t/ha.

MATERIALS AND METHODS

Among the seven Agro-climatological Zones of Tamil Nadu, the Cauvery Delta Zone was purposively selected for the study. The Cauvery Delta Zone comprises of Thanjavur, Nagappattinam, Thiruvarur, Tiruchirappalli (Musiri, Tiruchirappalli, Lalgudi, Thuraiyur and Kulithalai taluks), Perambalur, Ariyalur, Pudukkottai (Aranthangi taluk) and Cuddalore (Chidambram and Kattumannar koil taluks) districts. Yield gap referred to the gap between potential yield demonstrated in the Study area and the actual yield recorded by the farmers; the gap is expressed as percentage (Swathilaxmi *et al*, 2006).

$$\text{Yield Gap (\%)} = \frac{Yd - Ya}{Yd} \times 100$$

Potential Yield recorded by Front Line Demonstrations in the study area and the actual yield realized by farmers were collected from secondary data. The Potential yield recorded from Front Line Demonstrations was 6000 Kg/ha (Siddiq, 2000) and it was used for computing the Yield Gap. A sample of 240 farmers was randomly taken from Thanjavur, Nagappattinam, Thiruvarur, Thiruchirappalli, Ariyalur, Pudukkottai, Perambalur and Cuddalore districts (thirty each from the districts) for identifying the constraints.

RESULTS AND DISCUSSION

Rice Yield Level in India

Data relating to area, production and productivity of rice in India during 2001-2015 are presented in Table 1.Area ranged from 41.18 million ha to 45.54 million ha during 2001-2015. The production ranged from 71.82 million tonnes to 105.48 million tonnes. The productivity ranged from 1901 Kg/ha to 2461 Kg/ha and the mean productivity was 2183 kg/ha.

Rice Yield Level in Tamil Nadu

Data relating to area, production and productivity of rice in Tamil Nadu during 2001-2015 are presented in Table 2. Area ranged from 1.39 million ha to 2.06 million ha during 2001-2015. The production ranged from 3.22 million tonnes to 7.94 million tonnes. The productivity ranged from 2308 Kg/ha to 3918 Kg/ha with the mean productivity of 2960 Kg/ha. The productivity of rice cultivation in Tamil Nadu was higher than the national productivity.

Rice Yield Level in Cauvery Delta Zone

Data relating to area, production and productivity of rice in Cauvery Delta Zone during 2014-2015 are presented in Table 3. Area ranged from 8,994 ha in Perambalur district to 1,92,615 ha in Tiruvarur district during 2014-2015. The production ranged from 43,431 tonnes in Perambalur district to 8,52,925 tonnes in Tiruvarur district. The productivity ranged from 3630 Kg/ha in Nagappattinam district to 5019 Kg/ha in Ariyalur district with the mean productivity of 4420 Kg/ha in Cauvery Delta Zone.

Rice Productivity and Yield Gap in Cauvery Delta Zone

Data relating to productivity of rice and yield gap in Cauvery Delta Zone during 2014-2015 are presented in Table 4.

The productivity ranged from 3630 Kg/ha in Nagappattinam district to 5019 Kg/ha in Ariyalur district with the mean productivity of 4420 Kg/ha in the Cauvery Delta Zone. The Yield gap was the least in Ariyalur district (16.35%) and the highest in Nagappattinam district (39.50%) with the mean yield gap of 26.33%. Among the districts with larger area under rice cultivation, Nagapattinam and Thanjavur districts recorded larger yield gaps (39.50% and 34.75 %, respectively). Siddiq (2000) also reported that the yield gap in Tamil Nadu was the least in the past.

Constraints to rice productivity in Cauvery Delta Zone

Constraints to rice productivity as reported by the respondents of the study in Cauvery Delta Zone are presented in Table 5. The Table 5 reveals that shrinking labour availability for carrying out different operations in rice cultivation was the foremost constraint to rice productivity as reported by almost all the respondents (99.16%). Migration of labour force from rural areas to urban areas for better employment and higher wage might be the reason. It calls for selective mechanisation for land preparation, transplanting, harvesting, etc. Late planting of rice due to delayed water supply from canals was reported by 93.75 % of the respondents. Water scarcity was reported by 91.67 % of the respondents. Similar finding was reported by Siddiq (2000).Water management employing System of Rice Intensification (SRI) Technology in the Cauvery Delta Zone has already yielded positive results in managing these constraints (Balakrishnan and Vasanthakumar, 2010). It may be scaled up. Increasing soil salinity or alkalinity as well as high incidence of pests and diseases were reported a constraint by 76.67 % of the respondents. It reiterates the finding of Siddiq (2000). Over mining of nutrients and faulty irrigation might have caused salinity and alkalinity. Technology dissemination approaches need special attention (Nirmala *et al*., 2016). Limited availability of improved seeds was reported by 20.83 % of the respondents. This is a matter of serious concern because improved seeds play a critical role in bridging yield gap (Thyagarajan and Vasanthakumar, 1998).

