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Impact of Cluster frontline demonstrations (CFLD) oil seeds on increasing yield of Niger (*Guizotia abyssinica* L.) in tribal district of Mandla, Madhya Pradesh

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Abstract
The study was carried out by Krishi Vigyan Mandla district of Madhya Pradesh to know the yield gaps between scientific package and practices under cluster front line demonstration (CFLD oilseeds) and farmer's practice (FP) of Niger crop under rainfed condition. Cluster Front Line Demonstration on Niger were conducted on farmer's fields during kharif season of two sequential years i.e. 2018-2019 and 2019-2020 under National Food Security Mission (NFSM), Govt. of India to demonstrate the impact of enriched agro-techniques on production and economic benefits under rainfed conditions. CFLD's were conducted in 21.6 ha and 20 ha area for two years with active involvement of 104 farmers and scientific staff of Krishi Vigyan Kendra, Mandla. According to analysis of data the highest grain yield was obtained in demonstrated plots with an average of 5.53 q/ha as compared to local check with an average of 3.68 q/ha. An average mean of extension gap, technology gap and technology index were calculated as 1.85 q/ha, 1.97q/ha, 26.27 percent, respectively. Adoption of improved package of practices in Niger cultivation recorded average higher B:C ratio (2.82) as compared to Farmers Practice (2.47) during the period of study. Thus, the productivity of Niger could be increased with the adoption of recommended improved package of practices. The study resulted in satisfying the farming community for higher productivity and returns.

Keywords: Niger, front line demonstration, technology gap, impact, existing, technology index

Introduction
Tribal district of Mandla, Madhya Pradesh in India situated at an elevation of 1,768 feet (539 meters) above sea level an upland plateau at a U- shaped bend in the Narmada River where it is joined by the Banjar River. Mandla district has an area of of 8771 km^2. There are 9 blocks, 4 tehsils and 1214 villages in the district. Niger (*Guizotia abyssinica* L.) commonly known as ramtil, jagni or jatangi (Hindi), ramtal (Gujrati), karale or khurasani (Marathi), uhechellu (Kannada), payellu (Tamil), verrinuvvulu (Telugu), alashi (Oriya), sarguza (Bengali), ramtil (Punjabi) and sorguja (Assamese) in different parts of the country. It is an important edible oilseed crop of Indian tribal communities, which contains edible oil 38–43%, protein 20% and sugar 12%. As because Niger can be grown with minimum agro inputs, it is considered to be a crop for resources poor farmers particularly in developing countries like India. India is the chief producer of Niger seeds which ranks second and fourth position in the world for its acreage and annual production respectively (Dalei *et al*., 2014). It is grown in the states of Madhya Pradesh, Chhattisgarh, Odisha and Maharastra and to a lesser extent in Karnataka, Bihar, Jharkhand, Gujarat and Andhra Pradesh. The niger seed has nearly 40% of oil which is used in foods, paints, soft soaps, lighting, lubrication and cosmetics (DOR, 2013). In India about 75% of the harvested seeds are used for oil extraction and the rest is exported for bird food. Roasted or fried seeds are eaten as snacks or used as a condiment. The press cake after oil extraction contains 31–40% protein and is used as cattle feed. Since, the crop is cultivated by poor tribal farmers in the interiors of villages in scattered fields. KVK's are grass root level organizations meant for spreading of technology through refinement, assessment and demonstration of proven production technologies under different micro-farming situations (Das, 2010). The main aim of Krishi Vigyan Kendra is to reduce the time lag between generations of technology at the research and its transfer to the farmers for increasing productivity and income from agriculture and allied sectors. The main objective of Cluster Front Line Demonstration under National Food Security Mission was to demonstrate improved

crop production technologies of oilseeds on the farmers field and to popularize the newly notified improved varieties auto technologies for varietal diversification and efficient management of resources the present investigation was undertaken to study the impact of cluster frontline demonstration on yield of Niger (*Guizotia abyssinica* L.) under rainfed condition in Mandla district of Madhya Pradesh with the objective of increasing productivity and executed to narrow down the time lag and insured speedy adoption of technologies in district.

