**Productivity Enhancement in sesame through Cluster-based Front Line Demonstrations in Telangana**

**ABSTRACT**

“Productivity Enhancement in sesame through Cluster-based Front Line demonstrations in Telangana” under NFSM was done in the Nalgonda district of Telangana. A total of 75 frontline demonstrations were carried out during summer season of 2022-23 in cluster approach at farmer’s fields. The demonstration was done on a land size of 30 hectares in a cluster base. Participatory training was given to all participants on important agronomic practices and management measures. All the recommended agronomic management was applied. Agronomic data and grain yield was collected and analysed. Accordingly, an average grain yield data of 0.725 tons ha-1was obtained. Feedback was also collected from participants and they preferred the technology based on its early maturity, yield per plant, branch per plant, disease resistance, seed colour, marketability, and overall yield. Thus, using this improved sesame (JCS-1020) variety with its agronomics management is advisable. This study was carried out to enhance productivity and farmer profitability in Telangana.

**Keywords:** cluster, demonstration, oil seed, production, sesame, yield

1. **INTRODUCTION**

India stands as a prominent player in the global oilseed industry, holding the position of one of the leading cultivators and importers of edible oils. Within the agricultural landscape of India, oilseed cultivation spans over 27.13 million hectares, yielding a total production of 33.21 million tones and at an average productivity of 1214 kg/ha [1]. The varied agro-ecological conditions prevalent in the nation provide a conducive environment for the cultivation of annual oilseed crops.

The Indian climate is suitable for the cultivation of oilseed crops; therefore, large varieties of oilseeds are cultivated here. Sesame (*Sesamum indicum* (L.) is one of the oldest oilseed crop and has been cultivated in ancient times. It is known variously as til, gingelly, simsim, gergelim etc. It is better known as “Queen of oilseeds” by virtue of its quality edible oil and protein content, as it contains 50 percent oil and 18-20 percent protein. Sesame oil has long shelf life and rich in linoleic acid [2]. India ranks first (16.73 Lakh ha) in area, production (6.5 Lakh tonnes) and productivity (391 kg ha-1) and export of sesame in the world [3]. Sesame ranks third in terms of total oilseed area and fourth in terms of total oilseed production in India. Madya Pradesh, Rajasthan, Gujarat and Andhra Pradesh are major sesame growing states in India. In Telangana nearly 2.75 Lakh hectares being cultivated every year. It is the major crop for Adilabad, Nizamabad, Karimnagar, Nalgonda, Medak and Mahbubnagar [4].

Despite its economic importance, sesame production in India is facing a lot of challenges and the production and productivity are declining. The main contributors to such transformation have been, 1) availability of improved oil seeds production technology and its adoption, 2) expansion of cultivated area, 3) price support policy, 4) institutional support, particularly establishment of technology mission on oilseeds in 1986 [5]. The improved technology packages were found to be financially attractive. Yet, adoption levels for several components of the improved technology were low emphasizing the need for better dissemination [6]. In response, the Krishi Vigyan Kendra, Kampasagar, has conducted adaptation research to select the sesame variety that best suits the area and gives a higher yield. Accordingly, the one that gave a higher yielder variety JCS 1020 was recommended for further demonstrations and promotion in the area. Therefore, this study was conducted to demonstrate improved sesame technology through cluster-based approach and to create awareness on improved sesame technology and get feedback for further technology development.

**MATERIALS AND METHODS**

Nalgonda district is one of the major sesame cultivating districts in Telangana. Cluster-based large-scale demonstration of Sesame technology was undertaken in the Nalgonda district of Southern Telangana zone by Krishi Vigyan Kendra, Kampasagar. Selected suitable farmland in 3 villages namely Guntipally of Nidmanoor mandal, Phalthi thanda of Thripuraram mandal and maligireddy gudem of thirmalgiri mandal during the summer season 2022-23. The area of 30 hectares was covered in all 3 villages of 3 mandals. The study was conducted with active participation of farmers to demonstrate the improved technologies of sesame, so as to establish production potentials and expand the area under the crop in the district. Present study with respect to CFLDs and farmers’ practices are given in Table 1. The soils in selected villages were sandy loam. Farmers were trained to follow the package of practices for Sesame cultivation as recommended by the State Agricultural University and need based input materials provided to the farmers.

