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Assessment of kharif oilseed crop varieties and technologies disseminated through cluster frontline demonstrations in Chhattisgarh

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Abstract
Cluster Frontline Demonstration is an effective tool to demonstrate the latest high yielding varieties along with critical inputs on cluster basis in farmers' fields with a view to show the potentiality of the technologies to the participating farmers, neighbouring farmers and to analyse the production performance of the technologies for scientific feedback. Cluster Frontline Demonstrations on Oilseed crops (Groundnut, Niger, Sesame and Soybean) during kharif season were conducted by 27 KVKs in Chhattisgarh from 2017-18 to 2021-22. 4263 no. of CFLDs were conducted covering an area of 1801 ha under oilseeds. Productivity of oilseed crops obtained in FLDs was higher than the district average indicating potential for bridging the yield gap. Results of CFLDs on Oilseeds have shown encouraging results. It will also help in breaking yield plateau to achieve production of sufficient quantity of oilseeds to meet per capita availability for ensuring nutritional security and agro- ecological sustainability. 27 KVKs of Chhattisgarh were actively involved in conduction of CFLDs. The major technologies focused in the demonstration were introduction of suitable crops and their high yielding varieties, method of sowing, seed treatment, line sowing, integrated nutrient management and integrated pest management. Under this programme 1801 ha area was covered with demonstration of pulses across 27 districts from 2017-18 to 2021-22. During 2017-18, a total of 815 CFLDs were laid out in 345 ha area, in 2018-19, 1165 CFLDs were laid out in 470 ha area, during 2019-20, 476 CFLDs were laid out in 210 ha area, in 2020-21, 680 CFLDs were laid out in 302 ha area and in 2021-22, 1127 CFLDs were laid out in 474 ha area. Under the C.F.L.Ds on oilseeds Groundnut, Niger, Sesame and Soybean demonstrations were conducted in 1801 ha area in Kharif season during the last 5 years.

Introduction

Edible oils occupy a unique place in Indian society, culture, dietary patterns and economy of the country. Due to diverse agro-climatic conditions and geographical locations, farmers are able to grow the entire nine annual oilseeds *viz.* groundnut, mustard, soybean, sunflower, sesame, safflower, Niger, castor and linseed. Oilseeds are the rich source of energy, containing twice as much energy (9 kcl/g) as carbohydrate or protein (4 kcl/g), (FAO, 1980). In India, oilseeds are the second most important crop after cereals sharing 14 per cent of the country's gross cropped area and accounting for nearly 3 per cent of the gross domestic product (GDP). Value wise, oilseeds constitute nearly 6 per cent of the value of all agricultural products. India grows oilseeds on an area of nearly 27 million hectares with productivity of 1108 kg per hectare. Consumption of vegetable oils is increasing steadily because of the lifestyle changes in dietary pattern and increasing per capita income. Like pulses, oilseeds also face severe challenges in terms of climatic stresses and unfavourable farming conditions, oilseeds cultivation is mainly undertaken on marginal land by resource poor farmers who are generally reluctant to provide necessary inputs for increasing the productivity. Nearly, 82 per cent area of oilseeds cultivation fall under rainfed farming where climatic vagaries cause severe damage to crops.
Oilseeds also face a plethora of challenges. India is one of the largest producers of oilseeds in

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the world and contributes about 6-7% of the world oilseeds production. Though, India ranks among leading producers of oilseeds in the world which is close to 10 per cent, majority of oilseed production comes from rainfed areas, due to insect infestation and other problems farmers don't take interest in cultivation of oilseeds. At the same time, India is fortunate in having a wide range of oilseeds crops grown in its different agro climatic zones. Groundnut, mustard, sesame, safflower, linseed, Niger seed, castor are the major traditionally cultivated oilseeds. Our total consumption of edible oils is between 180 - 190 lakh tonnes annually. 50-60 per cent of this requirement is met through imports, bulk of which is in the form of palm oil imported from Indonesia and Malaysia. Ten top oil seed growing states account for 93 per cent acreage and 96 per cent production. Contribution of remaining states is negligible.

Govt. of India had started Technology Mission on Oilseeds in 1986 which has been converted into a National Mission on Oilseeds and Oil Palm (NMOOP) in 2014. This gave a thrust to Government's efforts for augmenting the production of oilseeds. This is evident by the increase in the production of oilseeds from about 11.3 million tonnes in 1986-87 to 36.56 million tons in 2020-21.

Area under cereals, pulses and oilseeds has increased in Chhattisgarh. In cereal crops the area under summer paddy and wheat has increased significantly, in case of oilseeds, area under sesame and groundnut has increased significantly. Maize, horse gram, mustard and Niger are the major crops in Bastar plateau, while wheat, mustard, linseed, sesame, Niger & black gram are the major crops in northern hill zone. Sugarcane followed by groundnut and maize are the major Zaid (summer) crops in Chhattisgarh.

Till date, the productivity level of pulses and oilseeds is not sufficient on account of several biotic and abiotic stresses besides unavailability of quality seeds of improved varieties in time and poor crop management practices due to unawareness and non-adoption of recommended production and plant protection technologies. Therefore, it is essential to demonstrate the high yielding varieties, resistant to biotic and abiotic stresses and other production technologies to which the farmers generally do not adopt. A wide gap exists between the available techniques and its actual implementation by the farmers which is reflected through poor yield in the farmers' fields. There are so many appropriate technologies generated at agricultural universities and research stations but the productivity of oilseeds is still very low due to poor transfer of technology from the points of its development to the points of its utilization and only a little new knowledge percolates to the farmers' fields hence, a vast gap has been observed between knowledge production and knowledge utilization. To achieve target of additional production of oilseeds, Cluster Frontline Demonstration (CFLD) of oilseeds on farmer's field may be helpful. The basic objective of this programme is to demonstrate improved proven technologies of recently released, early maturing, high yielding, varieties in a compact clusters with nutrient management, weed management and pest management at farmers field to bring in enhanced application of modern technologies to show high yield. Keeping this in view, demonstrations were conducted in 0.4 ha each to assess technological gap and production gain on some selected oilseed and pulse crops as per the suitability of district needs and farmer's choice.

Frontline Demonstrations in oilseeds under CFLD have been initiated involving all 27 KVKs across the state. Farmers are realizing potential of oilseed crops through these demonstrations and are adopting these remunerative crops in large scale.

Materials and Methods
India's economy has been dominated by agriculture. However, Indian agriculture fiercely depends on monsoon to yield sufficient agricultural returns. India's major food crops rice and wheat have been heavily incentivized with MSP in addition to preferential treatment of Public Distribution System to benefit the Indian poor. Hence, Indian farmers are motivated to grow either these crops or cash crops like cotton, sugarcane etc. Pulses and oilseeds have been a second choice for the farmers for cultivation.

Over a period of time, a number of improved oilseed varieties and production technologies have been developed, but full potential of these varieties as well as technologies could not be exploited due to low rate of adoption and low yields. Thus, factors limiting the productivity cannot be overlooked. It may emphasize on quality attributes, adoption and popularization of new agro technology, evolving better varieties for stress conditions and improving present yield potential. The aim of these demonstrations in general is to raise production through transfer of farm technology.

