

# Extension and Technological Gap Analysis in Rice–Wheat Production System in Chhattisgarh Plain of Madhya Pradesh

## ABSTRACT

The present study was undertaken to find out the yield gap through technological interventions under farmers FIRST project on rice-wheat cropping system. College of Agriculture, Balaghat has conducted 60 demonstrations on farmers' fields with a total of 24.0 ha area selected under the farmer FIRST project. Prevailing farmer's practices were treated as control for comparison with recommended practices. Results of two years, the data revealed that the rice crop average yield of demonstrated intervention was 41.35 q/ha over control (34.40 q/ha) with an increase of 20.19%, while in case wheat average yield was recorded 30.22 over the control 24.35 q/ha. The extension gap was observed 6.95 and 6.15 q/ha while in case of technology gap it was 8.65 and 13.35 q/ha in rice and wheat, respectively. The technology index was 17.30% and 32.83% in rice and wheat, respectively.

*Keywords: Rice, Wheat, Technology gap, Extension gap, Technology index, Cropping system.*

## 1. INTRODUCTION

In India, rice and wheat are the most important cereal crops of *Kharif* and *Rabi* seasons, respectively [1, 2, 3]. *Rice and Wheat* Both the crops are considered to be major staple food crops for the majority larger part of India's population (insert ref). Apart from and constituting a key portions of digestible energy and protein in human intake, these crops and occupying a premium position among all food communities [4, 5]. The rice-wheat cropping systems are one of the most prominent cropping systems prevailing on the Indian subcontinent and considered to be of utmost importance for food security and livelihood [6, 7, 8]. They also play pivotal role in cropping system of Chhattisgarh plain agro-climatic zone of Balaghat district. Technology is the prime mover of change and thus, technology fatigue and technology gap should be avoided. These challenges would necessitate This will be a call for revitalization of research, education and extension system. New innovative interventions dissemination among farming community defiantly improve the productivity of agricultural crops [9]. Obianefo *et al.*, [10] reported that provision of the providing new technology information to farmers on include improved rice varieties, crop diversification, mixed

**Comment [I1]:** Follow the journal format by including sub-sections (read author guidelines for the journal)

**Comment [I2]:** Re-craft the objective to make it more clear

**Comment [I3]:** Be consistent in presentation: What % increment did this represent (just like you did with rice)?

**Comment [I4]:** Were these gaps statistically significant? What were the p-values or confidence intervals to justify the claims?

**Comment [I5]:** You need to come clear on the specific problem being addressed by your work. The way it is, it's not clearly defined. Justification of your work is also not clearly stated i.e. How will your work benefit the society

You may also wish to do a thorough literature review on similar topics to beef up your introduction

**Comment [I6]:** Explain the two terminologies in clear English for the reader to appreciate the differences between the two crops with respect to their sowing season, harvesting season, rainfall dependability etc.

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cropping systems, and other sustainable land management strategies may help to improve productivity of cereal crops. The present study was thus carried out with the specific objectives to find out the technological gap in rice and wheat production systems.

## 2. MATERIALS AND METHODS

The present study was conducted under the ongoing ICAR funded 'Farmer FIRST project' at College of Agriculture, Balaghat, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Madhya Pradesh, India. Balaghat is one of the tribal district of Madhya Pradesh (21°34'56" N latitude and 79°47'31" E longitude) and uniquely situated in Chhattisgarh plain agro-climatic zone [11]. Climate of the district is sub-tropical characterized by a hot summer and general dryness except during the southwest monsoon season. The normal annual rainfall of Balaghat district is 1294.5 mm. Maximum temperature (43°C) recorded during the month of May and minimum (8°C) during the month of December [11, 12, 13, 14]. The demonstrations on technological interventions were conducted during *Kharif* and *Rabi* season of 2021-2022 and 2022-2023 (two consecutive years) in the cluster of villages (Lendehari, Chillod and Koppe) of project area under Farmer FIRST project running through College of Agriculture, Balaghat, Madhya Pradesh. From each village, 20 farmers were selected by using simple random sampling method. Thus, total of 60 respondents were selected for the study. The difference between the demonstration package and existing farmers practices are given in Table 1. Usual farmer's practice were treated as a control for comparison with recommended package *i.e.* use of quality seeds of improved varieties, line of sowing, seed treatment and timely weeding, necessity of pesticide as well as balanced fertilizer were also emphasized. The data on production cost and monetary returns were collected from demonstration plots for working out the economic feasibility of improved variety. The data were collected from demonstrated fields as well as from control field (farmers practices) and finally the technology gap, extension gap, technology index were calculated as formula given by Samui *et al.* [15] and Henderson and Tilton [16] as follows:

1. Technology gap = Potential yield (PY) – Demonstration yield (DY)
2. Extension gap = Demonstration yield (DY) – Farmers' yield (FY)
3. Technology index = Potential Yield (PY) – Demonstration Yield (DY) / Potential Yield (PY) x 100

The results were analyzed statistically using analysis of variance ( $P = 0.05$ ) ANOVA [17].

