# Impact Assessment of Frontline Demonstrations of Bajra in Haryana State

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## ABSTRACT

*The present study was carried out to know the yield gaps between Improved Package and practices (IP) and farmers practice (FP) of Bajra Crop. In IP the recommended dose of fertilizers is 40 kg N + 20 kg P2O5 / ha and 15 kg N + 62.5 kg P2O5/ha under rainfed and irrigated situations respectively. The yield in IP under irrigated conditions ranges from 1868 to 3390 kg/ha whereas under rainfed conditions it was in range of 1990 to 2240 kg/ ha. The per cent increase in yield with IP over FP was recorded in the range of 9.3 to 54.1 whereas per cent increase over state average yield was between 26.9 to 182.7. The improved hybrid HHB-97 gave significantly higher yield over local check i.e. HHB-67 (Improved) under both irrigated and rainfed situation. The yield advantage with HHB-197 over HHB-67 (improved) was in the range of 13.9 to 24.0% under irrigated conditions whereas the yield advantage under rainfed condition was between 8.4 to 13.0%. Where other improved hybrids i.e. HHB-117, HHB-60, HHB-94 and HHB-67-2 performed significantly better over the local checks i.e. HC-4, HC-20 and HHB-68. for realizing profitable yield of pearl millet farmers should apply recommended dose of fertilizers, used improved hybrid seed, integrated weed management, water management and insect–pest management. Conducting of frontline demonstrations on farmers field also help to identify the constraints and potential of the pearl millet in that specific area in realizing the food security as well as it helps in improving the economic and social status.*

***Key words** : Frontline demonstration; Improved package and practices (IP); Farmer practice (FP); Irrigated and rainfed conditions;*

***P***earl millet [(Pennisetum glaucum (L) R. Emend Stuntz] is one of the most important among the millets or nutritious coarse grain cereals crops. It provides staple food for the poor in a short period in the relatively dry tracts of the country and cultivated by the economically poor farmers using either no improved production technology or using it at suboptimal levels. Pearl millet is the most drought and heat tolerant among cereals or millets and it has the highest water use efficiency under drought stress. It is the only major crop that has high levels of tolerance to both acid and saline soils. It can be cultivated even in the most sandy infertile soils and droughty environments where no other cereal crop can survive, Pearl millet can produce about 300-400 kg/ha of grain yield. Farmers cultivating pearl millet continue to face uncertain and low economic returns when production falls and also when production increases (due to low prices). Improved crop management can play effective dual role both in increasing the productivity and enhancing production stability, provided there is commensurate demand for the grains. This demand for pearl millet grains is likely to increase with its increasing use as poultry feed. The demand of pearl millet grains can further increase if it enters the commercial channel for preparing environment foods. Such demand will increase the grain price, which in turn will lead to greater investment in crop management and productivity enhancement. These adaptive and nutritional features combined with yield potential make pearl millet an important nutra-cereal crop to address the emerging challenges of global warming, water shortages, land degradation and food related health issues. Its importance as dry fodder and green forage is apparent with pearl millet to sustain the cattle wealth of dry regions and promote milk and meat production. With the adoption of new scientific farm technology of crop production at a large scale on farmers field the concept of adoption of inputs like improved seed, fertilizers,

chemical, hired labour and mechanical draft power has greatly increased. Major emphasis in the adoption of new technology was on high yielding varieties, assured irrigation and use of chemicals. As a result of which the share of purchased inputs in the total cost of production has increased substantially. The farmers are, therefore, concerned about the cost-returns of crop enterprises that they are growing or of those they can grow as to enable them to take decisions regarding selection of crops and cropping systems with low cost of cultivation and high net returns. Conducting of front line demonstrations on farmers field help to identify the constraints and potential of the pearl millet in that specific area in realizing the food security as well as it helps in improving the economic and social status. The aim of the front line demonstration is to convey the scientific technical message to farmers that if they use recommended package and practices then the yield of this crop can be easily doubled / tripled than their present level. In view of the importance of demonstrations in crop productivity and continuously getting feed back of problems and constraints faced by the farmers, front line demonstrations with full skill and knowledge with scientists have been taken up in pearl millet also. In the present study various front line demonstrations on different aspects of pearl millet were conducted by the scientists to prove the advantages of a recommended practice.

