***Original Research Article***

# EFFECT OF TECHNOLOGICAL INTERVENTION ON YIELD OF SUMMER PEARL MILLET


## ABSTRACT

Front line demonstrations were conducted by pearl millet Research Station, JAU, Jamnagar at 313 farmer's field in 125 hectares of different villages of Gujarat state during summer season of 2015 to 2019. Prevailing farm practices were treated as control for comparison with recommended package. The cumulative effect of technological intervention over five years, revealed average grain yield 43.62 q/ha, and dry fodder yield 73.65 q/ha which is 6.17 % and 12.76 % higher over the farmers practices. The economics and cost benefit ratio of both farmers and improved practices was worked out. On an average net profit was obtained 6837 ₹/ha due to adoption of improved package of practices. Cost befit ratio was 2.23 to 3.54 under improved demonstration practices, while it was 1.99 to 3.20 under farmers practices. By conducting the Frontline Demonstrations of proven technologies, yield potential and net income from pearl Millet cultivation can be enhanced to a great extent with increase in the income level of the farming community.



**Key words:** Pearl Millet, Front Line Demonstration, Net profit


## INTRODUCTION

Pearl millet is a cereal crop that thrives in the arid and semi-arid tropical regions of Asia and Africa. It is an important food crop in areas with low rainfall and shallow soils. Being short in duration, it is the most drought-tolerant millet grown in the arid and semi-arid regions of the world (Bhagavatula *et al.* 2013). Pearl millet is grown over 8.0 m ha mainly as a rainfed crop in north and northwestern parts of country comprises state of Gujarat, Rajasthan, Maharashtra and Haryana.

In Gujarat it is an important food and fodder crop as it is second in terms of area after wheat and third after wheat and rice in terms of production. It is an important staple food for the people of arid and semi-arid regions of the state, North Gujarat, Kutch and Saurashtra. It is cultivated by Gujarat farmers in 3 different seasons viz., kharif semi-rabi and summer.

In Gujarat it is grown in 26 out of 33 districts covering an area of 1.63 lakh ha in Kharif with an average productivity 1272 kg/ha and around 2.4 lakh ha area under summer cultivation with an average productivity of 2628 kg/ha (Anonymous, 2018). The total area of Pearl Millet in the state is 3.97 lakh ha (Anonymous, 2018) with an average productivity 2430 kg/ha. The area of summer cultivation is increasing gradually due to short period of time window is available to farmer after rabi crops, acute demand of fodder and suitable climatic situation in the state.

Its grain has very high nutritive value for human consumption and livestock also relish its straw, both in fresh and dried forms. Pearl millet is an important coarse grain crop and serves as stable diet for the millions of people thriving under hunger. It is considered as whole crop utilization - a source of grain for human consumption and fodder for livestock (Gill 1991).

Available agricultural technology does not serve its purpose till it reaches and adopted by its ultimate users, the farmers. Technology transfer refers to the spread of new ideas from originating sources to ultimate users. There is ample scope for further improvement of production and productivity of pearl millet for raising the income level of the farming community of the Gujarat State. Yield loss under real farming condition can be attributed to several biotic and abiotic factors, important among them are use of farmer's hybrid and imbalanced use of nitrogenous fertilizers. Adoption of high yielding varieties under FLDs plays important role in the maximization of pearl millet production (Chaudhari *et al.,* 2018). With an object to combat the cause of yield erosion and lower economic returns, dissemination of recommended technology through front line demonstration was successfully attempted.

## MATERIALS AND METHODS

Front line demonstrations were organized conducted by Pearl Millet Research Station, JAU, Jamnagar at 313 farmer's field in 125 hectares of different villages of Gujarat state during summer season under real farming situations during 2015 to 2019. The area under each demonstration was 0.40 ha and all demonstrations on various location direct supervision of the scientists. To manage assessed problem, improved variety, seed rate 4 kg/ha, timely sowing, line sowing with spacing of 60 cm (R-R) and 10-12 cm (P-P), balanced use of fertilizers, thinning 15 days after sowing, weed management (pre emergence apply Atrazin @ 0.5 kg a.i./ha and one hand weeding), proper critical stage apply irrigation, two foliar spray of profenophos 0.05 % at 20 and 40 days after germination to control the shoot fly and stem borer pests infesting pearl millet, timely harvesting and threshing were followed as intervention during the course of front line demonstration scheme. Before the conduct of demonstrations, training to the farmers of respective villages was imparted with respect to proven technological interventions. All other steps like site and farmer selection, lay out of demonstration, farmer's participation were followed as suggested by Chaudhary (1999). Visits of farmers and extension functionaries were organized at demonstration plots to disseminate the message at large scale. The yield data were collected from both the demonstration and control (Farmer's practices) by random crop cutting method and analyzed by using simple statistical tools. The cost of cultivation, net income and cost benefit ratio were computed and analyzed. The extension gap, technology gap, technological index (Samui *et al.,* 2000, Thakur *et al.,* 2019) and state average yield gap (Parmar et. al., 2016) were calculated by using following formula as given below:

$$\text{Percentage increase yield} = \frac{(\text{Improved practice yield} - \text{Farmer practice yield}) \times 100}{\text{Farmer practice yield}}$$

$$\text{Technology gap} = \text{Potential yield} - \text{Improved practice yield}$$

$$\text{Extension gap} = \text{Improved practice yield} - \text{Farmer practice yield}$$

$$\text{Technology index} = \frac{(\text{Potential yield} - \text{Improved practice yield}) \times 100}{\text{Potential yield}}$$

$$\text{State average yield gap} = \frac{(\text{Improved practice yield} - \text{Average state yield}) \times 100}{}$$