Cluster front line demonstrations (CFLDs) is one of the most powerful tool of extension because farmers, in general, are driven by the perception that "Seeing is believing". Cluster Front Line demonstrations (CFLDs) is a unique approach to provide direct interface between scientist and farmers as the scientists are directly involved in planning, execution and monitoring of the demonstrations for the technologies developed by them and get direct feedback from the farmers about the crops in general and technology being demonstrated in particular. This enables the scientists to improvise upon the research programme accordingly. CFLDs provide an opportunity to researchers and extension personnel for understanding the farmer's resources and requirement to fine tune and/or modify the technologies for easy adaptability at farmers' fields.

Frontline Demonstration is a form of applied research through university system on latest released varieties along with critical inputs on selected farmers' fields with a view to demonstrate the potentiality of the technologies to (a) participating farmers (b) neighbouring farmers and other agencies; (c) to analyse the production (d) performance of the technologies for scientific feedback.

Objectives
The main objective of cluster frontline demonstrations is to demonstrate newly released crop production and protection technologies and its management practices in the farmer's field under the micro-farming situation.

Selection of site and beneficiary
- The sites of demonstrations selected were easily accessible to attract large number of farmers for more impact, easy monitoring and feedback.
- Technologies selected were of paramount importance and preferred by farmers.
- To create better and visible impact of a technology, the demonstrations were conducted in cluster approach of at least cluster of 10.0 hectares. One demonstration at individual farmer was not less than 0.4 hectare and not exceeding to one hectare.

- Demonstrations of improved variety and technology were planned well before time.
- Demonstrations were conducted on farming situations for scientific interpretation.

Under the ICAR sponsored scheme on oilseed production and protection technology, KVKs of Indira Gandhi Krishi Vishwavidyalaya, Raipur conducted cluster front line demonstrations on different oilseed crops during *kharif* season from 2017-18 to 2021-22. The Krishi Vigyan Kendras organized CFLDs in various villages of concerned districts of KVKs. A list of farmers was prepared from group meeting and training was imparted to the selected farmers regarding different aspects of recommended production and protection technologies. Assessment of gap in adoption of recommended technology were also identified before laying out the cluster frontline demonstrations (CFLD's) through personal discussion with selected farmers.

The technological interventions on pulse crops were comprised of suitable improved varieties and demonstrated role of critical inputs *viz*. proper tillage, proper seed rate, time of sowing and sowing method, seed treatment, application of biofertilizers, weed management and improved plant protection measure were applied at farmers' fields. Control plot (farmers practice) was also kept where farmers practices were carried out (use of non-descriptive varieties, broadcasting sowing method, no use of fertilizer and seed treating chemicals, no hand weeding and indiscriminate use of plant protection measures). Critical inputs for the technologies to be demonstrated were distributed to the farmers after the training like improved high yielding variety, recommended chemicals and literature etc and regular visit, monitoring and pest and disease advisory services management by the KVK scientist to the demonstration farmers.

The demonstrations on farmers' fields were monitored by scientists of Krishi Vigyan Kendra and officials of Indira Gandhi Krishi Vishwavidyalaya, Raipur right from sowing to harvesting and made to guide them. Finally, field day was conducted involving demonstration holding farmers, other farmers in the village, and scientists from university and officials from Department of Agriculture to demonstrate the superiority of the technology for each crop. These visits were also utilized to collect feedback information for further improvement in research and extension programme. The yield data were collected from the demonstrations and control plots and analysed with the suitable tools for different parameters.

Crop yield was recorded from the demonstration and control plots for the crops at the time of harvest. The most feasible way by which this could be achieved is by demonstrating the recommended improved technology on the farmer's fields through front line demonstrations with the objectives to work out the input cost and monetary returns between front line demonstration and farmers methods, to identify the yield gaps between farmer's practices and frontline demonstrations. The basic information was recorded from the farmer's field and analysed to comparative performance of cluster frontline demonstrations (CFLD's) and farmer's practice.

The yield data were collected from both the demonstration and farmers' practice.

Results and Discussion
Cluster Frontline Demonstrations on Groundnut were conducted by different KVK's during the Kharif season from 2017-18 to 2021-22 in 429 ha. The results reveal that average higher yield (12.78 q/ha) was recorded in CFLD's as compared to farmer's practice (6.84 q/ha). An appreciable increase in the net income (Rs. 42938 /ha) was attained over farmers practice (Rs. 20559/ha). The B: C ratio exhibited the same trend as in net returns which was found 2.98 in CFLDs and 2.44 in farmers practice. By conducting Cluster frontline demonstrations of improved variety with intervention of proven technologies the groundnut productivity was enhanced to a great extent leading to horizontal spread of this technology to 838 ha. The data also indicate average yield gap of 22.34% over district average yield.

Niger commonly known as Ramtil or Jatgi is grown under rainfed conditions mainly in the Northern and Southern part of Chhattisgarh. 1450 Cluster Frontline Demonstration on Niger were conducted from 2017-18 to 2020-21 in 600 ha in different villages to evaluate the impact of scientific production techniques on productivity and profitability. It was observed that Cluster Frontline Demonstrations gave a favourable yield increase of 4.61 q/ha over farmers practice (2.65q/ha). A higher net return of Rs. 17671 /ha was achieved in comparison to farmers practice. The results clearly indicate that the use of improved variety and package of practices with scientific intervention contributed to the increase in productivity and profitability of Niger leading to the horizontal spread of this technology to 1564 ha. The data also indicate average yield gap of 33.56% over district average yield.

Cluster Frontline Demonstrations on Sesame was conducted during the kharif season from 2017-18 to 2021-22 involving 742 demonstrations in 342 ha for enhancing the profitability of sesame using proven technology through scientific crop management practices. The demonstrated technology led to a yield increase of 5 q/ha in comparison to farmers practice 3.41 q/ha. Increased net returns (Rs.18774/ha) and B: C ratio (2.38) over farmers practice (Rs.9683/ha, 1.93) was also observed. The farmers were motivated to adopt the improved production technologies resulting in the horizontal spread to 623 ha area and resulting in yield gap of 27.78% over the district average yield.

Cluster Frontline Demonstrations on Soybean were conducted consecutively for 5 years from 2017-18 to 2021-22. The package of improved practices demonstrated encompassed use of improved variety, seed treatment with biofertilizers and integrated nutrient management. The improved technology recorded average yield of 12.66 q/ha which was 69% higher than that obtained with farmers practice of 7.54 q/ha. The improved technology also gave higher net return of Rs. 30144/ha with benefit cost ratio 2.89 as compared to farmers practice (Rs.15130/ha, 2.23). The data shows that during the last 5 years the demonstrated technology has horizontally spread over an area of 1336 ha attaining an average yield gap of 21.54% over district average yield.

