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Impact of technological interventions of Krishi Vigyan Kendra, Darsi in Prakasam district of Andhra Pradesh

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Abstract

The research was carried out between 2016 and 2022. Demonstrations implemented in KVK operated villages of Prakasam district were selected purposively. A total of 120 farmers (30 redgram, 30 blackgram, 30 chilli and 30 maize farmers) were selected from 12 villages. Most of the respondents selected for the study were age old (60.00%) with elementary school education (42.50%) having small farm holding size (55.83%) with medium level of farm experience (49.6%) extension contact (46.67%), social participation (45.00%), scientific orientation (65.84%) and medium level of annual Income (60.83%). The chosen trials were carried out in farmers' fields in accordance with the advice of Krishi Vigyan Kendra, Darsi. Mean percentage increase in yield over check for three consecutive years was 35.65% for redgram (2016–17, 2017–18, and 2018–19), 27.27% for blackgram (2018–19, 2019–20, and 2020–21), 8.89% for chilli (2017–18, 2018–19, and 2020–21), and 18.02 percent for maize (2018–19, 2019–20, & 2020–21. Redgram local varieties and LRG 41 were swapped out for LRG 52, while local varieties in blackgram were swapped out for TBG 104 in the demonstration cluster. Areas with LRG 52 showed significant creep from 100 ha to 16000 ha, whereas the TBG104 blackgram variety cultivating areas to treble from 150 ha to 15000 ha. Likewise, the execution of demonstrations resulted in an increase in the area under maize cultivation from 15 ha to 210 ha and the area under chili crop from 50 ha to 250 ha.

Keywords: Frontline demonstrations, cluster demonstrations, yield, varietal replacement, horizontal spread

Introduction

Krishi Vigyan Kendra (KVKs), the lighthouse for farmers in India, is an institutional project of ICAR. KVKs were dispersed around the nation with the intention of utilizing a multidisciplinary team known as Subject Matter Specialists (SMS) to assist in the transmission of agricultural technology to farmers on their fields. KVKs have a critical role in knowledge management, technological support, and advising to various stakeholders, including farmers, farmwomen, rural youth, and extension workers. The focus is on equipping participants with the essential knowledge and abilities to increase agricultural productivity and achieve financial independence through gainful employment.

Throughout the years, the Krishi Vigyan Kendra (KVK) system has expanded the range of its operations in the agricultural and related sectors by executing multiple activities like capacity building programs and frontline demonstrations, technology assessment and refinement in order to bringing new concepts of entrepreneurship opportunities, convergence of extension activities, integrated farming system, crop diversification, value addition, biodiversity conservation, organic farming etc. The KVK System has had a good effect on the rural agricultural community in terms of income, production, productivity, sale price, and most importantly, the ability to use resources as efficiently as possible. Accordingly, an evaluation of the effects of KVK's technology interventions was conducted in KVK Darsi's operational villages between 2016 and 2022.

In Prakasam district KVK was launched in 2001 at Darsi under the adminiship of Acharya N.G Ranga Agricultural University (ANGRAU), Lam, Guntur. It is located at Kurchedu road which is 3 km away from Darsi town. It possess a total of 21.46 ha land and it was working in 29 operational mandals covering both Prakasam and Bapatla districts of Andhra Pradesh with 8 farming situations. Predominant crops cultivating under KVK jurisdiction were rice, chilli, tobacco, redram, blackgram, chickpea, greengram and cotton. The present study was conducted with the below mentioned objectives

1. To examine the socio-personal characteristics of KVK beneficiaries
2. To explore the Economic impact of KVK interventions
3. To analyze the Horizontal spread of

varieties/technologies in the district
4. To elicit the Reasons for Adoption of recommended technologies

The study was conducted in Prakasam district of Andhra Pradesh. Survey period is from 2016 to 2022. An *ex-post-facto* research design was used to accomplish the objectives of the study. A multi-stage sampling design was followed for selecting the farmers. In first stage, Prakasam district was chosen purposively. In next stage, seven mandals of Prakasam were elected. In later stage, villages adopting the technologies introduced by Krishi Vigyan Kendra, Darsi were selected. In final stage a comprehensive list of all the beneficiaries from each finalized village was collected with the help of registers of KVK, Darsi. Apart from this, in order to assess the impact of 4 technology interventions of Krishi Vigyan Kendra, Darsi in terms of economic impact and horizontal spread of the selected technologies, a sample size of 30 for each technology were selected. Thereby, a total of 120 beneficiaries were finalized as respondents for the investigation. the details of sampling area was given in the table 1. These four technology interventions of KVK, Darsi were implemented in the villages in the form of cluster front line demonstrations(CFLD) and front line demonstrations (FLD). Implementation of CFLD & FLD includes selection of farmers through focused group discussion, interactive sessions, identification of gaps between recommended practice and existing practice (farmers practice),providing critical inputs *viz* seeds, fertilizers, weedicides and pesticides along with regular field visits by KVK scientists and recording of crop data and cost economics.