Materials and Methods

Cluster Frontline Demonstrations (CFLDs) on improved farm technology (Table 1) were conducted by Krishi Vigyan Kendra Mandla of JNKVV Jabalpur in Niger (JNC9) during kharif 2018-2019 and kharif 2019-2020 under rainfed conditions on 41.6 ha area of Mandla district covering 104 farmers. The improved technology such as improved varieties seed (JNC9) method of line sowing with Nari plough and seed drill, seed treatment with vitavax power and bio control agents weed management and integrated pest management practices was maintained during period of study seed treatment was done with vitavax power 2 gm/kg seed trichoderma at @ 5 gm/kg and PSB @ 5 gm/kg of seed before sowing to protect the crop against fungal diseases up to 20-25 days after sowing the seed rate of Niger was kept 10 kg/ha in demonstrations plot the sowing of Niger was done during 10th August to 15th August during the study period the spacing between row to row and plant to plant was kept 30x10 for the Cluster Frontline Demonstrations. The fertilizers were also given in the ratio of 20:40:20:10 kg/ha as basal dose spraying of chloropyriphos+ cypermethrin for controlling of insect and pests like aphids and Niger fly @1250 gm/ha. The data were collected from beneficiary farmers through personal interviews and after that data was tabulated and analysed to find out the findings and conclusions. The yield increase in demonstrations over farmers practice was calculated by using following formula.

$$\% \text{ Yield increase over farmer's} = \frac{\text{Demonstration average plot yield} - \text{Famer's average plot yield}}{\text{Farmer's average plot yield}}$$

Estimation of technology gap, extension gap and technology index

Extension gap means adoption of improved transfer of technology in demonstrations practices resulted in maximum grain yield than traditional farmer's practices. The similarly observations were also obtained in black gram crop by Mahalingam *et al*., (2018) Bairwa *et al*., (2013) [1], Hiremath and Nagarju (2010) [4] and also Jamwal Anamika *et al*. (2020). The estimation of technology gap, extension gap and the technology index were worked out by using following formula (Kadian *et al*., (1997) [5] Samui *et al*., 2000) [8].

- Technology yield gap = Potential yield – Demonstration plot average yield
- Extension yield gap = Demonstration plot average yield-Farmer's plot average yield

$$\text{Technology index} = \frac{\text{Technology yield gap}}{\text{Potential Yield}} \text{ x } 100$$

Results and Discussion

The findings of the study as well as relevant discussion have been conferred under following points.

Grain Yield

Data presented in Table 2 revealed that transfer of improved technology under Cluster Frontline Demonstrations in Niger resulted in higher yield as compared to farmer's practice. The higher yield in demonstration plot was due to improved variety of seed, seed treatment with bio control agent, integrated pest management practices. The average seed yield of demonstration plots was 5.53q/ha (Table 2) which was higher as compared to farmers practice 3.68 q/ha. The increased yield percentage over control was 50.05% in Cluster Frontline Demonstration over local check. However the seed yield of 5.53 q/ha in CFLD's was low as compared to potential yield 10 quintal per hectare of Niger variety JNC9 due to attack of Niger pod fly. The yield enhancement through adoption of improved technology has also been reported in earlier studies of FLD's (Kothyari *et al*. 2018 and Kumar *et al*. 2019 and Jamwal Anamika *et al*. 2020). Yield of the Frontline Demonstration trials and potential yield of the crop was compared to estimate the yield gaps which were further classified into technology and extension gaps (Hiremath & Nagarju; 2009 and Jamwal Anamika *et al*. 2020) [4].

Extension Yield gap

An average extension gap between demonstrated practices and farmers practices was recorded 1.85 q/ha (Table2). Higher extension gap in present study suggested that there is a need to motivate and aware the farmers for adoption of improved technologies in Niger over existing local farm practices. The similar results were also reported by Bairwa *et al*. 2013 [1] Gangadevi *et al* 2018 Jamwal Anamika *et al*. 2020.