Table 1: Performance of cluster frontline demonstrations on groundnut during kharif 2017-18 to 2021-22

Year	KVK's	Variety	No. of Demos	Area (Ha)	Yield (q/ha)		Yield increase in (%)	Net Returns (Rs/ha)		B: C ratio		District yield (q/ha)	Yield gap in (%)	Horizontal spread of technology (Ha)
					FP	Demo		FP	Demo	FP	Demo			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2017_18	Dantewada	K-6	50	20	5.3	10.47	98%	10085	25592	1.75	2.22	9.8	6.40	20
	Surguja	K-6	70	30	6.57	13.79	110%	15737	37366	2.17	2.56	9.80	28.93	24
Tot./Avg.			120	50	5.935	12.13	104%	12911	31479	1.96	2.39	9.8	17.67	44
2018_19	Kabirdham	Dharani	25	10	7.25	13.85	91%	21953	46727	2.63	3.23	12.80	7.58	20
	Korba	Dharani	22	10	8.40	13.20	57%	26076	45048	2.74	3.31	9.80	25.76	23
	Koriya	Dharani	25	10	6.35	11.32	78%	15852	34355	2.04	2.64	9.95	12.10	19
	Mahasamund	Dharani	125	50	4.80	9.86	105%	10472	25435	1.81	2.12	7.50	23.94	26
	Mungeli	Dharani	50	20	6.86	11.73	71%	18345	36360	2.21	2.73	7.50	36.06	29
	Raigarh	K-6	49	20	8.28	14.05	70%	25289	47705	2.66	3.27	11.50	18.15	25
Tot./Avg.			296	120	6.99	12.34	79%	19664	39271	2.35	2.88	9.84	20.60	142
2019_20	Korba	Dharani	25	10	7.62	13.52	77%	23586	46317	2.55	3.06	10.20	24.56	28
	Mahasamund	Dharani	25	10	5.14	11.32	120%	12163	34119	1.87	2.45	8.85	21.82	42
	Mainpat	K-6	25	10	6.20	12.45	101%	17058	39871	2.18	2.70	8.50	31.73	30
	Mungeli	Girnar-03	10	10	7.59	12.65	67%	25133	43389	2.86	3.07	8.15	35.57	45
	Surguja	Dharani	22	10	6.80	13.67	101%	21112	48580	2.56	3.31	9.80	28.31	38
Tot./Avg.			107	50	6.67	12.72	93%	19810	42455	2.40	2.92	9.1	28.40	183
2020_21	Bastar	ICGV-00350	50	20	6.55	12.10	85%	21051	42828	2.56	3.04	8.40	30.58	25
	Jashpur	K-9	50	20	7.75	13.52	74%	26381	50318	2.82	3.40	12.86	4.88	30
	Mainpat	Dharani	50	15	7.00	14.00	100%	22425	50350	2.55	3.14	9.85	29.64	55
Tot./Avg.			150	55	7.1	13.21	86%	23286	47832	2.64	3.19	10.37	21.70	110
2021_22	Balod	TCGS-1157	29	14	7.10	12.78	80%	25905	49929	2.92	3.38	8.60	32.71	21
	Balrampur	ICGV-91114	25	10	7.50	13.50	80%	27125	53925	2.87	3.57	9.00	33.33	17
	Gariaband	Dharani	50	20	7.40	12.78	73%	26570	49929	2.83	3.38	11.20	12.36	21
	Jashpur	K-9	50	20	8.19	12.75	56%	30255	49763	2.99	3.37	12.50	1.96	42
	Korba	Dharani	50	20	7.85	14.51	85%	28368	59531	2.87	3.83	11.33	21.92	35
	Mahasamund	Dharani	50	20	6.78	12.85	90%	24129	50318	2.79	3.40	10.20	20.62	54
	Mainpat	Dharani	50	20	7.12	14.49	104%	26016	59420	2.93	3.83	10.30	28.92	64
	Mungeli	Girnar	50	20	7.86	13.20	68%	28423	52260	2.87	3.49	9.10	31.06	50
	Surguja	ICGB-91114	24	10	7.66	14.65	91%	27313	57808	2.80	3.46	10.65	27.30	55
Tot./Avg.			378	154	7.50	13.50	81%	27123	53653	2.87	3.52	10.32	23.35	359
G. Tot./Avg.			1051	429	6.84	12.78	89%	20559	42938	2.44	2.98	9.89	22.34	838

Table 2: Year wise summary of groundnut during kharif

Year	No. of Demos	Area (Ha)	Yield (q/ha)		Yield increase in (%)	Net Returns (Rs/ha)		B:C ratio		District yield (q/ha)	Yield gap in (%)	Horizontal spread (ha)
			FP	Demo		FP	Demo	FP	Demo			
2017_18	120	50	5.94	12.13	104%	12911	31479	1.96	2.39	9.80	17.67	44
2018_19	296	120	6.99	12.34	79%	19664	39271	2.35	2.88	9.84	20.60	142
2019_20	107	50	6.67	12.72	93%	19810	42455	2.40	2.92	9.10	28.40	183
2020_21	150	55	7.10	13.21	86%	23286	47832	2.64	3.19	10.37	21.70	110
2021_22	378	154	7.50	13.50	81%	27123	53653	2.87	3.52	10.32	23.35	359
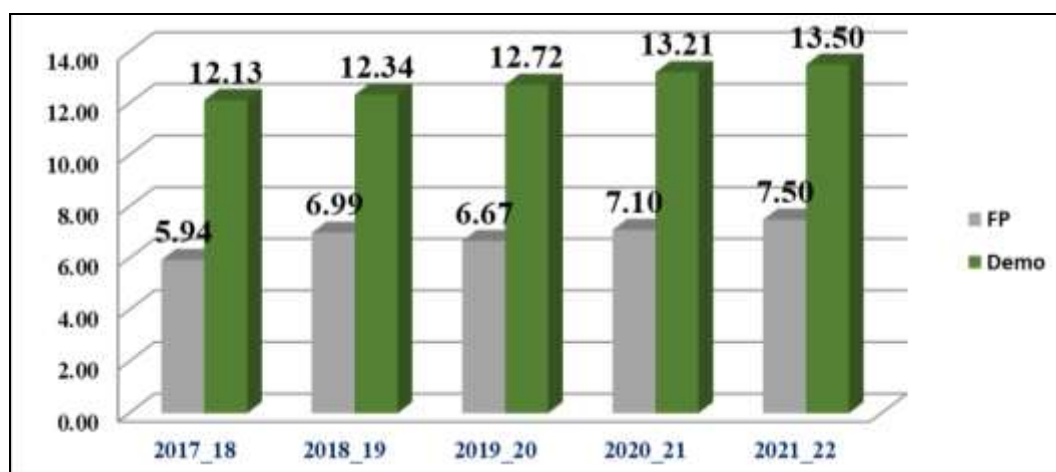
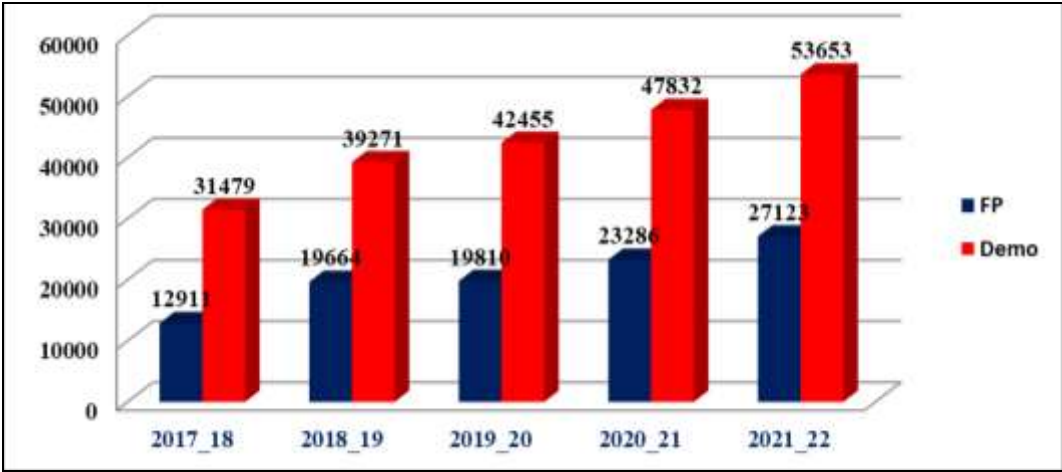**Fig 1:** Year wise yield (q/ha) of groundnut during Kharif