The primary information required were gathered from selected sample respondents using specially designed schedule. It contains data pertaining to the socio personal characteristics of respondents, economic impact, horizontal spread and reasons for adoption of technology. The schedule was subjected to pre-testing before directing it to the real beneficiaries. The schedule was modified and edited based on the suggestions received from the pre tested farmers (respondents).

Table 1: Details of mandals and villages of Prakasam district

S. No	Technology intervention	Villages	Mandals	Sample size (n)
1	Introduction of Redgram variety LRG 52 in Prakasam district	1. Bodhanampadu 2. Tanamchintala 3. East veerayapalem	Darsi	30
2	ICM in blackgram	1. Obanapalem 2. Bollapalli 3. Ammanaprolu	Naguluppalapadu Marturu Naguluppalapadu	30
3	Assessment of IPM module for the management of fall armyworm (FAW) in maize	1. Adavipalem 2. Rajampalli 3. mundlamuru	Santhamagulur Darsi mundlamuru	30
4	Evaluation of ICM (Integrated crop management) in chilli of Prakasam district	1. Chendalur 2. Aravalapadu 3. PRC Thanda	Darsi Kurchedu Pulllacheruvu	30
Total Sample Size				120

Results and Discussion

1. Socio-personal characteristics of KVK beneficiaries

It is clear from the Table 2 and figure 1 that the majority of farmers (60.00%) belonged to the middle age group (36-50 years) followed by old age group (>50 years) with 26.66 percent and young age group (< 35 years) with 13.34 percent, This might be due to lack of opportunity to change their profession among middle aged making them to become loyal to their existing profession. The above findings were in accordance with the results of Patel *et al.* (2013) [3].

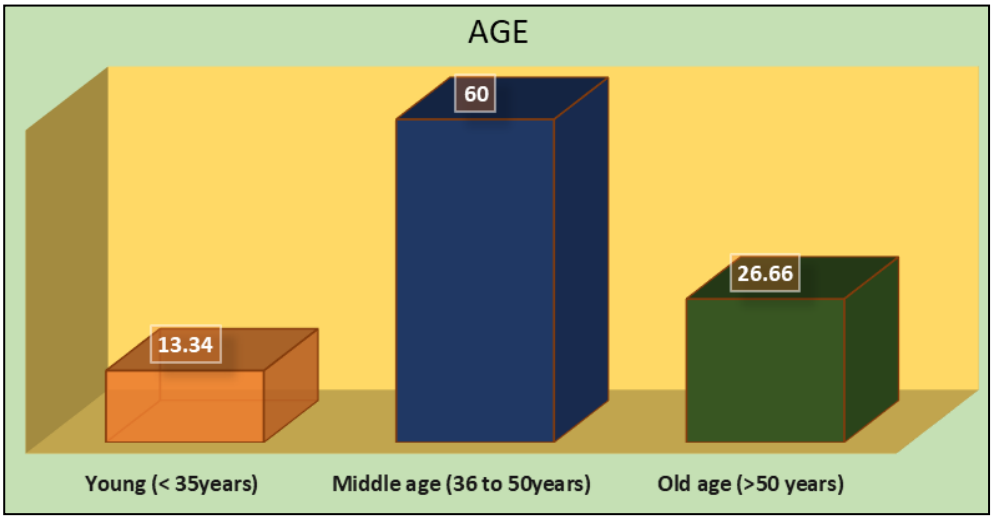


Fig 1: Distribution of respondents based on their Age

A cursory look at Table 2 and Figure 2 revealed that 42.50% of the farmers belonging to elementary school followed by the rest belonging to middle School (26.66%), illiterate (11.66%), high school (10.00%) and intermediate education (09.16%) categories. Majority of the respondents were educated this might be due to existence of government schools in the villages. This finding was in concurrence with the results of Naik *et al.* (2015) [4].

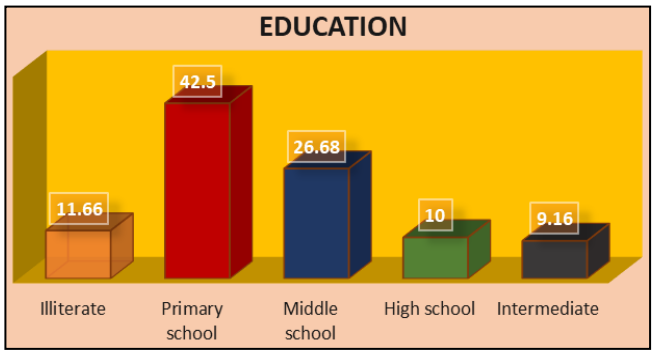


Fig 2: Distribution of respondents based on their Education

It was evident from Table 2. & Figure 3 most of the respondents had small farm holdings (55.83%), followed by marginal farmers (24.16%) category. Whereas, 15.00% belonged to medium farmers and 05.00% of them had large farm holding. Majority (33.34%) of the farmers had medium holdings followed by small holdings. Perhaps the reason was the splitting of joint families resulted in less acreage of land to individual farmers. Hence, there is a need to concentrate on small and medium farmers in transfer of technology. Efforts also should be made to motivate marginal farmers. The above findings were in accordance with the results of Ghuge *et al.* (2015) [5].