## METHODOLOGY

Front line demonstrations in Pearl millet were conducted from seasons kharif 1997 to kharif 2008 at various farmers' fields locations i.e. in Bhiwani, Mohindergarh, Jhajjar, Faridabad, Rohtak, Jind, Rewari, Sadalpur and Gurgaon in order to demonstrate the production potential benefits of latest technologies vis-à-vis traditional farming practices. The purpose of these FLD's was to know the yield gaps between FLD's and farmers field and to find out the reasons for low yield and specific constraints with the small farmers. The information on output data and inputs used per hectare was collected from the frontline demonstration trails.

Yield gap was calculated by using the following formula : - Demonstration yield – Yield of farmers field.

## RESULTS AND DISCUSSION

The area of pearl millet has almost been stabilized in the country around 9.5 million hectares with a production level of about 8.0 to 9.0 million tones (Table 1). During the last one decade (1997-98 to 2007-08), area under pearl millet hovered between 77.40 to 105.80 lakh hectares with a production range of 54.70 to 121.20 lakh tons and the productivity varied between 610 to 1145 kg/ha. Area, production and productivity of the Haryana state ranged during the decade between 5.00 to 6.60 lakh/ha, 4.5 to 11.61 lakh tones and 891 to 1843 kg/ha respectively (Table 1).

The data in Table 2 showed that the yield variations were quite large during the year 1998-2008. In total 253 front line demonstrations were conducted during the period on Improved package and practices (IP) v/s Farmers Practices (FP). IN IP mainly recommended dose fertilizer (40 kg N+20 kg P2O5/ha) under rainfed situation and (125 kg N+62.5 kg P2O5 / ha) in irrigated condition with 1-2 weeding and hoeing were practiced. The average yield of pearl millet with farmers practice in 253 demonstrations were 2740 and 1470 kg/ha whereas with the improved practices yield were 3390

Table 1. Area, Production and Productivity of pearl millet in Haryana and India (Kharif 1997 to Kharif 2008)

| Year | Haryana | | | India | | |
|---|---|---|---|---|---|---|
| | Area | Production | Productivity | Area | Production | Productivity |
| Kharif 1997 | 5.84 | 6.74 | 1154 | 96.7 | 76.4 | 791 |
| Kharif 1998 | 6.13 | 6.18 | 1008 | 92.8 | 70.3 | 758 |
| Kharif 1999 | 5.86 | 5.21 | 991 | 87.9 | 55.8 | 635 |
| Kharif 2000 | 6.08 | 6.50 | 1077 | 98.1 | 70.6 | 719 |
| Kharif 2001 | 5.70 | 6.60 | 1423 | 95.5 | 83.5 | 875 |
| Kharif 2002 | 5.10 | 4.60 | 891 | 77.4 | 47.1 | 610 |
| Kharif 2003 | 6.20 | 10.00 | 1606 | 105.8 | 121.2 | 1145 |
| Kharif 2004 | 5.00 | 4.50 | 900 | 78.8 | 54.7 | 694 |
| Kharif 2005 | 5.90 | 6.70 | 1147 | 95.9 | 77.0 | 803 |
| Kharif 2006 | 6.40 | 9.70 | 1500 | 94.2 | 80.1 | 850 |
| Kharif 2007 | 6.60 | 11.60 | 1750 | 89.1 | 85.2 | 957 |
| Kharif 2008 | 6.30 | 11.61 | 1843 | 95.0 | 97.9 | 1030 |

Area (lakh hectares); Production (lakh tones); and Productivity (kg/ha)

and 1868 kg/ha highest and lowest respectively. The average per cent increase in yield of IP over FP was 35.3 whereas over the state average the increase in yield was 96.2 per cent. The range of per cent increase over state average was from 26.9 to 182.7 with IP. The data also clearly showed that during the year 2007 and 2008 when IP was followed under irrigated situation the average grain yield was 2860 kg/ha in 2007 and 3390 kg/ha in 2008 compared to 2350 and 2740 kg/ha with FP, respectively. Under rainfed situation, the yields were 1990 (2007) and 2240 kg/ha (2008) with IP and these were 1610 and 2050 kg/ha, respectively in the FP's.

