Performance of rice variety P 1460 in front line demonstrations under rainfed conditions in Southern humid region of Rajasthan

Teekam Singh1*, Ranjeet Singh2 and R.L. Soni2

1Regional Rainfed Lowland Rice Research Station, Gerua-781 102 (Assam)
2KVK, Banswara, Maharana Pratap University of Agriculture & Technology, Udaipur (Rajasthan)
*e-mail: tiku_agron@yahoo.co.in

ABSTRACT

The study was conducted at Krishi Vigyan Kendra, Banswara in Southern Humid Agro-climatic Zone of Rajasthan (Zone IV b) for three consecutive rainy seasons of 2009, 2010 and 2011 to evaluate the performance of basmati type rice variety "Pusa 1460" at farmers' field under rainfed conditions. Front line demonstrations (FLDs) were conducted with scientific package of practices of rice technology. The Pusa 1460 variety of rice was found superior over farmers' existing practices with local landraces. Pusa 1460 with improved production technologies followed in FLDs, increased mean grain yield by 28.7% over existing farmers' practice with only Rs. 1511/ha extra expenditure on inputs. The mean extension gap (0.57 t/ha) and mean IBCR (3.94) are sufficiently high to motivate farmers for adoption of Pusa 1460 and rice production technology.

Key words : Front line demonstration, extension gap, technology gap, technology index.

Rice is the staple food of more than 60% of the world's population. In India, rice occupies about 42.6 m ha of area with total production 95.3 m t (GoI, 2012). The area under rice is fluctuated from year to year depending upon rainfall. The total area is 1.28 lakh ha with the productivity of 2031 kg/ha. The main reason for very low productivity is dependency on rains in major rice growing in area the state. The success of this crop largely depends upon timely sowing and well distributed rains in growing season. Rice production constitutes the major economic activity of tribal farmers in low laying regions of Southern Rajasthan where growing rice during the Kharif season is a physio-graphic compulsion.

The major causes of low productivity of rice in the region includes drought, lodging, weeds, insects, pests, diseases, prevalence of local varieties, unavailability of quality seeds of improved varieties in time and non-adoption of recommended production and plant protection technology. The local varieties such as Kalikuamod and Kalazira have some aromatic fragrance, therefore, non-aromatic varieties are unable to replace these varieties. So it is important to demonstrate the high yielding aromatic rice varieties to increase production of rice among the tribal farmers. Recognizing the importance of rice, seed production programme was taken at KVK Banswara district. KVK further spread the rice varieties through frontline demonstrations in the district to boost up the production of rice.

A wide gap exists in the available techniques and its actual application by the farmers which reflected through poor yield in the farmers' field. Farmers are generally practicing old age seedlings and imbalance use of fertilizers. Thus, there is tremendous opportunity for increasing the production and productivity of rice by adopting the improved production technologies. A range of rice production technologies have been generated by agricultural universities and research stations, but the productivity of rice is still low due to poor transfer of technologies from the research farms to the farmers' fields. Very little new knowledge percolates to the farmers'
field, hence a vast gap has been observed between knowledge production and knowledge utilization. Front Line Demonstrations (FLD) on rice including recently released early maturing, aromatic, high yielding, fine seeded, disease resistant varieties with INM, IWM and IPM on farmers' field may be helpful. Pusa 1460 is Basmati type aromatic semi-dwarf rice variety which is resistant against bacterial leaf blight and having strong aroma, less chalky grain and fine seeds. It has flowering duration 103 days so it can be taken under rainfed conditions in low lying areas. Hence, KVK has conducted FLDs on rice under rainfed condition in Banswara district of Rajasthan during three consecutive Kharif seasons of 2009 to 2011 with the aim: (i) to evaluate the performance of high yielding aromatic rice variety with recommended package of practices and (ii) to correct and analyse feedback information for further improvement in research and extension programme.