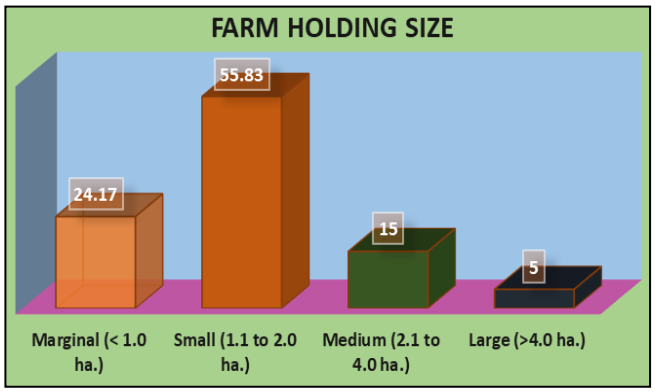


Fig 3: Distribution of respondents based on their farm holding survey

The above Table 2 and Figure 4 illustrated that nearly half of the respondents (49.16%) had medium level of farming experience followed by the rest with low (27.50%) and high (23.33%) level of farming experience. It's possible that this is because farming is the main occupation for farmers, who have been doing this activity for years together. The results were in line with the findings of Madhuri *et al*., (2020) [6].

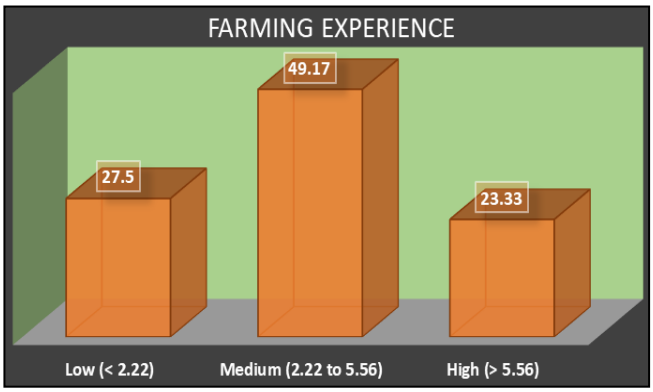


Fig 4: Distribution of respondents based on their Age

Table 2: Distribution of the respondents according to their socio-personal characteristics

S. No.	Independent variables	Category	Respondents	
			F	P
1.	Age	Young (< 38years) Middle age (38 to 56years) Old age (>56 years)	16 72 32	13.34 60.00 26.66
2.	Education	Illiterate Primary school Middle school High school Intermediate	14 51 32 12 11	11.66 42.50 26.66 10.00 09.16
3.	Farm Holding Size	Marginal (< 1.0 ha.) Small (1.1 to 2.0 ha.) Medium (2.1 to 4.0 ha.) Large (>4.0 ha.)	29 67 18 06	24.16 55.83 15.00 05.00
4.	Farming Experience $\overline{X}$ = 3.89 σ = 1.67	Low (< 2.22) Medium (2.22 to 5.56) High (> 5.56)	33 59 28	27.50 49.16 23.33
5.	Extension Contact $\overline{X}$ = 11.41 σ = 3.21	Low (< 8.20) Medium (8.20 to 14.62) High (> 14.62)	28 56 36	23.33 46.67 30.00
6.	Social Participation $\overline{X}$ = 6.53 σ = 1.76	Low (< 4.77) Medium (4.77 to 8.29) High (> 8.29)	30 54 36	25.00 45.00 30.00
7.	Scientific Orientation $\overline{X}$ = 10.81 σ = 2.26	Low (< 8.55) Medium (8.55 to 13.07) High (> 13.07)	13 79 28	10.83 65.84 23.33
8.	Annual Income $\overline{X}$ = 6.32 σ = 1.96	Low (< 4.36) Medium (4.36 to 8.28) High (> 8.28)	21 73 26	17.50 60.83 21.67

It could be comprehended from the Table 2 and Figure 5 that nearly fifty percent (46.67%) of the farmers had medium extension contact, followed by 30.00 percent of them with high and 23.33 percent of them with low extension contact This could be a result of a lack of understanding about extension services or a lack of inclination to consult extension officials. The findings of the study were in line with the findings of Madhuri *et al*., (2020) [6].

