"KVK-Led Initiatives and their Effect on the Knowledge and Adoption of Improved Chickpea Cultivar JAKI-9218"

ABSTRACT

The research was conducted during 2020-21 to study potential and economics of improved Chickpea varieties to improve the productivity as well as income of the farmers in Dharwad district of Karnataka. The KVK - Dharwad has been promoting varietal interventions in chickpea under Cluster Frontline Demonstrations since 2018-19. These demonstrations and extension activities have created awareness among farming community on improved technologies with special focus on IPM practices. An attempt was made to study the level of knowledge and extent of adoption of improved practices of chickpea farmers in Dharwad district of Karnataka using ex-post facto research design. Sample size consists of 120 farmers selected randomly from the beneficiary list obtained from KVK- Dharwad. The analysis indicated that 40 per cent of farmers possessed medium level of knowledge whereas 49.17 per cent farmers had medium adoption rate with regard to improved technologies. The economic analysis of Chickpea variety (JAKI- 9218) showed higher net returns of Rs.51, 165/ ha over farmers practice Rs. 44, 325 / ha and B: C ratio of 2.11 under demonstrated practice while it was 1.78 under check practice, indicated the positive effect of improved chickpea cultivar JAKI-9218. Majority of respondents revealed high cost of inputs (Chemicals, fertilizers) and lack of knowledge about balanced use of chemical fertilizers and plant growth regulators was constraint to adopt IPM technologies.

Keywords: Cluster Front Line Demonstrations, knowledge, adoption level, package of practices.

INTRODUCTION

Agriculture has been the backbone of the Indian economy for centuries, providing sustenance and livelihood to a significant portion of the population. Around 45.76% of India's total work force is engaged in agriculture (Economic survey, 2024), the sector plays a critical role in ensuring food security, economic stability and employment. However, traditional agricultural practices and indigenous crop varieties have faced numerous challenges, including low productivity, susceptibility to pests and diseases and vulnerability to climatic fluctuations. In this context, the development and adoption of improved crop varieties have emerged as pivotal in transforming Indian agriculture.

The Green Revolution in the mid-20th century exemplifies the transformative impact of improved crop varieties, leading to a substantial increase in food grain production and making India self-sufficient in staples like wheat and rice. Improved varieties, developed through scientific breeding techniques and genetic advancements, offer several advantages over traditional strains. These varieties are engineered to possess higher yield potential, better resistance to pests and diseases and improved tolerance to adverse environmental conditions. As a result, they contribute significantly to enhancing agricultural productivity, ensuring food security and promoting sustainable farming practices. In recent years, the focus has shifted towards developing varieties that not only enhance yield but also improve nutritional quality, reduce environmental impact and adapt to climate change.

Pulses, often referred to as the "poor man's meat," are a crucial component of the Indian diet. Among various pulses, Chickpea (Cicer arietinum) also known as Bengal gram holds a prominent position in India and is cultivated under a variety of agroclimatic circumstances. With an annual yield of 16.22 million tons and a productivity of 1252 kg/ha, chickpeas are grown on 14.97 million hectares throughout the world (FAO, 2019). India ranks first in both area and production contributing 71% of the world's area and 70% of its chickpea production. However,

due to farmers' low adoption of improved varieties and production technology, it trails behind numerous other countries in terms of productivity.

Karnataka, a major pulse-producing state in India, has a substantial area under chickpea cultivation. The crop is predominantly grown in the northern districts, where the climatic conditions and soil types are conducive to its growth. Chickpea cultivation in Karnataka has witnessed significant growth over the years, contributing to the state's agricultural economy. However, the productivity of chickpea in the region has been hindered by several factors, including traditional farming practices, pest infestations, diseases and climatic variability. To address these challenges, the introduction and adoption of improved chickpea varieties have become essential.

The development and dissemination of improved chickpea varieties have revolutionized chickpea cultivation in Karnataka. One such variety, Jaki-9218, released by Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV), Jabalpur (MP), has gained prominence due to its superior agronomic traits and resilience. Jaki-9218 has a semi-spreading plant type with a strong stem that resists lodging and is known for its larger seed size and an appealing seed coat, which is preferred in local and international markets. It is characterized by its high yield potential (18-20 q/ha), early maturity (112 days) and resistance to major diseases like Fusarium wilt and Ascochyta blight (http://jnkvv.org). In light of these attributes, considering it an ideal choice for farmers looking to enhance productivity and profitability, the KVK- Dharwad has been promoting this improved chickpea cultivar through CFLDs.

In light of this, an attempt was made to study the adoption of improved chickpea variety JAKI-9218 in Dharwad district of Karnataka state with the following specific objectives.

1.To measure the knowledge and adoption level of chickpea farmers regarding varietal interventions of KVK.

2.To analyze the impact of the varietal interventions on income level of chickpea farmers.

MATERIALS AND METHODS:

Selection of study area and respondents: The research study was conducted during 2020-2021 in Dharwad district of Karnataka using *Ex post-facto* research design. This district was purposively selected as it has highest area under chickpea cultivation. Further in Dharwad district, Dharwad and Navalgund taluks were purposively selected based on the availability of highest numbers of farmers who have adopted the technologies promoted by the KVK. A list of beneficiary farmers was obtained from the KVK, Dharwad. From the list 120 beneficiary farmers who have adopted chickpea technologies were selected through simple random sampling technique. Thus, constituted the total sample size of 120 for the study.

