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# EVALUATION OF FRONT LINE DEMONSTRATIONS ON IMPROVED VARIETY OF FODDER SORGHUM IN THE DANGS DISTRICT OF GUJARAT

**SAGAR A. PATEL*, BIPINCHANDRA M. VAHUNIA, PRATIK P. JAVIYA, HARSHAD A. PRAJAPATI, RAKESH S. PATEL, GAURANG B. PADSALA AND JENI H. LALWANI**

Krishi Vigyan Kendra
Navsari Agricultural University, Waghai (Dang)-394 730 (Gujarat), India
*****(*e-mail*: *drsagarpatel10@nau.in*)

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**SUMMARY**

The study implementing the Front Line Demonstrations (FLDs) were conducted during 2023–2025 by Krishi Vigyan Kendra, Navsari Agricultural University, Waghai–Dangs, Gujarat, to evaluate the field performance, productivity and economic benefits of improved fodder sorghum variety CSV 21F under farmers' field conditions. A total of 68 farmers covering 8.5 ha participated in the demonstrations. The demonstrated technology included CSV 21F along with recommended practices such as optimum seed rate, line sowing, balanced nutrient management, timely weed control and harvesting at the appropriate stage. The mean green fodder yield under FLD was 312 q/ha compared with 266.67 q/ha under farmers' practice, resulting in an average yield increase of 17.07% and an extension gap of 45.33 q/ha. The mean technology gap and technology index were 108 q/ha and 25.72%, respectively. Economic analysis showed higher benefit-cost ratios under demonstrations (2.98–3.34) compared with farmers' practice (2.37–2.78). The results demonstrated the productivity and economic potential of CSV 21F and indicated its suitability for improving green fodder availability under the farming conditions of the Dangs region.

**Key words:** Front line demonstration, fodder sorghum, fodder yield, extension gap and technology gap

Livestock plays a vital role in the Indian agricultural economy by providing income, employment and nutritional security to rural households. However, the productivity of livestock is largely constrained by the inadequate availability of quality fodder, as the country faces a chronic deficit of green and dry fodder (Singh *et al*. 2026). It is estimated that India experiences a deficit of about 11-12% green fodder and 25-30% dry fodder, which adversely affects milk yield and animal health (IGFRI 2019). However, nutritional insufficiency for livestock is one of the most burning worldwide problems of agricultural countries including India. Feeding and nutrition is playing a fundamental role in livestock rearing and account for 60-70 per cent of the total cost of milk production. It has been observed that imbalanced feeding with special reference to green fodder has tarnished the production potential of animals which in turn, affects the interest of dairy farmers due to low margin of profit leading to a nasty cycle (Khadda *et al*. 2021). Marginal farmers may have limited opportunities to cultivate green fodder, particularly during the lean season, where owning livestock is an alternate income generator. Under fodder, the production of sorghum plays an important role, in the nutrition and health of the dairy animals in India. The productivity of green fodder per unit area could be increased by adopting recommended scientific and sustainable packages and practices using a suitable high-yielding variety (Khadda *et al.* 2015).

Sorghum (*Sorghum bicolor* (L.) Moench) is an important fodder as well as grain crop grown in India and worldwide. Sorghum is mainly cultivated as fodder crop by the dairy farmers (Atri and Cheema, 2026). In smallholder farming systems, particularly in rainfed and tribal regions, seasonal fodder scarcity and low productivity of traditional fodder resources can restrict livestock productivity and increase the cost of feeding. Fodder sorghum is an important forage crop because of its high biomass-producing capacity, adaptability and usefulness as green fodder (Bhutada *et al*. 2020).

Absence of improved genotype, weed control, plant protection, fertilizer and irrigation resulted in 39, 33, 31, 30 and 22 per cent losses in the productivity of fodder sorghum as compared to full package of practices (Satpal *et al.,* 2021). Thus improved and location specific variety is very critical for realising the yield potential of fodder sorghum. High productivity of fodder sorghums also results in removal of huge quantity of nutrients, so application of recommended fertilizer dose is also important (Satpal *et al.,* 2026). CSV 21F is single-cut fodder sorghum cultivar used in forage-production systems and has been evaluated under different fertility and production environments in Gujarat. Front Line Demonstrations provide an effective mechanism for demonstrating recommended technologies in farmers' fields, allowing farmers to observe the difference between improved practices and their existing practices.