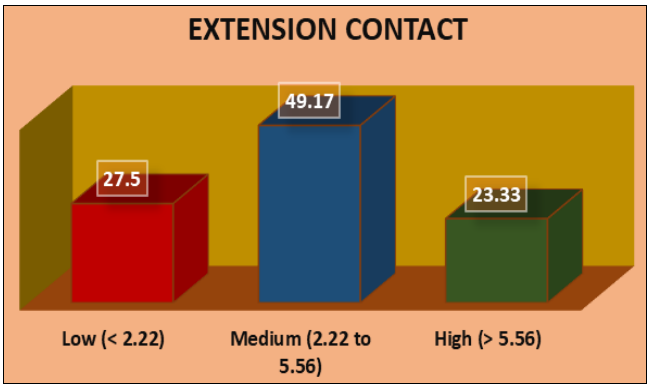


Fig 5: Distribution of respondents based on their Extension contact

It was evident from the table 2 and Figure 6 that almost fifty percent (45.00%) of the farmers had medium level of social participation, followed by 30.00 percent of them with high level and 25.00 percent of them with low level of social participation. From the results it could be inferred that majority of farmers tend to become members in social organizations *Viz*., co-operative agricultural credit societies, rythu clubs, farmer producer organizations. The main purpose was to gain from the organization, regardless of whether or not they were interested in it. Perhaps this is why the majority of respondents had medium level of social participation. The findings were in accordance with the findinds of Tomar *et al*., (2016) [7].

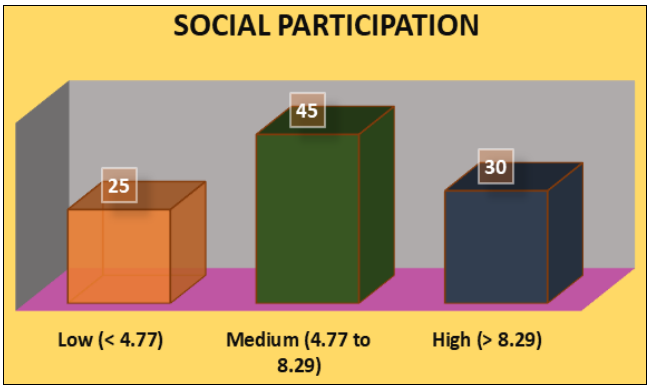


Fig 6: Distribution of respondents based on their social participation

From the Table 2 and Figure 7 it was clear, that more than sixty percent of the farmers (65.84%) had medium scientific orientation subsequently those with high (23.33%) and low (08.55%) levels of scientific orientation. Medium scientific orientation is a superb indication of farmers to accumulate new strategies in farming and can have ended in vast income. A good scientific approach leads to better decision making in agriculture. The results were in accordance with Madhuri *et al*., (2020) [6].

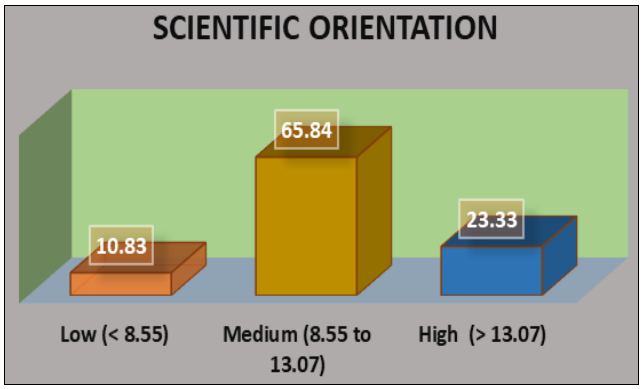


Fig 7: Distribution of respondents based on their scientific orientation

Results furnished in Table 2 and Figure 8 showed that sixty percent (60.83%) of the farmers had medium annual income followed by 21.67 percent with high and 17.50 percent with low annual income. This may be because most farmers were well educated and can think about the economics of agriculture and allied sectors. The results were in line with the findings of Madhuri *et al*., (2020) [6].