Average state yield

## RESULTS AND DISCUSSION

The gap between the farmers practices and improved technologies of pearl millet in different district of Gujarat is presented in Table 1. The gap was observed use of variety, sowing method, seed rate, sowing spacing, plant population, weed management, application of fertilizers dose, irrigation and application of plant protection measure.

The yield performances are presented in Table-2. The data reported that under improved practices, the performance of pearl millet grain yield was found to be substantially higher than the under farmers (local) practices during all the years (2015-2019). The grain yield of pearl millet under improved practice recorded was 39.67, 40.00, 45.15, 45.89 and 47.39 q/ha during summer 2015, 2016, 2017, 2018 and 2019, respectively. The yield improvement due to technological intervention was to the tune of 4.61, 6.10, 8.87, 5.79 and 5.45 per cent over farmer's practices. The cumulative effect of technological intervention over five years, revealed an average yield 43.62 q/ha, which was 6.17 % higher over farmer's practices. The data revealed that the average dry fodder yield of 2015 to 2019 was 73.65 q/ha in the improved practices which was 12.76 % higher than the farmer practices 65.51 q/ha. The highest dry fodder yield 76.12 q/ha was recorded in improve practices during summer 2018. The results indicate that higher yields obtained under improved demonstration practices compared to farmer practices.

The extension gap of 1.75, 2.30, 3.68, 2.51 and 2.45 q/ha was observed during summer 2015, 2016, 2017, 2018 and 2019, respectively in Table 3. On an average extension gap was observed 2.54 q/ha. The technology gap range 19.79 to 27.51 q/ha and on an average technology gap in the five years FLD programme was 23.56 q/ha. The technology gap observed may be attributed to dissimilarity in the soil fertility status, agricultural practices and local climatic situation. The technology index varied from 29.46 to 40.95 per cent. On an average technology index was observed 35.07 per cent, which shows the efficacy of good performance of technical

interventions. The wider gap between state average yield and improved farmer practice was 49.25 %, 45.45 %, 65.63 %, 57.21 % and 79.37 % during summer 2015, 2016, 2017, 2018 and 2019, respectively. On an average state average gap in the five years FLD programme was 59.38. It indicates that the pearl millet growers with low yield were identified by low knowledge of scientific technology of pearl millet cultivation. It is point of concern for research and extension worker to disseminate improved pearl millet production technology for raising the production of pearl millet.

The economic viability of improved technologies over farmer' practices were calculated depending on prevailing prices of inputs and outputs costs (Table 4). It was found that cost of cultivation of pearl millet varied from 30656 to 31247 ₹/ha with an average of 30687 ₹/ha in improved practices as against the variation in cost of cultivation from 31920 to 32600 ₹/ha with an average of 31954 ₹/ha in farmers practice. The cultivation of pearl millet in the improved practices gave higher net return ranged from 37856 to 79473 ₹/ha with a mean value of Rs. 52825 ₹/ha as compared to farmers practice which recorded 31674 to 71812 ₹/ha with a mean of 45988 ₹/ha. The higher benefit cost ratio 2.23, 2.81, 2.40, 2.60 and 3.54 were found under improved practices compared to 1.99, 2.53, 2.10, 2.35 and 3.20 and under farmer practices in the corresponding seasons. On an average net profit 6837 ₹/ha was obtained due to adoption of improved package of practices. Hence, there is a wide scope to increase the production of pearl millet crop by providing need based training and demonstration on improved production technology to the farmers. The above findings are in similarly with the findings of Singh (2002), Zala *et al.* (2013), Parmar *et. al*. (2016) and Thakur *et al. (*2019).

**CONCLUSIONS**

From the above discussion, it can be concluded that front line demonstration have shown the adoption of improved package of practices like improved variety, seed rate 4 kg/ha, timely sowing, line sowing with spacing of 60 cm (R-R) and 10-12 cm (P-P), balanced use of fertilizers, thinning 15 days after sowing, weed management (pre emergence apply Atrazin @ 0.5 kg a.i./ha and one hand weeding),

proper critical stage apply irrigation, two foliar spray of profenophos 0.05 % at 20 and 40 days after germination to control the shoot fly and stem borer pests infesting pearl millet, timely harvesting and threshing may result in higher productivity of pearl millet. In demonstration plot improved production technology of pearl millet performs better than control plot. It improves productivity 6.17 % in grain yield and 12.76 % dry fodder yield. The productivity of yield under FLD over farmer's practices created awareness and motivated the other farmers to adopt improved production technology of the pearl millet.