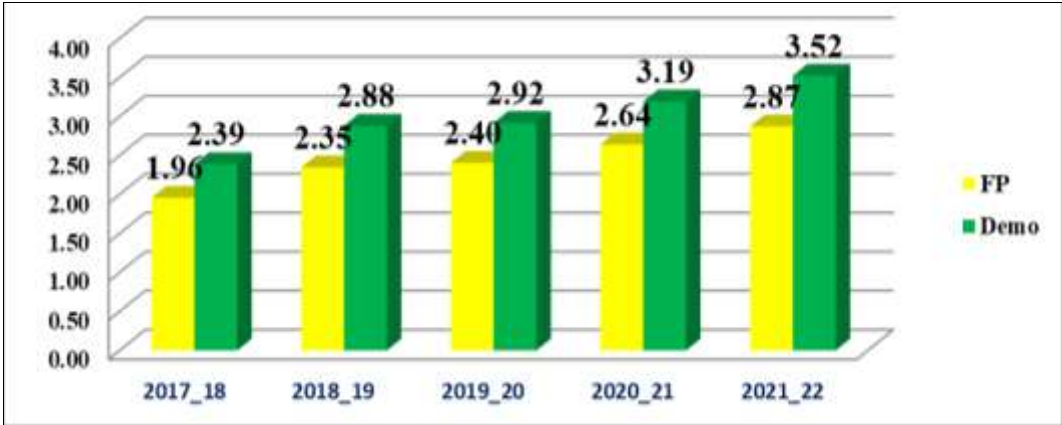**Fig 2:** Year wise net returns (Rs/ha) of groundnut during Kharif

Fig 3: Year wise B: C ratio of groundnut during Kharif
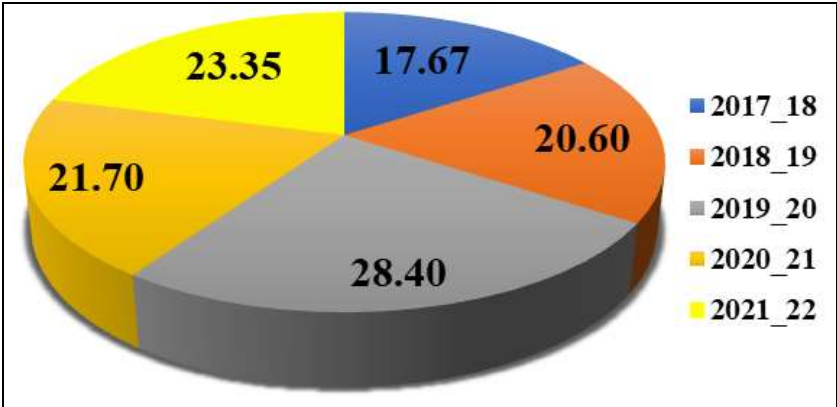

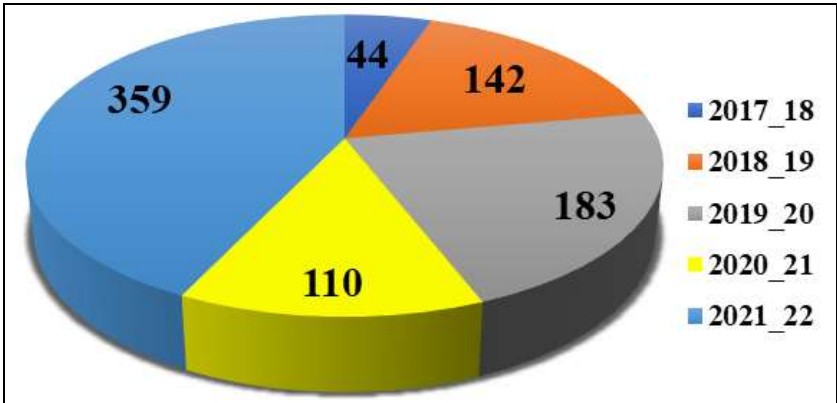**Fig 4:** Year wise average yield gap (%) of groundnut during Kharif

Fig 5: Year wise horizontal spread of technology of groundnut during Kharif

Table 3: Performance of cluster frontline demonstrations on Niger during Kharif 2017-18 to 2021-22