**MATERIALS AND METHODS**

The study was conducted in Banswara district of Southern Humid Region of Rajasthan by the Krishi Vigyan Kendra to popularize the rice variety "Pusa 1460" with improved production techniques. The constraints in production were identified through participatory approach, farmers meetings, training programmes and field diagnostic visits during crop growth period. Low yield of rice was conceived due to lack of suitable variety of rice, imbalance use of fertilizers, old age seedling, drought, infestation of weeds and improper crop geometry. Based on the farmers problems identified, conducted 125 front line demonstrations under rainfed farming situations during Kharif season of 2009 to 2011 at farmers' field. Soil samples were collected and analysed for major plant nutrients. The soils of the region are generally light black to red loam in texture, low in available N & P and medium in available K. The area under each demonstration was 0.4 ha. The crop received rainfall 616 mm, 536 mm and 974 mm during crop growth period in 2009, 2010 and 2011, respectively. To manage assessed problems, improved Basmati type "Pusa 1460" variety seed of rice and zinc sulphate were provided to the farmers as critical inputs and scientific recommended technologies were followed as intervention during the course of front line demonstration programme. The nursery raising was done during onset of monsoon in the last week of June and first week of July of each year. The rice seedlings of 25-30 days old were transplanted in the fields during last week of July and beginning of August every year. The demonstrations on farmers' fields were regularly monitored by the scientists of Krishi Vigyan Kendra from nursery raising to harvesting. In case of local check (control plots), existing farmers' practices were followed by the farmers. Well before conducting the demonstrations, a training programme was organized for the selected farmers of the respective villages each year to impart the technological knowledge of rice production techniques. All other steps like site selection, layout of demonstrations, farmers' participation etc. were followed as suggested by Choudhary (1999). The grain yield of demonstrations as well as farmers' practice (local check) were recorded and analysed according to different parameters suggested by Yadav et al. (2004). The details of these parameters are as:

1. **Extension Gap** = Demonstration yield (D1) - Farmers' practice yield (F1)
2. **Technology Gap** = Potential yield (P1) - Demonstration yield (D1)
3. **Technology Index** =
   \[
   \frac{\text{Potential yield (P1)} - \text{Demonstration yield (D1)}}{\text{Potential yield (P1)}} \times 100
   \]
4. **Additional Return** = Demonstration return (Dr) - Farmers' practice return (Fr)
5. **Effective Gain** = Additional return (Ar) - Additional cost (Ac)
6. **Increment B:C ratio** = \[\frac{\text{Additional return (Ar)}}{\text{Additional cost (Ac)}}\]

**RESULTS AND DISCUSSION**

**Rainfall pattern and initial crop stand**

Nursery raising of crop was satisfactory except in 2010 following good pre-monsoon
shower (30.9 and 37.5 mm in 2009 and 2011, respectively) ensuring better seedling growth and timely transplantation in the field. The total rainfall received during the growing seasons was 616, 535 and 974 mm in 2009, 2010 and 2011, respectively. Only kharif season of 2011 had normal rainfall (over 850 mm). However its distribution pattern was erratic across the cropping season (June-November) in all three years. The maximum rain 77 to 89% occurred during July to August every year (Fig. 1). September 2009 and June 2010 received the lowest rainfall while in 2011, October and November rainfall did not recieve that resulted in prolonged drought during flowering and grain filling stage of paddy and yield was lowest in 2011.

Since second fortnight of July, water started accumulating in the field and slowly increased in depth and remains 3 to 5 cm in low lying field throughout the end of August in all three years. In this way initial crop growth got momentum with adequate water availability encouraging elongation in plant height and tillering of seedlings. While in October and November of year 2009 and 2010 crop received good rainfall which resulted higher grain yield than kharif 2011. Boonjung and Fukai (1996) also reported that the effect of water stress on rice yield was most severe when drought occurred during panicle development and anthesis resulting low yield due to less number of spikelets per panicle and filled grains.

**Grain yield**

Grain yield of rice was higher under demonstrations as compared to existing farmers' practice. The increase in grain yield under demonstrations was 14.9 to 43.2% (Table 1) over existing farmers' practice. On an average 28.7% yield advantage was recorded under front line demonstrations carried out with improved seed and scientific package of practice as compared to farmers' traditional way of rice cultivation.

**Gap analysis**

An extension gap of 0.26 to 0.95 t/ha in yield was found between demonstrated technology and farmers' practices during different years. Average extension gap was 0.57 t/ha. The extension gap was lowest (0.26 t/ha) during 2011 which was due to prolonged drought at the time of grain fillings while the highest extension gap (0.95 t/ha) was during 2009 which may be due to well distribution of rainfall in which Pusa 1460 performed better and gave maximum yield (3.15 t/ha). Over all such gap might be attributed due to improved seed of Pusa 1460 and adoption of improved production technology in the demonstrations which resulted in higher grain yield than the existing farmers' practices. Wide technology gaps were observed during all the years. The mean technology gap of total 125 front line demonstrations was found 2.5 t/ha which is 50% of potential yield. The wide

![Fig. 1. Rainfall distribution pattern across the months of growing season from 2009 to 2011](image)
### Table 1. Grain yield and gap analysis of paddy under front line demonstrations at farmers' field