CONCLUSION

The productivity of rice was higher in Tamil Nadu compared to productivity at the national level. The mean yield gap in Cauvery Delta Zone was low. However, it deserves attention of policy makers and extension workers. The constraints to rice productivity included shrinking labour availability, late planting due to delayed water supply from canals, water scarcity, increasing salinity/alkalinity and high incidence of pests and diseases. It may be concluded that System of Rice Intensification (SRI) may be adopted to alleviate water related constraints and selective mechanisation may be attempted for managing labour scarcity. Appropriate fertiliser management is needed to address the constraints like salinity/alkalinity and high incidence of pests and diseases.

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Table 1.Area, Production and Yield of Rice in India during 2001-2015

Year	Area in million ha	Production in million tonnes	Productivity Kg/ha
2001-2002	44.71	84.98	1901
2002-2003	41.18	71.82	1744
2003-2004	42.59	88.53	2079
2004-2005	41.91	83.13	1984
2005-2006	43.66	91.79	2102
2006-2007	43.81	93.36	2131
2007-2008	43.91	96.69	2202
2008-2009	45.54	99.18	2178
2009-2010	41.92	89.09	2125
2010-2011	42.86	95.98	2239
2011-2012	44.01	105.30	2393
2012-2013	42.75	105.23	2461
2013-2014	44.14	106.65	2416
2014-2015	44.11	105.48	2391
2015-2016	43.39	104.32	2404
Mean	43.37	94.70	2183

Source: http://eands.dacnet.nic.in/PDF/Glance-2016.pdf

Table 2.Area, Production and Yield of Rice in Tamil Nadu during 2001-2015

Year	Area in million ha	Production in million tonnes	Productivity Kg/ha
2001-2002	2.06	6.58	3196
2002-2003	1.51	3.57	2359
2003-2004	1.39	3.22	2308
2004-2005	1.87	5.06	2703
2005-2006	2.05	5.20	2541
2006-2007	1.93	6.61	3423
2007-2008	1.78	5.04	2817
2008-2009	1.93	5.18	2683
2009-2010	1.84	5.66	3070
2010-2011	1.90	5.79	3039
2011-2012	1.90	7.45	3918
2012-2013	1.49	4.05	2712
2013-2014	1.84	7.11	3097
2014-2015	1.79	7.94	3191
2015-2016	1.80	7.37	3350
Mean	1.80	5.72	2960

Source: http://www.tn.gov.in/deptst/agriculture.pdf

Table 3 Area, Production, and Productivity of rice Rice in Cauvery Delta Zone during 2014-2015

District	Area in ha	Production tonnes	Productivity Kg/ha
Thanjavur	1,77,756	6,96,193	3915
Nagappattinam	1,59,499	5,79,962	3630
Thiruvarur	1,92,615	8,52,925	4423
Trichirappalli	51,272	2,40,199	4680
Perambalur	8,994	43,431	4780
Ariyalur	23,108	1,16,239	5019
Pudukkottai	67,238	2,79,126	4149
Cuddalore	1,34,677	6,41,958	4766
		Mean	4420

Table 4 yield Gap in Rice in Cauvery Delta Zone

S.No.	District	Productivity Kg/ha	Yield gap Kg/ha	Yield Gap %
1	Thanjavur	3915	2085	34.75
2	Nagappattinam	3630	2370	39.50
3	Thiruvarur	4423	1577	26.28
4	Trichirappalli	4680	1320	22.00
5	Perambalur	4780	1220	20.33
6	Ariyalur	5019	981	16.35
7	Pudukkottai	4149	1851	30.85
8	Cuddalore	4766	1234	20.56
	Mean	4420	1579	26.33

Table 5 Constraints to Rice Productivity in Cauvery Delta Zone

S.No.	Constraints	Percentage of Respondents (n=240)
1	Water scarcity	91.67
2	Late planting due to delayed water supply from canals	93.75
3	Increasing soil salinity/alkalinity	76.67
4	Shrinking labour availability	99.16
5	High incidence of pests and diseases	76.67
6	Weed incidence	37.00
7	Limited availability of improved seeds	20.83