## 3. RESULTS AND DISCUSSION

**Comment [I8]:** Rephrase this section and consider dividing it into sub-sections e.g. location & time, experimental design, data analysis etc. (refer to journal's author guide)

**Comment [I9]:** Write in full for this its first appearance within the text

**Comment [I10]:** Rephrase this sentence so the reader can understand what you are communicating

**Comment [I11]:** Rephrase the entire sentence to make it more clear for the reader.

Be consistent on the names used to describe the agricultural college being referred to herein

**Comment [I12]:** What was the justification for using this sample size? Did this sample size give a true representation of the population under study? Explain...

**Comment [I13]:** Tables & figures should be placed inside the text. Tables and figures should be presented as per their appearance in the text

Technology interventions undertaken in demonstration fields and practices adopted by farmers in control are presented in Table 1, and revealed that the farmers were not adopting recommended practice properly in rice wheat production system although it is considered as major crop by the farmers.

### Rice

The data presented in table 2 revealed that yield of rice in demonstration plots were recorded as 40.20 q/ha and 42.50 q/ha however in farmer's practice grain yield recorded as 33.60 q/ha and 35.20 q/ha in Kharif 2021 and 2022, respectively. Significant higher mean grain yield (41.35 q/ha) was recorded under intervention as compared to farmer practices (34.40 q/ha). In recommended intervention, there was increase in yield of rice that 19.65 and 20.74 % during the respective year (2021 and 2022). The result shows that mean technology gap was 8.65 q/ha, extension gap was 6.95 q/ha and mean technology index was 17.30 %. According to these results, farmers need to convince for adoption of the new suggested technology for increasing yield of the rice, which is more suitable for the study area [9, 14, 18].

### Wheat

In case of wheat it is evident from data presented in table 2 that demonstration plot of improved package in wheat recorded higher seed yield ranged from 28.80 to 31.65 q/ha with mean yield of 30.22 q/ha as compared with the farmers' practices (23.20 to 25.50 q/ha). The percent increase in yield with average of 24.12% during demonstration period. The above trend of successively increased in yield of wheat over the year was obtained due to adoption of improved variety of wheat JW-3288, recommended seed rate (100 kg/ha) which maintain optimum plant population and seed treatment with Carbendazim @ 3 g/kg of seed. Similar yield enhancement in different crops in demonstration plot has been documented by [19, 20]. Yield of the demonstrations and control of the different varieties of crop were compared to estimate the mean extension gap which was 5.88 q/ha. The extension gap showed increasing trends in each consecutive year of study during demonstration years which emphasizes there is a need to educate the farmers through various means for adoption of improved agricultural production technologies to reverse the trend. In case of technology gap which shows the gap in the demonstration yield over potential yield and the mean technology gap was 14.78 q/ha. The observed technology gap may be attributed to dissimilarities in soil fertility and other vagaries of weather conditions in the area. Hence, to narrow down the gap between the yields of different varieties, location specific recommendation appears to be

**Comment [I14]:** Is this information being extrapolated from table 1? & is table 1 supposed to be in RESULTS AND DISCUSSION section or in MATERIAL AND METHODS?

**Comment [I15]:** Rephrase this section to make it more clear. Include p-values to justify your claims

**Comment [I16]:** What is the P-value?

**Comment [I17]:** Consider doing a thorough literature review to support your findings

**Comment [I18]:** Same here: were these differences statistically significant? Show P-values and present them as per journal requirement

necessary. Technology index shows the feasibility of the variety at the farmer's field. The mean technology index was 32.83% it claimed that medium value of technology index related with medium level of feasibility. Singh *et al.*, [9] reported the 10.35 q / ha average extension gap, 15.26 q / ha technology gap was and 21.81 % technology index at Krishi Vigyan Kendra, Basuli, Mahrajganj.