Year	KVK's	Variety	No. of Demos	Area (Ha)	Yield (q/ha) FP	Yield (q/ha) Demo	Yield increase in (%)	Net Returns (Rs/ha) FP	Net Returns (Rs/ha) Demo	B: C ratio FP	B: C ratio Demo	District Yield (q/ha)	Yield Gap in (%)	Horizontal spread of technology (Ha)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2017_18	Balrampur	JNS-9	75	30	4.20	7.30	74%	9010	18565	2.13	2.69	1.73	76.30	21
	Bastar	GA-10	54	30	4.18	6.85	64%	8929	16743	2.12	2.52	4.80	29.93	26
	Dantewada	JNS-9	50	20	3.14	5.54	76%	4217	11437	1.50	2.04	1.58	71.48	20
	Jashpur	JNS-9	75	30	3.15	5.12	63%	4258	9736	1.50	1.89	3.30	35.55	29
	Korba	JNC-9	50	20	3.40	6.35	87%	5270	14718	1.62	2.34	3.10	51.18	50
	Narayanpur	GA-10	75	30	3.50	6.50	86%	6175	15325	1.77	2.39	1.50	76.92	35
Tot./Avg.			379	160	3.60	6.28	75%	6310	14421	1.77	2.31	2.67	56.89	181
2018_19	Balrampur	JNS-9	75	30	3.20	6.30	97%	10806	26025	2.35	3.37	1.73	72.54	27
	Bastar	BN-03	100	40	4.00	6.17	54%	15508	25261	2.94	3.30	4.80	22.20	45
	Jashpur	JNS-9	75	30	3.33	5.86	76%	11570	23439	2.45	3.13	3.80	35.15	85
	Korba	JNS-9	51	20	3.10	6.80	119%	10219	28964	2.28	3.63	3.40	50.00	65
	Koriya	JLC-9	50	20	3.13	5.28	69%	10395	20031	2.30	2.82	3.23	38.83	21
	Narayanpur	JNS-9	75	30	3.20	5.40	69%	10806	20736	2.35	2.89	1.50	72.22	45
Tot./Avg.			426	170	3.33	5.97	81%	11551	24076	2.44	3.19	3.08	48.49	288
2019_20	Bastar	JNC-9	25	10	3.90	6.70	72%	15166	28798	2.90	3.62	5.25	21.64	76
	Jashpur	JNS-9	25	10	3.08	5.28	71%	9295	20363	2.03	2.85	3.80	28.03	91
	Koriya	JNC-6	25	10	2.66	3.98	50%	7800	12641	1.98	2.15	3.23	18.84	35
	Mainpat	JNS-9	25	10	3.12	5.08	63%	10533	19175	2.32	2.74	3.90	23.23	38
	Narayanpur	JNS-9	25	10	2.20	4.20	91%	5068	13948	1.63	2.27	1.50	64.29	35
	Surguja	JNS-9	17	10	2.90	5.10	76%	9226	19294	2.15	2.75	3.40	33.33	42
Tot./Avg.			142	60	2.98	5.06	70%	9515	19037	2.17	2.73	3.51	31.56	317
2020_21	Bastar	BN-03	48	20	3.98	7.14	79%	18146	36302	3.13	4.16	5.70	20.17	82
	Jashpur	JNS-9	50	20	2.98	4.86	63%	11451	22038	2.35	3.10	3.80	21.81	102
	Mainpat	JNS-9	50	20	3.70	5.97	61%	16772	28969	3.10	3.63	3.90	34.67	45
	Narayanpur	JNS-9	25	10	2.80	4.58	64%	10246	19663	2.21	2.79	1.65	63.97	38
	Surguja	BN-03	40	20	2.80	4.90	75%	10746	21806	2.34	2.98	3.40	30.61	56
Tot./Avg.			213	90	3.25	5.49	68%	13472	25756	2.63	3.33	3.69	34.25	323
2021_22	Bastar	JNS-9	25	10	4.20	7.90	88%	20606	43247	3.42	4.76	5.90	25.32	92
	Jashpur	JNS-9	50	20	2.95	4.91	66%	12444	23026	2.56	3.09	3.90	20.57	115
	Kondagaon	BN-03	50	20	1.37	3.16	131%	2494	10899	1.36	1.99	1.45	54.11	36
	Koriya	JNC-9	25	10	1.68	3.29	96%	3642	11800	1.46	2.07	3.24	1.52	45
	Mainpat	JNS-30	50	20	3.19	5.48	72%	13607	26476	2.60	3.30	3.90	28.83	50
	Narayanpur	BN-03	50	20	2.50	4.54	82%	9325	20462	2.17	2.86	1.65	63.66	55
	Surguja	JNS-30	40	20	3.41	4.94	45%	15631	23234	2.95	3.11	4.10	17.00	62
Tot./Avg.			290	120	2.76	4.89	83%	11107	22735	2.36	3.03	3.45	30.14	455
G. Tot./Avg.			1450	600	2.65	4.61	63%	8659	17671	1.89	2.43	2.73	33.56	1564

Table 4: Year wise summary of Niger during kharif

Year	No. of Demos	Area (Ha)	Yield (q/ha) FP	Yield (q/ha) Demo	Yield increase in (%)	Net Returns (Rs/ha) FP	Net Returns (Rs/ha) Demo	B:C ratio FP	B:C ratio Demo	District yield (q/ha)	Yield gap in (%)	Horizontal Spread (ha)
2017_18	379	160	3.60	6.28	75%	6310	14421	1.77	2.31	2.67	56.89	181
2018_19	426	170	3.33	5.97	81%	11551	24076	2.44	3.19	3.08	48.49	288
2019_20	142	60	2.98	5.06	70%	9515	19037	2.17	2.73	3.51	31.56	317
2020_21	213	90	3.25	5.49	68%	13472	25756	2.63	3.33	3.69	34.25	323
2021_22	290	120	2.76	4.89	83%	11107	22735	2.36	3.03	3.45	30.14	455

Fig 6: Year wise yield (q/ha) of Niger during Kharif

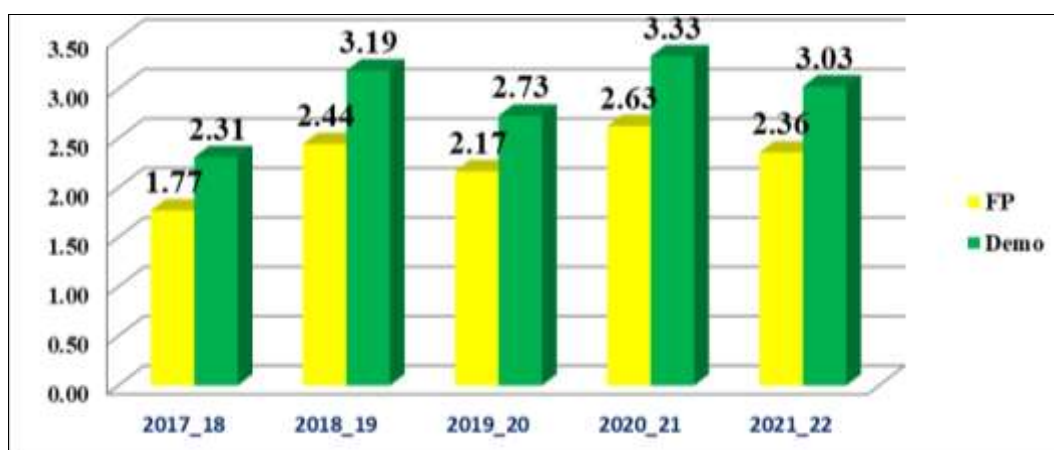**Fig 7:** Year wise net return (Rs/ha) of Niger during Kharif

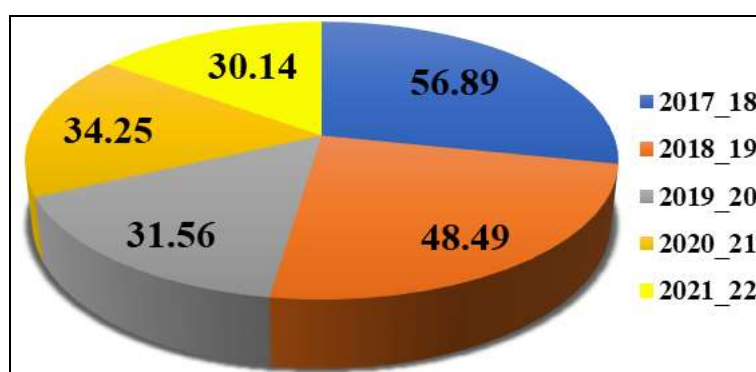**Fig 8:** Year wise B: V ratio of Niger during Kharif