<table>
<thead>
<tr>
<th>Season/Year</th>
<th>No. of demonstrations</th>
<th>Potential yield (t/ha)</th>
<th>Demonstration yield (t/ha)</th>
<th>Farmers’ practice Yield (t/ha)</th>
<th>Increase over Farmers’ practices (%)</th>
<th>Extension gap (t/ha)</th>
<th>Technology gap (t/ha)</th>
<th>Technology index (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kharif 2009</td>
<td>50</td>
<td>5.0</td>
<td>3.15</td>
<td>2.20</td>
<td>43.2</td>
<td>0.95</td>
<td>1.85</td>
<td>37.0</td>
</tr>
<tr>
<td>Kharif 2010</td>
<td>50</td>
<td>5.0</td>
<td>2.35</td>
<td>1.85</td>
<td>27.0</td>
<td>0.50</td>
<td>2.65</td>
<td>53.0</td>
</tr>
<tr>
<td>Kharif 2011</td>
<td>25</td>
<td>5.0</td>
<td>2.01</td>
<td>1.75</td>
<td>14.9</td>
<td>0.26</td>
<td>2.99</td>
<td>60.0</td>
</tr>
<tr>
<td>Average</td>
<td>42</td>
<td>5.0</td>
<td>2.50</td>
<td>1.87</td>
<td>28.4</td>
<td>0.57</td>
<td>2.50</td>
<td>50.0</td>
</tr>
</tbody>
</table>

### Table 2. Economic analysis of front line demonstrations on paddy var. P 1460 at farmers' field

<table>
<thead>
<tr>
<th>Season/Year</th>
<th>Cost of cash input</th>
<th>Additional cost in demons.</th>
<th>Sale price (MSP) of grain</th>
<th>Total Returns (Rs./ha)</th>
<th>Additional cost in demons.</th>
<th>Farmers’ practice</th>
<th>Effective gain (Rs./ha)</th>
<th>Incremental B:C ratio (IBCR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Demons. (Rs./ha)</td>
<td>Farmers’ practice (Rs./ha)</td>
<td>Demons. (Rs./ha)</td>
<td>Farmers’ practice (Rs./ha)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kharif 2009</td>
<td>3,731</td>
<td>2,300</td>
<td>1,431</td>
<td>980</td>
<td>30,870</td>
<td>21,560</td>
<td>9,310</td>
<td>7,879</td>
</tr>
<tr>
<td>Kharif 2010</td>
<td>3,731</td>
<td>2,300</td>
<td>1,431</td>
<td>1,030</td>
<td>24,205</td>
<td>19,055</td>
<td>5,150</td>
<td>3,719</td>
</tr>
<tr>
<td>Kharif 2011</td>
<td>4,619</td>
<td>2,950</td>
<td>1,669</td>
<td>1,110</td>
<td>22,311</td>
<td>19,425</td>
<td>2,886</td>
<td>1,217</td>
</tr>
<tr>
<td>Average</td>
<td>4,027</td>
<td>2,516</td>
<td>1,511</td>
<td>1,040</td>
<td>25,795</td>
<td>20,013</td>
<td>5,782</td>
<td>4,272</td>
</tr>
</tbody>
</table>
differences in technology gap during different years might be due to rainfall distribution. Similarly, the technology index for all the demonstrations during different years was in accordance with technology gap. Higher technology index reflected the inadequate proves of technology for transferring to farmers and insufficient extensions services for transfer of technology.

Economic analysis

Seed and fertilizers were considered as critical cash inputs for the demonstrations as well as farmers' practices. On an average, an additional investment of Rs. 1511/ha was made under demonstrations. Economic returns as a function of grain yield and minimum support price (MSP) as sale price varied during different years. Maximum returns were obtained during the year 2009 followed by 2010 due to higher grain yield. The higher additional returns and effective gain obtained under demonstrations could be due to improved variety Pusa 1460 and adoption of scientific production techniques like timely transplanting and application of fertilizers. The highest incremental benefit: cost ratio (6.50) and effective gain (Rs. 7879/ha) were observed during 2009 which is due to higher additional return and low additional cost (Table 2). Sarda and Khurana (1993), Singh et.al (2009) and Nirmala and Muthuraman (2009) also found that adoption of scientific techniques by farmers in rice production results higher economic returns.

CONCLUSION

Improved Basmati type variety "Pusa 1460" of paddy and production technologies followed in demonstrations, on an average increased the grain yield by 28.7% over existing farmers' practice. The increment in yield cost only Rs. 1511/ha. This amount is so less that even small and marginal farmers can afford it. The mean extension gap (0.57 t/ha) and IBCR (3.94) are sufficiently high to motivate the farmers for adoption of Pusa 1460.

REFERENCES