## MATERIALS AND METHODS

### Study period and location

The Front Line Demonstrations on fodder sorghum CSV 21F was conducted by Krishi Vigyan Kendra (KVK), Navsari Agricultural University (NAU), Waghai–Dangs, Gujarat, during 2023 to 2025. The thematic area of the demonstrations was fodder management, with improved fodder sorghum variety CSV 21F as the demonstrated technology throughout the study period. The FLDs were conducted under farmers' field conditions in villages associated with KVK, NAU, Waghai–Dangs, to evaluate the field performance, productivity and economic benefits of CSV 21F under prevailing farming conditions. A total 68 farmer beneficiary were associated under FLD programme and 8.5 ha area during the three-year period.

Prior to conducting the Front Line Demonstrations (FLDs), selected farmers were sensitized and trained on various aspects of the recommended cultivation practices through Kisan Gosthies, farmer–scientist interactions, farmer meetings and technical lectures. Before initiation of the demonstrations, training programmes were organized for farmers of the respective villages covering the envisaged technological interventions, site, selection of beneficiaries, layout and implementation of demonstrations. Regular visits by scientists and extension functionaries to the demonstration plots were also organized to provide technical guidance, monitor the implementation of recommended practices and facilitate wider dissemination of the demonstrated technologies among the farming community.

**2.2 Demonstration coverage of sorghum variety CSV 21F**

| Year | No. of farmers | Area (ha) |
|---|---|---|
| 2023 | 28 | 3.5 |
| 2024 | 20 | 2.5 |
| 2025 | 20 | 2.5 |
| Total | 68 | 8.5 |




Fig. 1. Fodder Sorghum seed distribution to the beneficiaries.

Demonstration of improved fodder sorghum variety CSV 21F along with recommended practices, including optimum seed rate, line sowing, balanced nutrient management, timely weed control and harvesting at the appropriate physiological stage for enhancing green fodder productivity and quality.

The FLD was conducted to study the technology gap between potential yield and demonstrated yield, extension gap between demonstrated yield and yield under existing practice. The yield data were collected from both the demonstration and farmers practice using random crop cutting method and analyzed. The technology gap, extension gap and technological index (Samui *et al.*, 2000, Javiya *et al.*, 2023 and Sunil *et al.*, 2020) were calculated by using following formula as given below:

1. Technology gap = Potential yield – Demonstration yield
2. Extension gap = Demonstration yield – Farmer practice yield
3. Technology index = Potential yield – Demonstration yield X 100/ Potential yield
4. Percent increase yield= Demonstration yield- Farmer practice yield X 100/ Farmer practice yield

## RESULTS AND DISCUSSION

### Frontline Demonstration analysis - fodder sorghum CSV-21F

The yield enhancement obtained in the present study was comparable with the findings of Der *et al.* (2025) from Narmada district of Gujarat, where sorghum FLDs recorded a 16.0% increase in fodder yield over farmers' practice. This close similarity suggests that improved sorghum varieties combined with recommended production technologies can provide a consistent productivity advantage under farmers' field conditions in different regions of Gujarat. The observed yield increase of 17.07% was in conformity with the findings of Gami *et al.* (2024) and Singh *et al.* (2026). It is evident from the results that the yield of improved variety was found better than the local variety under same environment conditions. Farmers were motivated by results of demonstrated agro-technologies applied in the FLDs and it is anticipated that they would adopt these technologies in future.

