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Yield gap analysis of rice in Raichur district of Karnataka

Rice is grown on an area of about 43 mha accounting for about 20 % of the total cropped area in India. The production of rice in 2007 was 93 mt. It is projected that India needs to produce 115 mt of rice by the year 2020 to maintain the present level of self-sufficiency. The future increase in rice production requires improvement in productivity and efficiency (Paroda R.S.,1998). There are gaps between yields obtained at research station and farmers fields. Closing these gaps could improve not only the productivity but also the efficiency of rice production (Elsamma Job., 2006). To maintain national food security there is a need to increase rice production to sustain self sufficiency. Against this backdrop a study was undertaken to assess the gap between the potential yield recorded at the research station and actual yield obtained by the farmers in Raichur district of Karnataka and also to study the major constraints in rice production in the study area.

Yield gap is the difference between the maximum attainable yield and the farm level yield. Maximum attainable yield is the yield of experimental or on – farm plots with no physical, biological and economic constraints and with known management practices at a given time and in a given ecology. Farm level yield is the average farmers yield in a given area at a given time in a given ecology. Yield gap has two components. The first component cannot be narrowed or is not exploitable because it is mainly due to factors that are non – transferable such as environmental conditions. The second component is mainly due to difference in management practices. Yield gap II is manageable and can be bridged by deploying more efficient research and extension services.

The present study was conducted in Raichur district of Karnataka. Though the average productivity of Karnataka is highest (3.8 t/ha) during 2005-06 in India, nearly half of the rice growing districts have productivity of less than 2.5 t/ha. Raichur district with an area of 174434 hectares under irrigated rice, with an average productivity of 2.5 t/ha during 2005-06 is selected as study area since there is a gap of 1.3 t/ha when compared to average productivity of the state. Four villages were selected randomly from Raichur taluq. From each village fifteen farmers were selected randomly. Thus, the study constituted a total of 60 sample farmers. Data were also collected on cost of cultivation aspects of rice from research station and demonstration plots in Raichur district. Various indices of yield gaps were worked out to compare the yields in farmers fields with those of research station and demonstration yields.

The potential yield at research station was 6.5 t/ha while at the demonstration site, the potential farm yield was reported to be 5.69 t./ha (Table 1). It can be inferred that there is 12.46 % of yield gap between potential yield realized at research station and the yield that was reported at the demonstration plot (Fig1). This gap is nothing but Yield gap I., which explains the extent of the untapped potential yield that is possible to achieve at the field demonstration. Yield gap II which is the difference between the potential farm yield (Yd) and the actual yield (Ya) was 11.82 %. Index of yield gap which is the ratio of the difference between the potential yield (Yp) and the actual yield (Ya) to the potential yield (Yp) worked out to be 22.81 %. Index of realized potential yield is the ratio of the actual yield (Ya) to the potential yield (Yp) was 77.18 % and the index of realized potential farm yield which is the ratio of the actual yield (Ya) to the potential farm yield (Yd) was 88.17 %. The total yield gap (difference between the potential yield (Yp) and the actual yield (Ya)) was 14.83%. As mentioned earlier, Yield gap I is non-exploitable because it is mainly due to differences in the environmental factors. Yield gap II can be bridged because it is mainly due to difference in farmer's management practices (S. Lakshmanan, 2007).

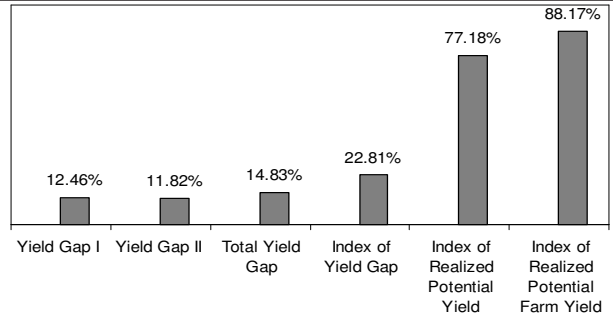

Fig 1. Yield Gaps in Rice Production

The gross costs in cultivation of rice worked out to be Rs.31539 whereas the gross returns and net returns were Rs.44228.7 and Rs.12689.74 respectively (Table 2). The cost benefit ratio in rice cultivation was 1:1.4.

Among the major constraints to rice production labor shortage ranked first, followed by lack of remunerative price (rank II), pests and disease incidence (rank III) and untimely release of canal water (rank IV). Imbalanced use of fertilizers, non-availability of agricultural machinery, small size of the farm, weed infestation, tenancy problems, non-optimal plant population, nutritional disorders, late transplanting, natural calamities, salt affected soils and poor organic matter status of the soils were the other hindering factors in realization of the potential yield (Table 3).

Table1. Yield levels in different situations

	Yield (Qts/ha)
Research station yield	6.5
Demonstration yield	5.69
Farmer's field yield	5.017

Table 2. Cost-returns profile of rice production

Gross costs (Rs./ha)	31539.01
Gross returns (Rs./ha)	44228.75
Net returns (Rs./ha)	12689.74
GR-Operational costs (Rs./ha)	24241.08
CB ratio (Rs./ha)	1.40

Bridging the yield gap requires integrated and holistic approaches and adequate institutional support to farmers. It is not static but dynamic with technological developments in rice production, as the gap tends to enlarge with the improvement of the yield potential of rice varieties. Mechanization, timely release of canal water and proper management of pests and diseases will help in bridging the yield gaps in Raichur. Bridging the yield gaps is the local solution to the national problem. It results in increased production with the additional incentives of cost reduction, poverty alleviation, social justice and equity. Closing the yield gap alone could supply 60 percent of the increased annual rice demand by the year 2025. Hence it is essential to expedite the bridging of yield gaps for improving the productivity and efficiency of rice production and thereby food security. For this purpose institutional and policy support to farmers is crucial for ensuring agricultural input supplies, farm credit, and minimum support price in a holistic approach for sustainable increase in rice production. Even with the existing technologies it is possible to increase the production by closing the yield gaps in rice. This will help in ensuring food and nutritional security in future.

Table 3. Constraints in rice production (Multiple responses) n=60

Sl No.	Constraints		No. of farmers responded	% of farmers responded	Rank
1	Institutional	Release of canal water	18	30	IV
2	Bio physical	Natural calamities	4	7	XI
3	Technical	Late transplanting	4	7	XI
		Non-optimal plant population	6	10	IX
		Imbalanced use of fertilizers	13	22	V
		Ineffective weed control	10	17	VIII
		Pest and disease incidence	36	60	III
4	Soil related problems	Salt affected soils	3	5	XII
		Nutritional disorders	5	8	X
		Poor organic matter status	2	3	XIII
5	Agricultural machinery		12	20	VI
6	Socio-economic	Small size of the farm	11	18	VII
		Problems of tenancy	6	10	IX
		Lack of remunerative price	43	72	II
		Labor shortage	47	78	I

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