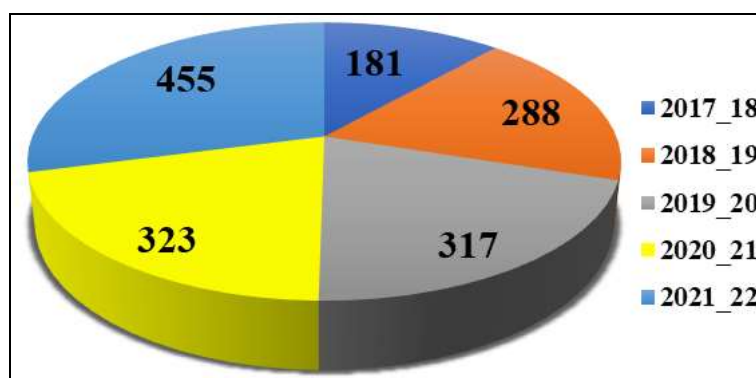**Fig 9:** Year wise average yield gap (%) of Niger during Kharif

Fig 10: Year wise horizontal spread of technology of Niger during Kharif

Table 5: Performance of cluster frontline demonstrations on sesame during Kharif 2017-18 to 2021-22

Year	KVK's	Variety	No. of Demos	Area (Ha)	Yield (q/ha)		Yield increase in (%)	Net Returns (Rs/ha)		B:C ratio		District Yield (q/ha)	Yield gap in (%)	Horizontal spread of technology (Ha)
					FP	Demo		FP	Demo	FP	Demo			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2017_18	Balrampur	GT-2	75	30	2.60	3.71	43%	3190	7617	1.35	1.59	2.80	24.53	11
	Rajnandgaon	GT-3	12	5	3.00	5.15	72%	6105	14295	1.68	2.10	5.00	2.91	17
	Surguja	GT-2	54	30	3.20	4.55	42%	6900	13205	1.77	2.06	3.20	29.67	13
Tot./Avg.			141	65	2.93	4.47	52%	5398	11706	1.60	1.91	3.67	19.04	41
2018_19	Koriya	TKG-55	50	20	2.24	3.37	50%	4373	8684	1.49	1.67	2.09	37.98	14
	Raipur	TKG-308	25	10	3.20	5.60	75%	10872	22494	2.21	2.80	3.50	37.50	24
Tot./Avg.			75	30	2.72	4.49	63%	7622	15589	1.85	2.23	2.80	37.74	38
2019_20	Bilaspur	TKG-308	20	10	4.80	7.90	65%	12216	25577	2.11	2.76	6.50	17.72	27
	Koriya	RT-351	25	10	2.50	3.10	24%	3202	6511	1.29	1.45	2.28	26.45	18
	Raipur	TKG-308	25	10	3.20	5.53	73%	11752	22862	2.31	2.76	3.50	36.71	34
	Surguja	RT-351	22	10	3.40	4.40	29%	11049	18712	2.00	2.44	3.50	20.45	21
Tot./Avg.			92	40	3.48	5.23	48%	9555	18416	1.93	2.35	3.945	25.33	100
2020_21	Balod	TKG-306	25	10	4.10	5.90	44%	17106	27445	2.56	3.11	3.90	33.90	19
	Bhatapara	GT-5	50	50	3.45	4.35	26%	10593	18876	1.96	2.45	3.28	24.60	17
	Mungeli	GT-5	50	20	5.30	6.40	21%	16585	28275	2.38	2.95	4.20	34.38	14
	Raipur	TKG-308	50	20	4.08	5.68	39%	12650	25122	2.15	2.73	3.60	36.62	66
	Surguja	RT-351	17	6.8	3.50	4.80	37%	11484	20795	2.04	2.60	3.90	18.75	32
Tot./Avg.			192	107	4.09	5.43	33%	13684	24103	2.22	2.77	3.78	29.65	148
2021_22	Balod	TKG-306	25	10	3.70	4.70	27%	12248	24519	2.07	2.69	3.90	17.02	24
	Dhamtari	GT-5	25	10	3.30	4.23	28%	10286	19331	1.86	2.33	3.15	25.53	17
	Koriya	GT-5	25	10	2.10	2.29	9%	6075	13632	1.61	1.94	2.00	12.66	32
	Mahasamund	GT-5	50	20	3.80	7.55	99%	15182	29938	2.27	3.00	4.28	43.31	23
	Mungeli	GT-5	50	20	4.50	6.80	51%	13552	28831	2.23	2.99	4.50	33.82	26
	Raigarh	TKG-306	25	10	5.10	6.95	36%	10798	26346	1.90	2.82	4.80	30.94	25
	Raipur	TKG-308	25	10	4.60	5.58	21%	17666	28465	2.47	2.96	3.60	35.48	78
	Surguja	GT-5	17	10	3.70	4.91	33%	11432	21377	2.04	2.47	4.00	18.53	71
Tot./Avg.			242	100	3.85	5.37625	38%	12155	24055	2.05	2.65	3.78	27.16	296
G. Tot./Avg.			742	342	3.41	5.00	47%	9683	18774	1.93	2.38	3.59	27.78	623

Table 6: Year wise summary of sesame during kharif

Year	No. of Demos	Area (Ha)	Yield (q/ha)		Yield increase in (%)	Net Returns (Rs/ha)		B:C ratio		District yield (q/ha)	Yield gap in (%)	Horizontal spread (ha)
			FP	Demo		FP	Demo	FP	Demo			
2017_18	141	65	2.93	4.47	52%	5398	11706	1.60	1.91	3.67	19.04	41
2018_19	31	30	2.72	4.49	63%	7622	15589	1.85	2.23	2.80	37.74	38
2019_20	92	40	3.48	5.23	48%	9555	18416	1.93	2.35	3.94	25.33	100
2020_21	192	107	4.09	5.43	33%	13684	24103	2.22	2.77	3.78	29.65	148
2021_22	242	100	3.85	5.38	38%	12155	24055	2.05	2.65	3.78	27.16	296