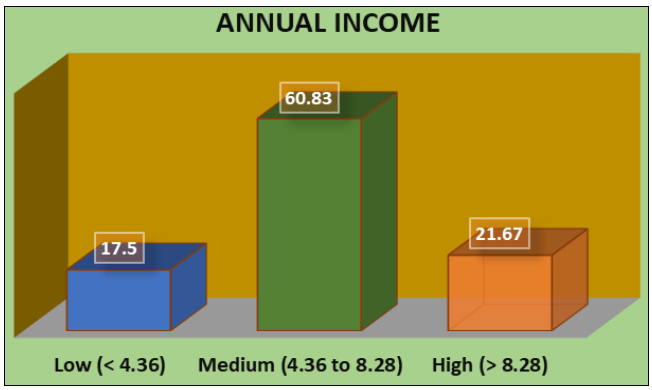


Fig 8: Distribution of respondents based on their Annual income

Economic impact of KVK interventions

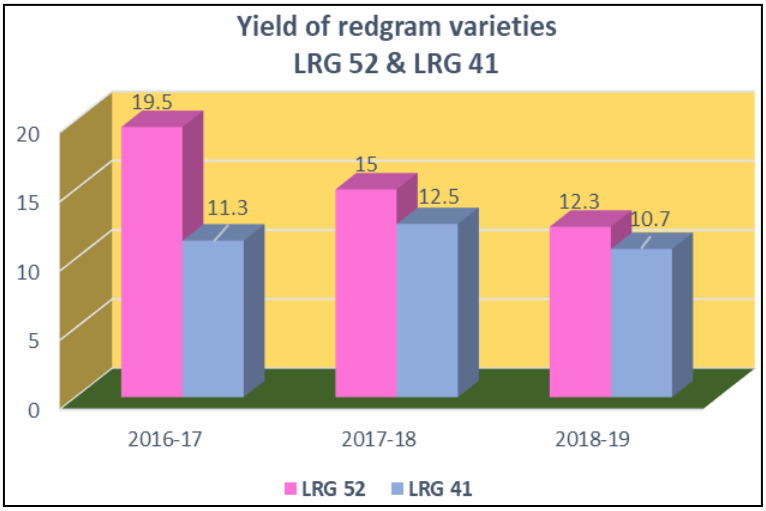
Technology 1: Introduction of Redgram (LRG 52) under CFLDs

Over the course of three years, from 2016–17 to 2018–19, KVK, Darsi evaluated the yield attributes of LRG 52 over LRG 41 in cluster FLDs of 50 acres each. Prolonged dry spells and unexpected rainfall were the main challenges in the Prakasam district. In order to address these issues, RARS, Lam, ANGRAU released a new redgram variety LRG 52 in 2015 which was introduced to Prakasam district by Krishi Vigan Kendra, Darsi. This variety reaches maturity 20–25 days earlier (155–160 days) than the long-duration variety LRG 41 (180 days), which was currently popular in the district during the study. The performance of these two varieties was shown in the below table No 3.

Table 3: Yield attributes and other parameters of Redgram varieties LRG 52 and LRG 41

Year	Yield (q/ha)		Impact (% change in yield)	Cost of cultivation (Rs/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		C:B Ratio	
	LRG 52	LRG 41		LRG 52	LRG 41	LRG 52	LRG 41	LRG 52	LRG 41	LRG 52	LRG 41
2016-17	19.5	11.3	72.57	36500	37000	70450	55200	33950	18200	1:1.9	1:1.5
2017-18	15.0	12.5	20.00	24150	26250	57000	47500	32850	21250	1:2.4	1:1.8
2018-19	12.3	10.7	14.95	25000	25000	79625	69550	54625	44550	1:3.2	1:2.8
Mean	15.6	11.5	35.65	28550	29417	69025	57417	40475	28000	1:2.5	1:2.0

Table 3 clearly shows that the mean grain yield was 15.6 q/ha, which was 36% higher than LRG 41; the cultivation cost was 3% lower than LRG 41; the gross returns were 23% higher than LRG 41; the net returns were 55% higher than LRG 41; and the cost benefit ratio was 2.50 where as it was 2.03 with LRG 41 variety, which was a positive sign.



Yield of redgram varieties LRG 52 & LRG 41

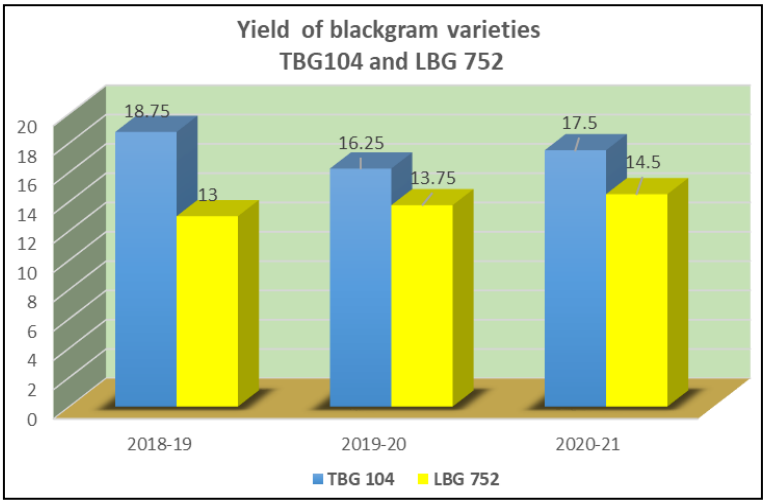
Technology 2: Integrated crop Management (ICM) in blackgram with variety (TBG 104) under CFLDs

Under Cluster Front Line Demonstrations (CFLDs), KVK, Darsi carried out ICM in blackgram demonstration in 50 acres per year for three consecutive years, from 2018–19 to 2020–21. ICM in blackgram with TBG104 was taken as treatment 1 (T_1)and Non ICM practice with LBG 752 was taken as treatment 2 (T_2).The statistics unequivocally showed that (Table 4), over the course of three years of demonstration, the net returns from the recommended pactice was significantly higher than the T_2 from 2018–19 to 2020–21. When compared to treatment 2, which yields net returns of Rs 40658/ha, the average net returns from treatment 1 were found to be Rs 61358/ha. The technology intervention offered in demonstration plots (Treatment 1) is credited with producing an extra income of Rs. 20700/ha.