Implementation design

Sesame production technology with improved variety JCS 1020 was used for the demonstration. The sesame production technology was implemented during the summer of 2022-23. The row planting method was employed and spacing of 30cm between rows and 10 cm between plants was used for the demonstration trial. The recommended seed rate of 5 kg/ha was used for sowing.

**Table 1. Particulars showing the details of Sesame grown under Cluster based FLDs and farmers’ practice**

|  |  |  |
| --- | --- | --- |
| **Operation** | **Farmers’ practice** | **Improved practices demonstrated under Cluster based FLDs** |
| Sowing | Broad casting of seed | Spacing 30 cm between rows and 10 cm between plants. |
| Use of variety | Local Variety | JCS 1020 |
| Seed treatment | No seed treatment | Seed treatment with imidacloprid @ 2ml/kg + mancozeb @ 3g/kg of seed |
| Powdery mildew and alternaria leaf spot tolerance | No tolerance | Tolerant variety |
| Weed management | No Weed management | Weeds control by using herbicide Pendimethalin 1kg / ha in 500 liter of water as pre-emergence treatment for effective control of weeds within two days after sowing. |
| Nutrient management | No fertilizer application | Recommended dose of fertilizers |
| Whole package | Farmers are cultivating the Sesame crop without adoption of any improved technology | All the crop (production and protection) management practices as per the package of practices for *Yasangi* crop by PJTAU, Hyderabad were followed for raising the crop |

**Training**

Pre-sowing trainings were organized with involving the selected farmers on the crops. Conducted Farmer training programmes to create awareness and improve the associated skill gap on improved agronomic practices of sesame technology. At each stage of the sesame production, different awareness creation works were done regarding seed treatment, fertilizer application, water and weed management, integrated pest and disease management etc.

**Data collection and analysis**

Farmers’ perception, trait preference and the data with respect to grain yield from FLD plots and from Farmers’ Practice of the area were collected and evaluated. Besides, constraints ranking method was to used rank sesame production constraints. Regular visit by the scientist helped in proper execution of trials as well as collecting farmer’s opinion on the demonstrated varieties. The performance of the varieties in the trials was judged visually as well as quantitatively by farmers themselves. Potential yield was taken in to consideration on the basis of standard plant population (404440 plants/ ha) and average yield per plant 22.5 g/plant under recommended package of practices with 30 X 10 cm crop geometry. Different parameters as suggested by Yadav *et al* (2004) [7] was used for gap analysis, and calculating the economics. The details of different parameters and formula adopted for analysis are as under

Extension gap = Demonstration yield - Farmers’ practice yield

Technology gap = Potential yield - Demonstration yield

Potential yield - Demonstration yield

Technology index = X 100

Potential yield

**RESULTS AND DISCUSSION**

**Achievement through the provision of training**

Training is one way of information delivery method that farmers enhance the level of awareness and practical skill of the target groups. Both theoretical and on-farm practical training sessions were arranged by Krishi Vigyan Kendra, Kampasagar. Theoretical training on sesame production technology and post-harvest handling was given to 38 (male=32, female=6) participants and given method demonstration on seed treatment.

**Monitoring and evaluation**

Monitoring was conducted from land preparation until the final yield harvesting. During monitoring, maintained frequent contact with participant farmers and getting feedback and providing technical advice were done. The stakeholders discussed the next steps, and potential new positions were identified. The roles and duties for the subsequent contributions toward improving sesame production and cluster-based demonstration along the production chain were distributed.

**Field day**

A field day was conducted in Guntipally village clusters at plant maturity stage with involving demonstration holding farmers, neighboring farmers, Scientists from KVK, Officials from Department of Agriculture and local extension functionaries to demonstrate the superiority of the technology. During the field day, a discussion section was organized to enhance awareness of demonstration farmers through experience sharing and also brochures and local media were used to boost the popularization of the technology.