Table 2. Yield variation between Improved Package of Practices and Farmers' practices

| Year | | No. of Demonstration (kg/ha) | Improved package of practices (IP) (kg/ha) | Farmers Practices (FP) | % increase | % increase over state average |
|---|---|---|---|---|---|---|
| 1998 | | 2 | 2850 | 1850 | 54.1 | 182.7 |
| 1999 | | 5 | 2150 | 1553 | 38.0 | 116.9 |
| 2000 | | 5 | 2892 | 2170 | 23.3 | 168.5 |
| 2001 | | 8 | 2324 | 1920 | 21.1 | 63.3 |
| 2003 | | 91 | 2039 | 1660 | 22.8 | 26.9 |
| 2004 | | 44 | 1868 | 1470 | 27.1 | 107.6 |
| 2007 | Irrigated | 32 | 2860 | 2350 | 21.7 | - |
| | Rainfed | 36 | 1990 | 1610 | 23.6 | - |
| | Total | 68 | 2425 | 1980 | 22.5 | 38.6 |
| 2008 | Irrigated | 8 | 3390 | 2740 | 23.7 | - |
| | Rainfed | 22 | 2240 | 2050 | 9.3 | - |
| | Total | 30 | 2815 | 2395 | 17.5 | 52.7 |
| | Grand Total | 253 | 2502 | 1848 | 35.3 | 96.2 |

Table 3. Impact of newly developed hybrids / varieties compared to existing hybrids.

| Year | Improved hybrid varieties (IH) | Number of FLD's conducted | Local check (LC) | Grain Yield (kg/ha) | | % increase |
|---|---|---|---|---|---|---|
| | | | | IH | LC | |
| 1998 | HHB 117 | 6 | HHB 68 | 2642 | 2015 | 31.1 |
| | HHB 60 | 6 | HHB 68 | 2195 | 2015 | 8.9 |
| 1999 | HHB 94 | 7 | HC 4 | 2100 | 1624 | 29.0 |
| 2000 | HHB 117 | 3 | HHB 94 | 2350 | 2175 | 8.0 |
| 2007 | HHB 197 | 15 (Irrigated) | HHB 67 (Improved) | 3620 | 2920 | 24.0 |
| | | 4 (Rainfed) | HHB 67 (Improved) | 1930 | 1780 | 8.4 |
| | HHB 67-2 | 9 (Irrigated) | HC 20 | 2340 | 2160 | 8.3 |
| | | 15 (Rainfed) | HC 20 | 1930 | 1780 | 18.1 |
| 2008 | HHB 197 | 27 (Irrigated) | HHB 67 (Improved) | 3030 | 2660 | 13.9 |
| | | 44 (Rainfed) | HHB 67 (Improved) | 2170 | 1920 | 13.0 |

Raising the productivity of pearl millet through high yielding hybrids is an important component. Table 3 indicated that the newly developed hybrids have added advantage from 8.0 to 31.1 per cent higher yield as compared to the existing cultivars. The results of FLD's during 2007 and 2008 indicated that the performance of newly developed HHB 197 hybrid in comparison to HHB 67-2 was better under irrigated situation compared to rainfed condition. The yield advantage were 24.0 and 13.9 per cent in irrigated situation and 8.4 and 13.0 per cent under rainfed condition during the 2007 and 2008 season, respectively.

*Reasons of low yield of pearl millet at farmer's fields:*

1. Optimum sowing time is not followed due to early and late arrival of monsoon.
2. As per onset of monsoon, sometimes it is too early and there is non availability of quality hybrid or variety seed and farmers go for the planting of the

crop with the seed in hand.