Economic analysis of the yield performance revealed that average yield in T_1 was 17.50 which was 27% higher than T_2; the cultivation cost was 3% lower than T_2; the gross returns were 21% higher than T_2; the net returns were 33% higher than T_2; and the cost benefit ratio was 2.54in T_1 and in T_2 it was 2.05. Favourable BC Ratio indicated the treatment's economic viability and persuaded farmers of its usefulness. These findings were in line with the results of Dhaka *et al.*, (2010) [9].

Table 4: Yield and economics of the frontline demonstrations on blackgram

Year	Yield (q/ha)		Impact	Cost of cultivation (RS/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		C:B Ratio	
	T_1	T_2	(% change in yield)	T_1	T_2	T_1	T_2	T_1	T_2	T_1	T_2
2018-19	18.75	13.00	44.23	40200	39000	112500	78000	72300	39000	1:2.80	1:2.00
2019-20	16.25	13.75	18.18	41500	40500	89375	75625	47875	35125	1:2.15	1:1.87
2020-21	17.50	14.50	20.69	37600	36250	101500	84100	63900	47850	1:2.70	1:2.32
Mean	17.50	13.75	27.27	39766	38583	101125	79241	61358	40658	1:2.54	1:2.05

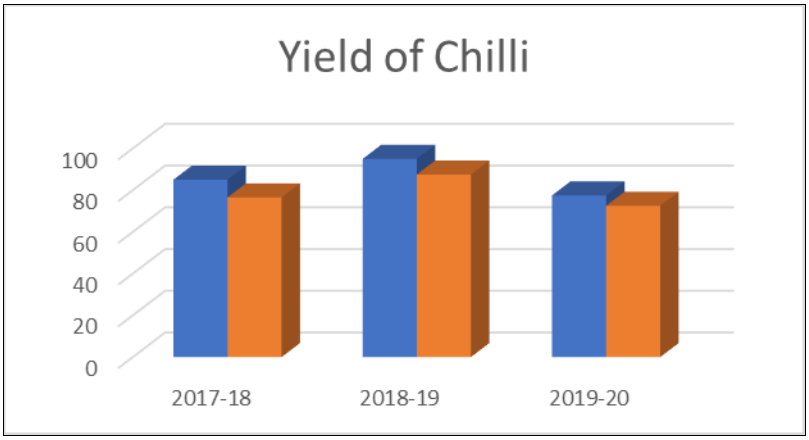


Yield of blackgram varieties TBG104 and LBG 752

Technology 3: Integrated Crop Management (ICM) in chilli
For three consecutive years (2017–18, 2018–19, and 2019–20) KVK carried out an experiment on the evaluation of integrated crop management in the Prakasam district with the aim of analyzing the integrated management module in chilli to enhance profitability and productivity during kharif season. ICM module was considered as treatment 1(T_1) and non ICM module (farmers practice) was considered as treatment 2 (T_2).
It was clear from Table 5 that, In Treatment 1 net returns were substantially larger than those of Treatment 2. The average net returns from treatment 1 were found to be Rs 573667 /ha, in contrast to treatment 2, which had net returns of Rs 480333 /ha. Treatment 1, the technology intervention provided in Treatment 1, is attributed with generating an additional income of Rs. 93333/ha.
The yield performance on economic analysis, which showed that the average yield in T_1 was 85.83 q/ha, whereas in T_2 it was 78.83 q/ha. The net returns were 19% greater than T_2, the gross returns were 8% higher than T_2, the cost of cultivation was 6% lesser than T_2, and the cost benefit ratio was 2.34 in T_2 compared to 2.75 in T_1. Farmers were convinced with the treatment 1 as there was a significant impact on cost benefit ratio.

Table 5: Yield data and other parameters in chilli crop

Year	Yield (q/ha)		Impact (% change in yield)	Cost of cultivation (Rs/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		C:B Ratio	
	T_1	T_2		T_1	T_2	T_1	T_2	T_1	T_2	T_1	T_2
2017-18	85	76.5	11.11	300000	335000	72500	650250	422500	315250	1:2.4	1:1.9
2018-19	95	87.5	8.57	305000	325000	836000	770000	531000	445000	1:2.7	1:2.3
2019-20	77.5	72.5	6.90	356250	370500	1123750	1051250	767500	680750	1:3.15	1:2.83
Mean	85.83	78.83	8.88	320416.6	343500	894083.3	823833.3	573666.6	480333.3	1:2.75	1:2.34