**Practicing farmers’ trait preference of improved sesame production**

A cluster-based approach has multiple advantage of improving beneficiaries’ involvement in selecting technologies that fulfil their preference for sustainable technology diffusion and it enables beneficiaries to share experience, work together, use resource efficiently and access inputs has opportunity to maximize yield [8]. Thus, practicing farmers identified six common preference parameters to compare improved variety (JCS 1020) with local variety. The parameters were weighted according to their importance to be used as comparison, then technology with greater percentage from the total was selected as primary choice. The overall weighted ranking matrix result shows that improved sesame variety (JCS 1020) was the first choices of practicing farmers in all parameters. However, as the study area is agro-ecologically classified as dry land and described by recurrent rainfall shortage and their production practice of sesame is with irrigation by furrow irrigation system, practicing farmers’ given high score for early maturation, disease resistance, high yielding and marketability of improved sesame as compared to the locally available sesame variety (Table 2).

**Table 2. Preference of practicing farmers on improved variety** (JCS 1020) **and local variety**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Improved Variety** | | | | **Local variety** | | |
| **Parameters** | **Score** | **weight** | **Score\*weight** | **Score** | **weight** | **Score\*weight** |
| Oil content | 3 | 1 | 3 | 1 | 1 | 1 |
| Disease/pest/ resistance | 3 | 2 | 6 | 1 | 2 | 2 |
| Seed color | 3 | 3 | 9 | 2 | 3 | 6 |
| Yield | 3 | 5 | 15 | 1 | 5 | 5 |
| Marketability | 3 | 4 | 12 | 2 | 4 | 8 |
| Sum of Score\*weight | 45 | | | 22 | | |
| Rank | 1 | | | 2 | | |

Score = (1= Low 2= Medium 3= High) & Weight = (1=Early maturity 2=Disease resistance 3=seed colour4=Marketability 5=yield 6=Drought resistant

**Yield and yield components**

The result of the study revealed that the productivity of improved sesame with its technology packages was better than the local variety with existing farmers' practice (Table 3). Thus, the mean grain yield of improved sesame was 0.737 ton/ha and the yield of the local variety was 0.58 ton/ha in similar production years in the study area. This implies that improved sesame had higher yield advantage over the local variety. This greater yield advantage was achieved through the proper use of recommended technology packages such as the use of the improved variety, chemicals, seed rates, and good management practices. Production of crop depends on the qualities of seed (Kumawat, 2008) [9]. A similar yield result was also reported by Abady et al., 2017; Kinfe & Tesfaye, 2018; Birhane et al., 2019 [10][11][12]. The result suggested the positive effects of improved technology demonstrations over the existing farmers’ practice towards enhancing the yield of sesame with its positive effect on yield attributes.

**Table 3. Seed yield of Sesamum under Cluster based front line Demonstrations and Farmers Practice.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Area (ha)** | **Demonstrations (No)** | **Yield obtained (kg/ha)** | | | **Yield kg/ha** | | **Per cent**  **increase** |
| **Max.** | **Min.** | **Av.** | **Demo** | **FP** |
| 2022-23 | 30 ha | 75 | 825 | 575 | 737 | 737 | 580 | 27.0 |

**Performance of Cluster Demonstrations**

The study (Table 4) revealed that an extension gap of 157 kg/ha was found between demonstrated technology and farmers’ practice, which emphasized the need to educate the farmers through various means for the adoption of improved high yielding varieties and newly improved agricultural technologies to reverse this trend of wide extension gap. More and more use of new HYV's by the farmers will subsequently change this alarming trend to galloping extension gap [13]. The technology gap was 13 kg/ha, it was lowest due to better performance of recommended varieties with different interventions and more feasibility of recommended technologies during the course of study. Similarly, the technology index for all demonstrations in the study was in accordance with technology gap. The new technologies will eventually lead to the farmers to discontinuance of old varieties with the new technology. The technology index shows the feasibility of the evolved technology at the farmer's field. The lower the value of technology index more is the feasibility of the technology [14]. Higher technology index reflected the inadequate transfer of proven technology to growers and insufficient extension services for transfer of technology. Hence, it can be inferred that the awareness and adoption of improved varieties with recommended scientific package of practices have increased during the study period. The technology index was 1.73, which shows good performance of Cluster demonstrations in Nalgonda conditions and this will accelerate the adoption of newer technologies to increase the productivity of sesame in this area. These results are in conformity with the findings of Sagar and Chandra (2004), Rohit and Jitendra Singh, (2019)[13][14].