Technology Yield gap and Technology Index

The technological gaps generally appear even if the CFLD'S were conducted under the strict direction of farm scientists on the farmers field the data presented in table 2 showed that the value of technological gap was lower 1.90 to till per hectare during the year 2019-20 while during 2018-19 the technological gap was 2.04 per ha the technology gap observed may be attributed to the decimal dissimilarity in soil status, lake of irrigation facilities non congenial weather conditions, disease and pest attacks and change in the position of demonstrations plots every year. Technology index specified the feasibility of the generated Technology at the farmer's fields under existing agro climatic conditions (Vedna *et al*. 2007) [9]. The results of table 2 revealed that value of technology index was 27.20% and 25.33% during 2018-2019 and 2019-20 respectively. Whereas the average value of technology index was recorded 26.27%. Lower the value of the technology index more is the feasibility and applicability of the tested technology. This showed that a gap existed between technology evolved and technology adopted at farmer's field. The similar results were also observed by Gangadevi *et al*. 2018, Chaudhari *et al*. 2019 and Jamwal Anamika *et al*. 2020

Table 1: Technology demonstrated in CFLD's and Farmer's practices

S/No.	Intervention	Demonstrated Intervention	Farmers Intervention
1	Field preparation	2 ploughings	Single plough
2	Method of sowing	Line sowing by seed drill & Nari	Broad casting
3	Seed variety	JNC9	Local
4	Seed treatment	vitavax power @ 2 gm/kg seed, PSB @ 5gm/kg seed	Not treated
5	Seed rate	10kg/ha	15-20 kg/ha
6	Manures and fertilizers	PSB 500ml, with 100kg vermicompost and sulphor 20:40:20:10	Nil
7	Weed management	Pendimethaline @ 2.5lit/ha	No pre emergence used
8	IPM measures	IPM practices like spray of Neem oil and pheromone traps, yellow sticky traps	Imbalance use of pesticides
9	Technical guidance	Time to time	Nil

Table 2: Year wise productivity, extension gap, technology gap and technology index of Niger under CFLD's and existing package of practices.

Year	Yield q/ha		Increase yield % over Control	Extension gap (q/ha)	Technology gap (q/ha)	Technology Index %
	Demo	Farmer's Practice				
2018-19	5.46	3.65	49.58%	1.81	2.04	27.20
2019-20	5.60	3.72	50.53%	1.88	1.90	25.33
Mean	5.53	3.68	50.05%	1.85	1.97	26.27

Table 3: Cost of cultivation, Gross return and B:C ratio of Niger under CFLD's and existing package of practices.

Year	Cost of Cultivation (Rs/ha)		Gross Return (Rs/ha)		Net Return (Rs/ha)		B:C Ratio	
	Demo	Farmer's Practice	Demo	Farmer's Practice	Demo	Farmer's Practice	Demo	Farmer's Practice
2018-19	10500	8000	29484	19710	18984	11710	2.80	2.46
2019-20	10700	8200	30240	20088	19540	11888	2.83	2.48
Mean	10600	8100	29862	19899	19262	11799	2.82	2.47

Economic analysis of Cluster Front Line Demonstrations

Average cost of cultivation of demonstration plot (Rs10600/ha) is more as compared to Farmer's practice (Rs 8100/ha). The data in table 3 clearly clarified the implication of Cluster Frontline Demonstration at Farmer's field during the period of study in which higher average net return rupees 19262 were acquired under Demonstration plots as compared to farmer's practice (Rs 11799/ha). Benefit cost ratio recorded was also higher in demonstration plots (2.82) as compared to farmer's practice (2.47) increased monetary returns as well as Benefit cost (B:C) ratio through improved farm technology have also been reported by various scientists (Vedna *et al*. 2007, Bairwa *et al*. 2013 and Jamwal Anamika *et al*. 2020) [1, 9].

Conclusion

The present study indicated that the incorporation of improved farm technology practices along with active participation of farmer's of the area has positive effect on increasing the grain yield and economic return of Niger in Mandla district the economic viability of suitable technology for increasing the productivity of Niger motivated the farmers towards adoption of technologies demonstrated at farmer's field.

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