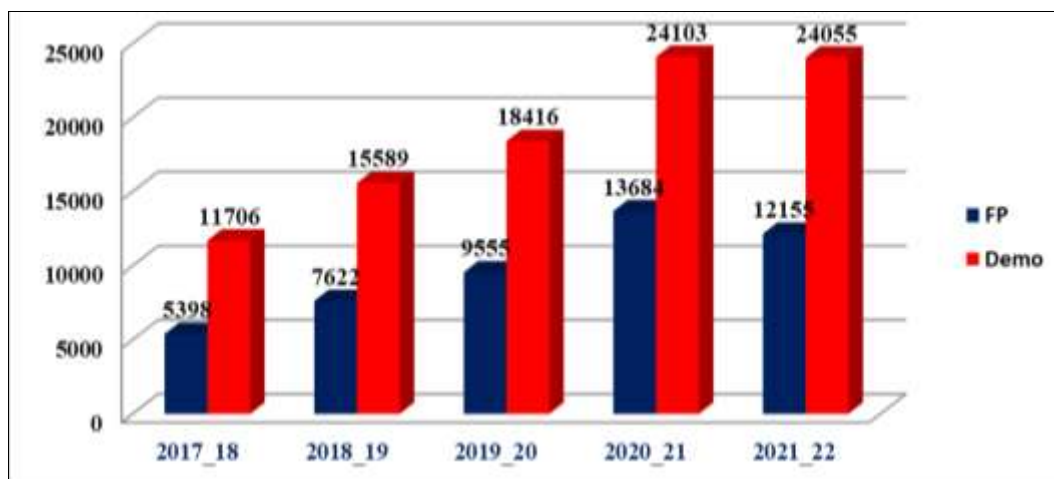**Fig 11:** Year wise yield (q/ha) of sesame during Kharif

Fig 12: Year wise net return (Rs/ha) of sesame during Kharif

Fig 13: Year wise B: C ratio of sesame during Kharif
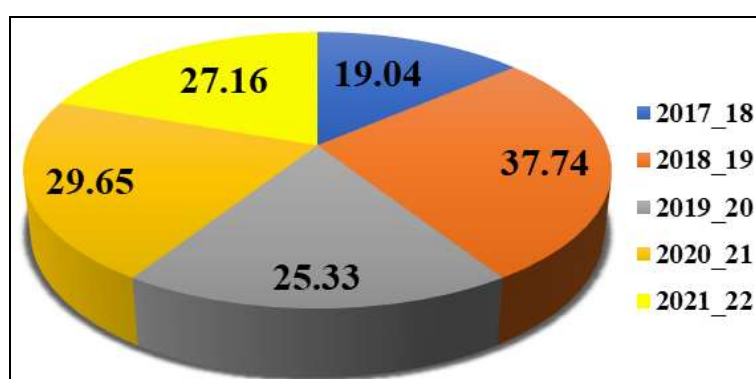

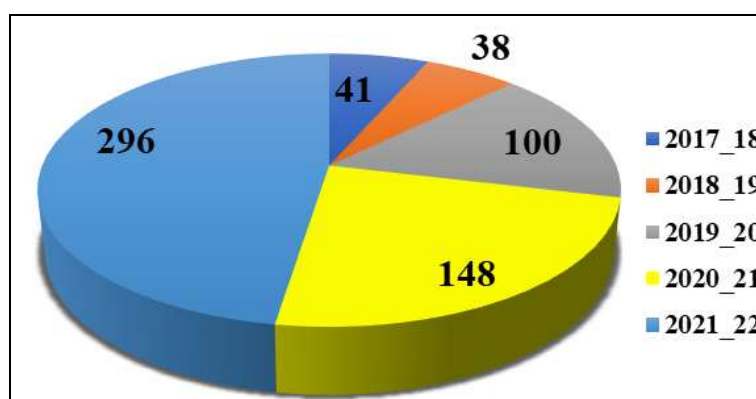**Fig 14:** Year wise average yield gap (%) of sesame during Kharif

Fig 15: Year wise horizontal spread of technology of sesame during Kharif

Table 7: Performance of Cluster Frontline Demonstrations on Soybean during Kharif 2017-18 to 2021-22

Year	KVK's	Variety	No. of Demos	Area (Ha)	Yield (q/ha) FP	Yield (q/ha) Demo	Yield increase in (%)	Net Returns (Rs/ha) FP	Net Returns (Rs/ha) Demo	B:C ratio FP	B:C ratio Demo	District Yield (q/ha)	Yield gap in (%)	Horizontal spread of technology (Ha)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2017_18	Kabirdham	JS-9752	125	50	6.03	9.87	64%	7142	16604	1.63	2.23	8.10	17.93	35
2017_18	Rajnandgaon	JS-9752	50	20	7.22	12.10	68%	10771	21055	1.96	2.33	10.65	11.98	42
Tot./Avg.			175	70	6.63	10.99	66%	8956	18829	1.80	2.28	9.38	14.96	77
2018_19	Bemetara	JS-9560	100	40	6.78	10.96	62%	10545	21153	1.84	2.31	8.00	27.01	30
2018_19	Kabirdham	JS-9560	100	40	5.50	10.21	86%	8195	18604	1.78	2.16	8.50	16.75	51
2018_19	Mungeli	JS-9560	43	20	6.83	12.11	77%	10415	25062	1.81	2.56	6.50	46.33	25
2018_19	Raipur	JS-9560	25	10	7.17	12.01	68%	13121	25322	2.17	2.63	9.75	18.82	32
2018_19	Rajnandgaon	JS-9560	100	40	8.09	12.45	54%	14998	26818	2.20	2.73	11.25	9.64	64
Tot./Avg.			368	150	6.87	11.55	69%	11455	23392	1.96	2.48	8.8	23.71	202
2019_20	Bemetara	JS-9752	25	10	7.76	13.26	71%	16290	33095	2.30	3.06	9.85	25.72	54
2019_20	Bhatapara	JS-9752	10	10	7.05	13.38	90%	13656	33540	2.09	3.08	11.50	14.05	34
2019_20	Kabirdham	JS-9752	25	10	6.85	13.11	91%	14164	32638	2.26	3.04	11.15	14.95	78
2019_20	Mungeli	C.G.Soya-1	25	10	8.21	13.00	58%	17959	32130	2.44	3.00	7.25	44.23	42
2019_20	Raipur	C.G.Soya	25	10	7.90	12.46	58%	15809	30127	2.17	2.87	10.12	18.78	45
2019_20	Rajnandgaon	JS-9560	25	10	7.50	11.89	59%	15825	28012	2.32	2.74	10.90	8.33	74
Tot./Avg.			135	60	7.545	12.85	71%	15617	31590	2.26	2.96	10.13	21.01	327
2020_21	Kabirdham	RVS2001-4	25	10	7.50	13.45	79%	17100	36086	2.43	3.24	11.58	13.90	91
2020_21	Mungeli	C.G.Soya	50	20	9.20	14.60	59%	22246	40548	2.65	3.52	8.65	40.75	63
2020_21	Raipur	C.G.Soya	50	20	8.75	13.68	56%	20450	36978	2.51	3.30	11.15	18.49	78
Tot./Avg.			125	50	8.48	13.91	65%	19932	37871	2.53	3.35	10.46	24.38	232
2021_22	Bemetara	C.G.Soya	25	20	8.98	13.75	53%	21971	38213	2.63	3.37	10.30	25.09	68
2021_22	Durg-II	C.G.Soya	17	10	8.03	14.50	81%	18719	40775	2.44	3.47	8.80	39.31	34
2021_22	Kabirdham	C.G.Soya	50	20	7.50	13.96	86%	18375	39042	2.63	3.42	12.25	12.25	105
2021_22	Mungeli	C.G.Soya	50	20	7.60	14.98	97%	17520	42171	2.40	3.48	9.12	39.12	87
2021_22	Raipur	C.G.Soya	25	10	8.95	14.24	59%	21813	40148	2.61	3.49	11.65	18.19	103
2021_22	Rajnandgaon	JS-2029	50	20	7.85	12.65	61%	19758	33868	2.76	3.10	11.65	7.91	101
Tot./Avg.			217	100	8.15	14.01	73%	19692	39036	2.58	3.39	10.63	23.64	498
G. Tot./Avg.			1020	430	7.54	12.66	69%	15130	30144	2.23	2.89	9.88	21.54	1336