The mean extension gap of 45.33 q/ha observed in the present study indicates a substantial scope for increasing fodder production through adoption of the demonstrated technology. The

TABLE 1
Effect of new technology on average yield, extension gap, technology gap and technology index

| Year | Potential yield (q/ha) | Demonstration yield (q/ha) | Farmer practice yield (q/ha) | Technology gap (q/ha) | Extension gap (q/ha) | Technology index (%) | Percent increase yield (%) |
|---|---|---|---|---|---|---|---|
| 2023 | 420 | 310 | 257 | 110 | 53 | 26.19 | 20.62 |
| 2024 | 420 | 318 | 276 | 102 | 42 | 24.29 | 15.22 |
| 2025 | 420 | 308 | 267 | 112 | 41 | 26.67 | 15.36 |
| Mean | 420 | 312 | 266.67 | 108 | 45.33 | 25.72 | 17.07 |

TABLE 2
Effect of new technology on economics of different experimental year

| Category | Major parameters | | % change in major parameter | Economics of demonstration* (Rs./ha) | | | | Economics of check (Rs./ha) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demo | Check | | Gross cost | Gross returns | Net returns | BCR** (R/C) | Gross cost | Gross returns | Net returns | BCR (R/C) |
| **Dairy cow- 2023** | | | | | | | | | | | |
| 1. | 310 (q/ha) | 257 (q/ha) | 20.62 | 26000 | 77500 | 51500 | 2.98 | 27000 | 64250 | 37250 | 2.37 |
| **Dairy cow - 2024** | | | | | | | | | | | |
| 1. | 318(q/ha) | 276(q/ha) | 15.22 | 26000 | 79500 | 53500 | 3.05 | 27000 | 69000 | 42000 | 2.55 |
| **Dairy cow - 2025** | | | | | | | | | | | |
| 1. | 308 (q/ha) | 267 (q/ha) | 15.36 | 23000 | 77000 | 54000 | 3.34 | 24000 | 66750 | 42750 | 2.78 |




Fig. 2. Front line demonstration of fodder sorghum (CSV 21F) at farmers' field.




Fig. 3. Demonstration of improved fodder sorghum variety CSV 21F.

extension gap was highest in 2023 (53 q/ha) and declined to 42 and 41 q/ha during 2024 and 2025, respectively. Khadda *et al.* (2021) reported a much higher extension gap of 174 q/h for CoFS-29, while Der *et al.* (2025) reported an extension gap of approximately 8.84 q/ha in their sorghum FLDs. These differences are primarily attributable to variation in crop type, genotype, farmers' practice, productivity level and agro-environmental conditions. The positive extension gap observed consistently in the present study confirms the need for continued dissemination of improved fodder sorghum production practices.

The average technology gap of 108 q/ha and technology index of 25.72% indicate that CSV 21F was able to realize a substantial proportion of its potential yield under farmers' conditions. The technology index was considerably lower than the 69.84% reported for CoFS-29 by Khadda *et al.* (2021), suggesting comparatively better realization of the specified potential yield of CSV 21F in the present study. The remaining technology gap may be associated with variations in soil fertility, rainfall, moisture availability and field-level crop management, factors also identified by Khadda *et al.* (2021) as important causes of yield variation in fodder sorghum.

Economic analysis further established the viability of the demonstrated technology. The BC ratio under CSV 21F demonstrations increased from 2.98 in 2023 to 3.34 in 2025, compared with 2.37–2.78 under farmers' practice. Thus, the improved technology consistently provided better economic efficiency. This finding agrees with Khadda *et al.* (2021), who reported a BC ratio of 3.18 for fodder sorghum compared with 2.14 under the local check. Similarly, Der *et al.* (2025) reported improved economic viability of sorghum under FLDs in Narmada district. Similar improvements in BCR under FLDs have been reported by Singh and Chauhan (2021) and Ashoka *et al.* (2020).The higher BC ratio obtained under CSV 21F demonstrates that the technology was not only productive but also economically attractive to farmers.

## CONCLUSION

Based on observations of various parameters, it may be concluded that the fodder sorghum variety CSV 21F was superior to the local check in terms of green fodder yield and dry matter yield. Following the demonstrated potential of CSV 21F, farmers have shown increased interest in adopting the variety in place of traditional cultivars. Its adoption can contribute to increased farm income and help mitigate the scarcity of green fodder for livestock. Owing to its drought tolerance and multi-cut nature, CSV 21F has made a positive contribution to livestock-based farming systems. Therefore, CSV 21F may be considered a promising fodder sorghum variety for improving green fodder availability and supporting livestock production under suitable agro-climatic conditions of the Dangs region.

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