**Table 4. Technological gap analysis Cluster based front line Demonstrations on Sesame farmers’ field.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **No.of Demonstrations** | **Potential**  **yield**  **(kg/ha)** | **Demo**  **yield**  **(kg/ha)** | **FP**  **yield (kg/ha)** | **EG**  **(kg/ha)** | **TG**  **(kg/ha)** | **TI**  **(kg/ha)** |
| 2022-23 | 75 | 750 | 737 | 580 | 157 | 13 | 1.73 |

FP= Farmers practice EG= Extension gap; TG= Technology gap; TI= Technology index; FP= Farmers practices

**Economics**

Economic returns as a function of gain yield and MSP sale price varied during different years. The maximum gross returns of Rs. 51590/- and net returns of Rs. 28590/- were obtained. The higher additional returns and effective gain obtained under demonstrations could be due to improved technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring and also sale of seed to other farmers as a seed. The benefit cost ratio of demonstrations and farmers practice were 2.24 and 1.75 respectively (Table 5). Demonstration fields recorded higher net returns (Table 5) and B:C ratio in comparison to farmers' practise, these results are in line with the results of Meena *et al.* (2014) and Singh *et* *al.* (2014)[15][16].

**Table 5. Economics of sesame under Cluster based front line Demonstrations and Farmer's Practice.**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Variety** | **Farmer's Practice(Rs./ha)** | | | | **Demonstration plot(Rs./ha)(CFLD)** | | | |
| **Gross cost** | **Gross return** | **Net return** | **B:C Ratio** | **Gross Cost** | **Gross return** | **Net return** | **B:C ratio** |
| 2022-23 | JCS-1020 | 26000 | 45500 | 19500 | 1.75:1 | 23000 | 51590 | 28590 | 2.24:1 |

**Farmers’ Feedback**

At the end of the activity, feedbacks were collected from participants of participants to know their perception of the technology. Accordingly, they show their interest regarding the new sesame variety in comparison with their local ones. The criteria used to evaluate sesame production technology was its oil content, Early maturity, disease resistance, seed color, marketability, and overall yield relative to local.

**Learning outcome**

Mostly, the participants are Progressive farmers and the formation of groups makes them learn from each other. This helped the participatory group to undertake all the crop management activities. The other is the use of improved sesame and row planting were not common in the area. So, the participatory team spirit and the influence of group members on one another made a sense of competition between members. So, the formation of a participatory group is a main tool for technology adoption and the further diffusion of the sesame production technology in the study.

**CONCLUSION**S

Sesame is one of the crops produced in the area but they follow a traditional agronomic practice and use local seeds. As a result of these, sesame production and productivity are low in the area. Accordingly, the Cluster frontline demonstrations conducted on sesame at farmer’s field revealed that the adoption of improved technologies significantly increased the yield as well as gross and net returns to the farmers. Hence, there is a need to disseminate the high yielding varieties with improved technologies among the farmers with effective extension methods like training and demonstrations. Therefore, it may conclude that the sesame technology is a source of income and the technology should be scaled up in the area. The farmer’s should be encouraged to adopt the recommended package of practices for realizing higher returns.

**ETHICS APPROVAL**

Not applicable

**REFERENCES**

[1] Anonymous, “Department of Economics and Statistics, Ministry of Agriculture Cooperation and Farmers Welfare”, Government of India. 2020.