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**Table. 1 Difference between improved and farmers practices under front line demonstration on pearl millet**

| Sr. No. | Components | Improved Practices | Farmers Practices |
|---|---|---|---|
| 1 | Land preparation | Two Ploughing | Two Plouging |
| 2 | Variety | Improved Hybrid GHB 558, GHB 538 and GHB 732 | Local available variety |
| 3 | Sowing method | Line sowing | Broadcasting & Line sowing |
| 4 | Seed rate | 3.75 kg/ha | 6-8 kg/ha |
| 5 | Spacing of row to row and plant to plant | 60 cm & 10-15cm | 45 cm & 10 cm |
| 6 | Plant population | Optimum | Uneven |
| 7 | Weed management | Pre emergence apply Atrazin @ 0.5 kg a.i./ha + one hand weeding | Weeding in not common |
| 8 | Doses of NPK fertilizers | 120-60-0 kg/ha | Imbalance and inadequate |
| 9 | Irrigation at critical stage | 8-10 | Unequal |
| 10 | Plant protection | Application of recommended dose of insecticide as per requirement | Use of incorrect dose and plant protection is not common |

**Table.2 Yield performance of FLD on pearl millet crop**

| Season | No. of Demon-stration | Variety | Grain yield (q/ha) | | % Increase in yield over farmers practice | Dry fodder yield (q/ha) | | % Increase in dry fodder yield over farmers practice |
|---|---|---|---|---|---|---|---|---|
| | | | Improved practice | Farmers practice | | Improved practice | Farmers practice | |
| Summer 2015 | 76 | GHB-558, GHB-732 | 39.67 | 37.92 | 4.61 | 69.43 | 56.89 | 22.04 |
| Summer 2016 | 75 | GHB-538, GHB-732 | 40.00 | 37.70 | 6.10 | 71.88 | 65.69 | 9.42 |
| Summer 2017 | 62 | GHB-558, GHB-538, GHB-732 | 45.15 | 41.47 | 8.87 | 74.92 | 66.07 | 13.39 |
| Summer 2018 | 50 | GHB-732 | 45.89 | 43.38 | 5.79 | 76.12 | 69.82 | 9.02 |
| Summer 2019 | 50 | GHB-538, GHB-732 | 47.39 | 44.94 | 5.45 | 75.91 | 69.06 | 9.92 |
| **Mean** | **313** | **-** | **43.62** | **41.08** | **6.17** | **73.65** | **65.51** | **12.76** |

**Table.3 Extension gap, technology gap, technology index and state average gap (%) of pearl millet under FLD and existing package of practices**

| Season | Grain yield (q/ha) | | Extension gap (q/ha) | Technology gap (q/ha) | Technology Index | State average yield gap (%) |
|---|---|---|---|---|---|---|
| | Potential | State average | | | | |
| Summer 2015 | 67.18 | 26.58 | 1.75 | 27.51 | 40.95 | 49.25 |
| Summer 2016 | 67.18 | 27.50 | 2.30 | 27.18 | 40.46 | 45.45 |
| Summer 2017 | 67.18 | 27.26 | 3.68 | 22.03 | 32.79 | 65.63 |
| Summer 2018 | 67.18 | 29.19 | 2.51 | 21.29 | 31.69 | 57.21 |
| Summer 2019 | 67.18 | 26.42 | 2.45 | 19.79 | 29.46 | 79.37 |
| **Mean** | **67.18** | **27.39** | **2.54** | **23.56** | **35.07** | **59.38** |

**Table.4 Economics of FLD on pearl millet crop**

| Year | Gross expenditure (₹/ha) | | Gross return (₹/ha) | | Net return (₹/ha) | | C:B ratio | |
|---|---|---|---|---|---|---|---|---|
| | Improved practice | Farmers practice | Improved practice | Farmers practice | Improved practice | Farmers practice | Improved practice | Farmers practice |
| Summer 2015 | 30656 | 31920 | 68512 | 63594 | 37856 | 31674 | 1:2.23 | 1:1.99 |
| Summer 2016 | 30875 | 32173 | 86816 | 81413 | 55941 | 49240 | 1:2.81 | 1:2.53 |
| Summer 2017 | 30387 | 31610 | 72821 | 66337 | 42435 | 34727 | 1:2.40 | 1:2.10 |
| Summer 2018 | 30268 | 31470 | 78690 | 73959 | 48422 | 42489 | 1:2.60 | 1:2.35 |
| Summer 2019 | 31247 | 32600 | 110720 | 104411 | 79473 | 71812 | 1:3.54 | 1:3.20 |
| **Mean** | **30687** | **31954** | **83512** | **77943** | **52825** | **45988** | **1:2.72** | **1:2.43** |

Selling price of pearl millet grain was 1377, 1811, 1281, 1383 and 2016 ₹/q in June month of 2015, 2016, 2017, 2018 and 2019, respectively. Dry fodder yield 200 ₹/q