#### 4. CONCLUSIONS

It may be concluded that technological gap exist in adoption of recommended rice and wheat crops in the study area. More efforts should be made to educate the farmers through various means for adoption of improved agricultural production technologies to reverse the trend. This will help to bridge the extension and technology gap.

**Comment [I19]:** This should briefly state the major findings of the study

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UNDER PEER REVIEW

**Table 1: Comparison between technological interventions and farmers' practice under FFP demonstration in Balaghat district of Madhya Pradesh**

**Comment [I20]:** Tables should be presented within text

| Sr. No. | Crop  | Technological component | Technology Interventions  | Farmers Practice   |
|---------|-------|-------------------------|---|--|
| 1       | Rice  | Variety                 | JR-81   | MTU 1010   |
|         |       | Seed rate               | 35 kg/ha  | 45 kg/ha   |
|         |       | Seed treatment          | Carbendazium @ 3 g/kg of seed                                     | Not applied  |
|         |       | Azotobactor culture     | 10g/kg seed   | Not treated  |
|         |       | Time of sowing          | 30 <sup>th</sup> June   | 10 <sup>th</sup> July  |
|         |       | Weed management         | Pendimethylene@ 1.5 kg/ha   | Not applied  |
|         |       | Nutrient dose           | 100:60:40 Kg NPK/ha (On soil test basis)                          | Irrational use of nitrogenous fertilizers and non application of MoP       |
|         |       | Insect-pest management  | Need based spray of insecticide at Economic threshold level (ETL) | Overdoses/ un recommended brands of insecticide                            |
| 2       | Wheat | Variety                 | JW3288  | Local  |
|         |       | Seed rate               | 100 kg/ha   | 130 kg/ha  |
|         |       | Seed treatment          | Carbendazium @ 3 g/kg of seed                                     | Not applied  |
|         |       | Azotobactor culture     | 10g/kg seed   | Not treated  |
|         |       | Time of sowing          | 25-30 <sup>th</sup> November                                      | 5-15 <sup>th</sup> December  |
|         |       | Weed management         | Clodinafop @ 25 g/ha and Metsulfuron methyl @ 25 g/ha             | Not applied  |
|         |       | Nutrient dose           | 100:60:40 Kg NPK/ha (On soil test basis)                          | Irrational use of nitrogenous fertilizers and non application of potassium |
|         |       | Insect-pest management  | Need based spray of insecticide at Economic threshold level (ETL) | Overdoses/ un recommended brands of insecticide                            |

**Table 2. Technology gap, extension gap and technology index in Rice and wheat in Balaghat District of Madhya Pradesh (n=60)**

**Comment [I21]:** Should be presented within text

| <b>Crop (Variety)</b> | <b>Season /year</b> | <b>Area in (ha)</b> | <b>No of farmers</b> | <b>Farmers Practice</b> | <b>Intervention</b> | <b>Potential Yield q/ha</b> | <b>% Change over farmers practice</b> | <b>Technology gap</b> | <b>Extension Gap</b> | <b>Technology index</b> |
|-----------------------|---------------------|---------------------|----------------------|-------------------------|---------------------|-----------------------------|---------------------------------------|-----------------------|----------------------|-------------------------|
| Rice                  | Kharif 2021         | 24                  | 60                   | 33.60                   | 40.20               | 50.00                       | 19.65                                 | 9.80                  | 6.60                 | 19.60                   |
|                       | Kharif 2022         | 24                  | 60                   | 35.20                   | 42.50               | 50.00                       | 20.74                                 | 7.50                  | 7.30                 | 15.00                   |
|                       | <b>Mean</b>         | 24                  | 60                   | 34.40                   | 41.35               | 50.00                       | 20.19                                 | 8.65                  | 6.95                 | 17.30                   |
| Wheat                 | Rabi 2021-22        | 24                  | 60                   | 23.20                   | 28.80               | 45.00                       | 24.14                                 | 16.20                 | 5.60                 | 36.00                   |
|                       | Rabi 2022-23        | 24                  | 60                   | 25.50                   | 31.65               | 45.00                       | 24.11                                 | 13.35                 | 6.15                 | 29.66                   |
|                       | <b>Mean</b>         | 24                  | 60                   | 24.35                   | 30.22               | 45.00                       | 24.12                                 | 14.78                 | 5.88                 | 32.83                   |