[2] G.B. Unde, “Optimization of spacing and fertilizer levels in sesame (*Sesamum indicum* L.)” (Doctoral dissertation, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani). 2017.

[3] R. Puspha, P. Senthil kumar, “Studies on the combining ability in sesame (*Sesamum indicum* L.). Paper presented in the National Seminar on Advances in Genetics and Plant Breeding - Impact of DNA revolution”, October 30-31, University of Agricultural Sciences, Dharwad, Karnauika, India, 2003.

[4] K. Vilakar, S. Sharma, H. K. Ravi, P. Madhukar Rao, P. Revathi, “Soil fertility status of sesame growing soils of Northern Telangana zone”, The Pharma Innovation Journal*;* SP-10(9): pp 267-271, 2021.

[5] DM. Hedge, “Becoming self – reliant”. Hindu survey of Indian agriculture, pp 45-47, 2004.

[6] V.R. Kiresur, S.V. Rumana Rao, D.M. Hedge, “Improved Technologies on Oilseeds Production - An Assessment of their Economic Potentials in India”*.* Agricultural Economics Research. Rev; 14 pp 95-108, 2001.

[7] K.R, Yadav, DS, Yadav, N. Ravi, S.K. Sanwal, P. Sarma, “Commercial Prospects of Ginger Cultivation in North Eastern Region, Division of Horticulture, ICAR Research Meghalaya”, Envis Bulletin:Himalayan Ecology, 12(2), 2004.

[8] T. Abate, M. Fisher, T. Abdoulaye, T. [Girma Kassie](https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-017-0108-6#auth-Girma_T_-Kassie-Aff5),  [R. Lunduka](https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-017-0108-6#auth-Rodney-Lunduka-Aff6), P. [Marenya](https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-017-0108-6#auth-Paswel-Marenya-Aff2), W. [Asnake](https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-017-0108-6#auth-Woinishet-Asnake-Aff2), “Characteristics of maize cultivars in Africa: How modern are they and how many do smallholder farmers grow?”, Agriculture & Food Security, 6, pp 30, 2017

[9] S. R. Kumawat, “Impact of front line demonstration on adoption of improved castor production technology”*.* Rajasthan Journal of Extension Education. 16, pp 143-147, 2008.

[10] S. Abady, G. Liku, D. Yadeta, “Participatory varietal selection and evaluation of twelve sorghum (Sorghum bicolor (L.) Moench) varieties for lowlands of Eastern Hararghe”. International Journal of Plant Breeding and Crop Science*,* 4*,* pp281-285, 2017.

[11] H. Kinfe, Tesfaye. A, Yield Performance and Adoption of Released Sorghum Varieties in Ethiopia. *Edelweiss Applied Science and Technology, 2*(1), 46-55, 2018.

[12] G. Birhane, F. Belay, T. Gebreselassie, D. Desta, “Enhancing sorghum yield through demonstration of improved sorghum varieties in Tanqua-Abergelle Wereda, Central Zone of Tigray, Ethiopia”*.* Journal of Agricultural Extension andRural Development, 11(1), pp 11-16, 2019.

[13] Rohit and Jitendra Singh, “Impact of front line demonstrations on sesame (*Sesamum indicum* L.) in Agra district of Utthr Pradesh. Journal of Pharmacognosy and Phytochemistry, 8(6): pp 339-341, 2019.

[14] R. L. Sagar, G. Chandra. “Front line demonstration on sesame in West Bengal”. Agricultural Extension Review.; 10, pp 7-10, 2004.

[15] B. L. Meena, R. P. Meena, R. R. Meena, Bhim Singh, “Popularization of improved maize (*Zea mays* L.) production technology through frontline demonstrations in semi-arid zone IVA of Rajasthan”. Journal of Applied and Natural Sciences,6(2), pp 763-769, 2014.

[16] A. K. Singh, K. C. Singh, Y. P. Singh, D. K. Singh “Impact of frontline demonstrations on adoption of improved practices of oilseed crops”. Indian Research Journal of Extension Education, 14(3): 75-77. 2014.