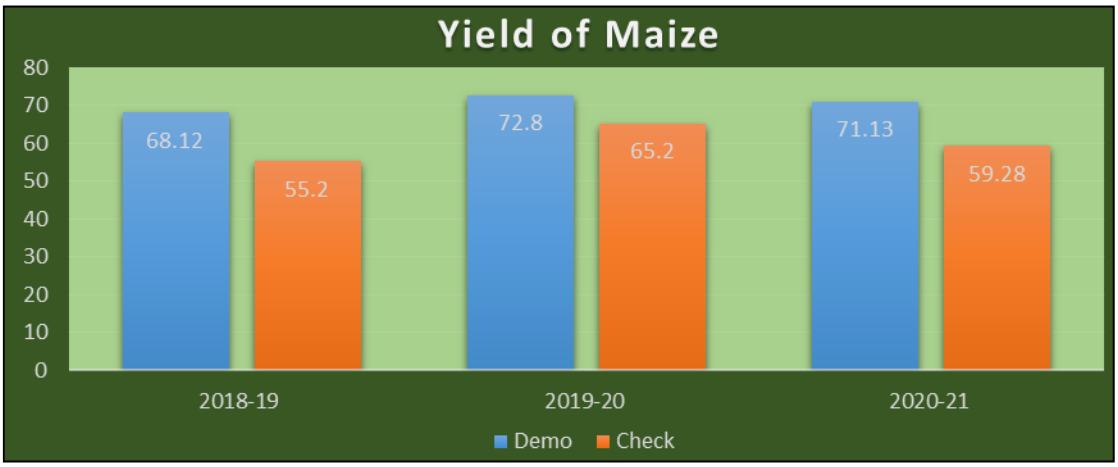


Yield of Chilli

Technology 4: Introduction of IPM module for the management of fall army worm (FAW) in maize
An experiment was carried out on the IPM module's effectiveness in managing fall armyworm (FAW) in maize within the agricultural lands of Prakasam district over the course of 2018-19, 2019-20, and 2020-21. Recommended KVK practices of IPM module was conducted in farmer's field and it was taken as demo and farmers practice was taken as check for data collection.
It was clear from Table 6, In demo plot net returns were significantly higher than those of check plot. The average net returns from demo were found to be Rs 70048 /ha, in contrast to check, which had net returns of Rs 50604 /ha. the technology intervention provided in demo, is attributed with generating an additional income of Rs. 19444/ha.
The yield performance on economic analysis, which showed that the average yield in demo was 70.68 q/ha, whereas in check it was 59.89 q/ha. The net returns were 38.4% greater than check, the gross returns were 17.86% higher than check, the cost of cultivation was 3.4% lesser than check, and the cost benefit ratio was 2.46 in demo compared to 2.02 in check. Farmers were convinced with the IPM module as there was a significant positive impact on cost benefit ratio.

Table 6: Economic analysis of the demonstration in maize crop

Year	Yield (q/ha)		Impact (% change in yield)	Cost of cultivation (RS/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		C:B Ratio	
	Demo (IPM)	Check (Non IPM)		Demo (IPM)	Check (Non IPM)	Demo (IPM)	Check (Non IPM)	Demo (IPM)	Check (Non IPM)	Demo (IPM)	Check (Non IPM)
2018-19	68.12	55.2	23.41	47900	48300	122616	99360	74716	51060	1:2.55	1:2.05
2019-20	72.8	65.2	11.66	47600	49600	131040	117360	83440	67760	1:2075	1:2.36
2020-21	71.13	59.28	19.99	47600	50000	99590	82992	51990	32992	1:2.09	1:1.65
Mean	70.68	59.89	18.02	47700	49300	117748	99904	70048	50604	1:2.46	1:2.02