3. Seed of private hybrids are too expensive and the resource crunch poor marginal or submarginal farmers are reluctant to purchase the seed with a future risk of failure involved due to crust formation as result of high intensity rainfall.
4. More than 90 per cent of pearl millet seed for planting is supplied by the private companies. These hybrids mostly require high input management conditions rather in drought prone areas. Non-availability of suitable varieties for dry land areas having the characteristics of high drought tolerant with sustainable stable yield and also resistant to common diseases and pests, which result in poor yield per unit area.
5. Inadequate soil moisture at sowing time results in poor germination and thereby finally gives poor crop stand. In most of the situation the plant population at farmers field is just half or two third of the recommended stand.
6. Seed of Pearl millet is small in size and it is to be placed at depth from where it could emerged out easily.
7. Lack of popularization of ridger seeding machine for sowing to avoid crop failure by crust formation or covering of the seed with deep soil.
8. Use of inadequate and imbalance dose of fertilizers specially the phosphatic fertilizes by farmers does not make possible to fetch potential yield.
9. Use of biofertilizers is almost negligible where it can supplement 8-16 kg of Nitrogen per hectare.
10. The incidence of insect pest and disease is not up to a great extent but sometimes the problem of downy mildew or infestation by white grub or grass hoppers cause substantial loss in the crop. The chemical control measure are costlier and unpopular and therefore, farmers do not adopt.
11. Mechanical weed control is costly and chemical control is quite uncommon in the cultivable zone of Haryana.

*Specific constraints with Marginal / Sub marginal Farmers :*

*a) Small Holding :* The adoption of well proven technology is constrained due to small size of holding and poor farm resources. Small and marginal farmers have less capability to take risk and do not dare to invest in the costly inputs due to high risk and the purchase capacity of small farmer is also very low.

*b) Farm Implements and Tools :* Traditional implements and tools are still in practice due to small holdings which have poor working efficiency. The lack of simple modern tools for small holdings also hinders the adoption of improved technologies.

*c) Lack of Marketing sale facilities :* Since the grain of the crop is consumed as human feed for a limited period (3-4 months) during winter months mostly by poor man. Human consumption is very low. The produce is not sold even at the Minimum Support Price (MSP) rates. Stover of the crop is sometime not even having a market rate of Rs. 50/q. During the year 2008, farmers had to burnt their stover in the field itself. Therefore, lack of marketing facilities in terms of sale of produce is one of the bottle neck in the cultivation of this crop.

## CONCLUSION

Appropriate agro-techniques are necessary to realize profitable yields from Pearl millet. The major components of agro technologies for the system consist of tillage and seed bed preparation, seeding techniques, seed rate, planting geometry, varietal options, nutrient management, water management, plant protection measure, hoeing and weed management. Pearl millet requires fine seed bed for proper emergence and establishment of seedling. Therefore, timely and optimum tillage are major considerations for achieving satisfactory crop stand, promote soil aeration, water retention in root zone and availability of water to the crop. A smooth finable and clod free seed bed assures placement of seed at uniform depth and good soil seed contact for uniform plant stand. It would be worthwhile to mention here that to achieve and maintain optimum plant stand a little higher (10 to 15%) seed rate should be preferred for pearl millet crop and after establishment of seedlings thinning be done at appropriate time. Selection of varieties have wide options for pearl millet and should be selected to specific requirement of farming situations. Thus, for adoption of complete package of practices balanced fertilizer use not only increase crop yield but also improves farmers profit. To achieve the potential yield, weed, insect pest and disease should b controlled to save the crop from heavy loss of the yield. Front line demonstrations are to be planned in such a way so that the productivity of pearl millet enhanced with all sustainable measure particularly under rainfed areas. Integrated nutrient management, weed management and moisture conservation practices should be on priority in this regard. Innovative / Indigenous / Traditional farmers practices may be incorporated in agronomic requirements for sustaining the yielding levels. The day is not so far when the pearl millet will have a definite place in enhancing the food security base in the coming years under rainfed areas of the country.