Table 8: Year wise summary of soybean during kharif

Year	No. of Demos	Area (Ha)	Yield (q/ha) FP	Yield (q/ha) Demo	Yield increase in (%)	Net Returns (Rs/ha) FP	Net Returns (Rs/ha) Demo	B: C ratio FP	B: C ratio Demo	District yield (q/ha)	Yield gap in (%)	Horizontal spread (ha)
2017_18	175	70	6.63	10.99	66%	8956	18829	1.80	2.28	9.38	14.96	77
2018_19	368	150	6.87	11.55	69%	11455	23392	1.96	2.48	8.80	23.71	202
2019_20	135	60	7.55	12.85	71%	15617	31590	2.26	2.96	10.13	21.01	327
2020_21	125	50	8.48	13.91	65%	19932	37871	2.53	3.35	10.46	24.38	232
2021_22	217	100	8.15	14.01	73%	19692	39036	2.58	3.39	10.63	23.64	498

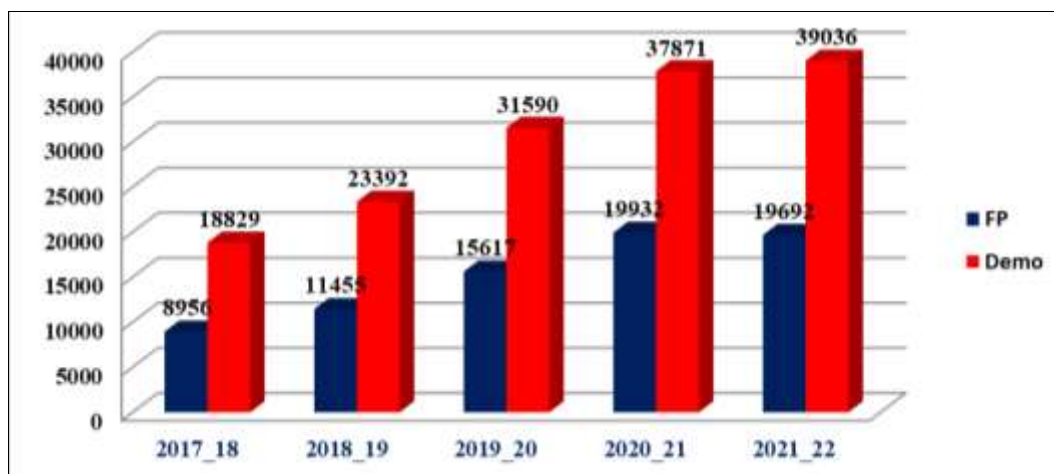**Fig 16:** Year wise yield (q/ha) of soyabean during Kharif

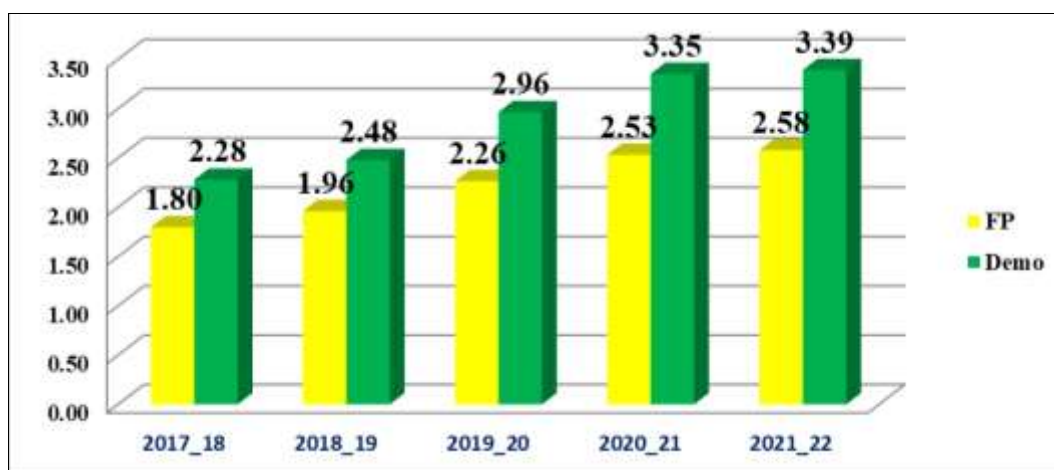**Fig 17:** Year wise net return (Rs/ha) of Soyabean during Kharif

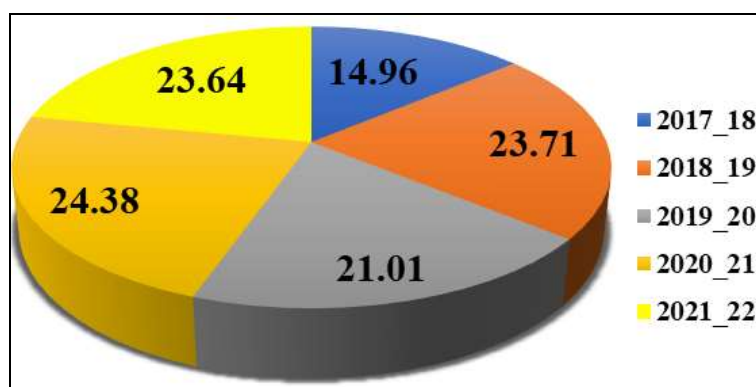**Fig 18:** Year wise B: C ratio of Soyabean during Kharif

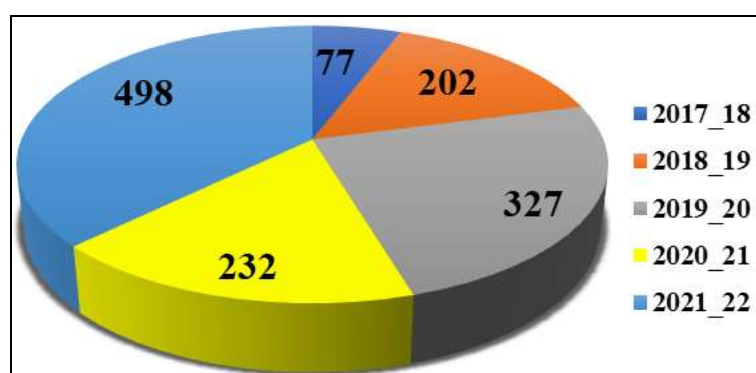**Fig 19:** Year wise average yield gap (%) of Soyabean during Kharif

Fig 20: Year wise horizontal spread of technology of Soyabean during Kharif

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