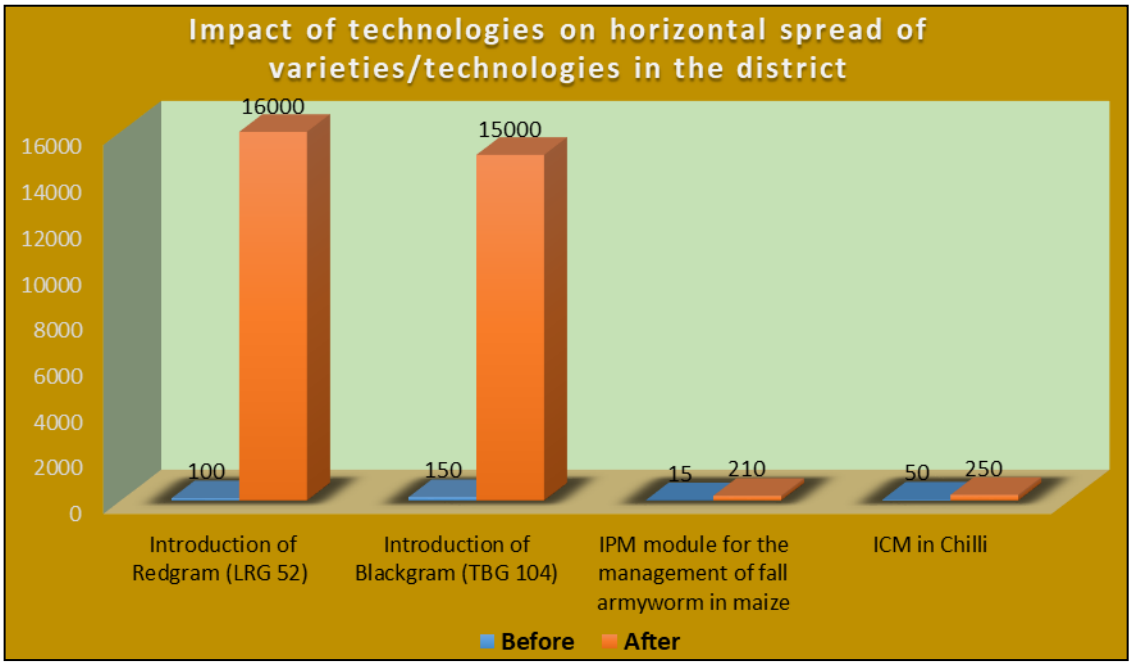
Yield of Maize

3. Impact of technologies on horizontal spread of varieties/technologies in Prakasam district

Table 7 showed that FLD and CFLDs demonstrated on different crops contributed to an increase in the area under suggested varieties/ technologies.Due to CFLDs, the area increased significantly from 100 ha to 16000 ha under the redgram variety LRG 52 and from 150 ha to 15000 ha under the blackgram variety TBG104. Likewise, as a result of FLDs, the area under maize crop increase from 15 ha to 210 ha and the area under chili crop increased from 50 ha to 250 ha. The horizontal spread of redgram and blackgram crop varieties were positively impacted by the CFLDs. Additionally, the introduction of the IPM module for managing FAW in maize and the ICM module for managing chillies had a major favorable influence on the horizontal spread of technologies. Thus, the study comes to the conclusion that the KVK, Darsi-organized CFLDs & FLDs had a major influence on the horizontal spread of both varieties and technologies.

Table 7: Effect of technologies on horizontal spread of varieties/technologies in the district

S. No	Crop	Title of technology intervention	Area Before adoption	Area After adoption	Impact (% Change in area)
1	Redgram	Introduction of Redgram (LRG 52)	100	16000	15900
2	Blackgram	Introduction of Blackgram (TBG 104)	150	15000	9900
3	Maize	Introduction of IPM module for the management of fall army worm (FAW) in maize	15	210	1300
4	Chilli	ICM in Chilli	50	250	400



Impact of technologies on horizontal spread of varieties/technologies in the district

4. Reasons for Adoption of recommended technologies

The primary justifications for implementing the suggested technologies were listed in Table 8.

Table 8: Motivations behind the Use of Suggested Technologies

S. No	Crop	Technological interventions	Reasons for adoption
1	Redgram	Varietal introduction LRG 52	• Escapes terminal moisture stress • Able to tolerate wilting while minimizing yield loss • Higher yielder compared to long duration variety LRG 41
2	Blackgram	Varietal introduction TBG 104	• Capable of withstanding the YMV • Photo insensitive & ideal throughout the year (kharif, rabi & summer) • Shiny black seed of medium in size
3	Maize	IPM Module	• Less number of sprays • Less cost of cultivation • Less impact of natural enemies
4	Chilli	ICM practices	• Appreciative B:C ratio • Increased returns • Mean incidence of gemini virus was 18.9% in demo whereas in check was 28.6% (during the reporting period)

The demonstrations of CFLDs and FLDs significantly increased the output potential of various crops on farmer's fields. In order to increase the productivity potential of main crops and hasten the spread of flagship technologies, it is advised that stakeholders involved in the transfer and application of agricultural technologies on farmer's fields prioritize organizing large-scale Front Line Demonstrations (FLDs) in cluster approaches. FLDs cause the majority of low-yielding local cultivars to be replaced. Thus, it is recommended that policy makers enable the frontline extension system to organize CFLDs and FLDs under the careful supervision of agricultural scientists and extension staff by providing sufficient financial support. At the local, state, and federal levels, this could contribute to increased agricultural productivity.

Conclusion

In conclusion, the analysis of socio-personal characteristics among KVK beneficiaries sheds light on the demographics and educational levels prevalent among farmers. The economic impact of KVK interventions, particularly in introducing new technologies and crop management practices, has been significant, leading to higher yields and increased profitability. Furthermore, the horizontal spread of these technologies has been facilitated by Front Line Demonstrations (FLDs) and Cluster Front Line Demonstrations (CFLDs). To sustain and amplify these positive outcomes, continued support for FLDs and CFLDs, alongside policy measures to promote technological adoption, is essential. This collaborative effort promises to enhance agricultural productivity and economic well-being for farmers in the region.

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