Knowledge of recommended cultivation practices: Knowledge was operationally defined as the body of information understood and retained by respondents with respect to improved chickpea variety and recommended cultivation practices of chickpea. The knowledge test was constructed based on package of practices for chickpea referring to the package of practices as mentioned and recommended by the University of Agricultural Sciences (UAS), Dharwad. A list of knowledge items on each practice was prepared based on the judgement of the experts, to obtain the response from the respondents. The answers to questions were quantified by giving score 1 for known item and 0 to not known item. The summation of score for the answers of particular respondent indicates his knowledge level about recommended cultivation practices of chickpea. Further the respondents were classified into three categories based on mean and standard deviation as follows.

List 1 : Categories and score range for knowledge test

SI. No	Categories	Score range
1	Low	Below (mean – 0.425SD)

2	Medium	Between (mean ± 0.425SD)
3	High	Above (mean + 0.425SD)

Adoption of recommended cultivation practices: Adoption is a decision to make full use of an innovation as the best course of action available. It refers to the extent of adoption of recommended and improved chickpea variety and production practices by chickpea farmers as mentioned and recommended by the University of Agricultural Sciences (UAS), Dharwad. Respondents were asked questions to know whether they have adopted each of recommended production technologies or not. The answers elicited from the farmers were quantified by giving "1" score to adoption and "0" to non-adoption. The total score obtained by the respondents from all practices was the adoption score of the individual respondent. Based on the total score, the respondents were grouped into three categories namely, 'low', 'medium' and 'high' using mean and standard deviation as a measure of check.

List 2 : Categories and score range for understanding Levels of adoption of recommended and improved chickpea variety and production practices

SI. No	**Categories**	**Score range**
1	Low	Below (mean – 0.425SD)
2	Medium	Between (mean ± 0.425SD)
3	High	Above (mean + 0.425SD)

Income of the chickpea farmers: Income was operationally defined as the consumption and saving opportunity gained by an entity within a specified time frame, which is generally

expressed in monetary terms and it referred to net profit gained by farmer by cultivating chickpea and it was worked out by using the following formula

Net returns = Gross returns – Total cost of cultivation

Gross returns = Average yield per acre x Average market price per quintal

RESULTS & DISCUSSION:

Knowledge level of Chickpea growers in respect of individual recommended cultivation practices of Chickpea

The results furnished in Table 1 revealed that cent per cent of the respondents have knowledge regarding the practices like land preparation, selection of varieties, season of sowing, seed treatment, method of application of fertilizers and FYM, manual weed control, inter-cultivation, nipping, irrigation, intercropping, adoption of resistant cultivars for wilt control and harvesting time, since, majority of these practices are basic aspects of cultivation and does not require any technical skills and being practiced since the age of forefathers and due to their participation in CFLD organized by the KVK might helped farmers to possess full knowledge regarding certain practices like intercropping, adoption of resistant cultivars for wilt control, application of appropriate quantity of fertilizers, weed management *etc*., in Chickpea.

From the Table 1, it is also clear that more than three fourth of the Chickpea growers have knowledge about early sowing to escape rust infection (81.67 %), seed rate (76.67 %) and nearly two third of the respondents have knowledge regarding chemical control of pod borer (64.17 %), chemical control of *fusarium* wilt (61.67%), installation of bird perches for pod borer control (60.00 %), chemical control of rust (55.00 %).The insights from Table 1, also revealed that majority of the Chickpea growers have no knowledge regarding growth regulators usage like Cycocel (89.17 %) and NAA (75.00 %), intercropping with linseed for cutworm management (75.83%), chemical control of cut worm (69.17 %), recommended doses of NPK (65.83%), spacing (60.00 %) and chemical weed control (60.00 %).

Reasons for lack of knowledge about the above mentioned recommended practices might be due to lack of awareness, lack of farmers' interest to know about the recommended practices, less exposure to the various extension activities organized by the concerned agricultural departments (field days, field visits, demonstrations and training programmes) and non-availability of extension personnel to farmers in time to provide timely and credible information regarding recommended cultivation practices of Chickpea. From the above results it was also observed that the practices which are complex and difficult to remember were moderately known to Chickpea growers. On the other hand, the practices which are simple, traditionally practiced and followed by forefathers were known to majority of the Chickpea growers.

The results depicted in Table 2 indicated that two fifth (40.00 %) of the Chickpea growers had medium knowledge whereas 34.17 per cent and 25.83 per cent of the Chickpea growers belonged to high and low knowledge level categories, respectively, regarding the recommended cultivation practices of Chickpea (Rojh *et al*., 2016). These results indicated that nearly three fourth of the Chickpea growers had medium to high level of knowledge about recommended cultivation practices of Chickpea. It might be due to the fact that majority of the farmers were middle aged, literates and had medium to high experience in Chickpea cultivation. Further, high economic motivation and medium extension participation and scientific orientation of farmers might have influenced them to had medium to high level of knowledge about the recommended cultivation practices of Chickpea.

Adoption level of Chickpea growers in respect of individual recommended cultivation practices

It is interesting to note from Table 3 that no gap was observed in adoption of practices like land preparation, improved varieties, time of sowing, method of fertilizer application, manual weed control, irrigation, adoption of resistant Chickpea cultivars and harvesting time. The possible reason for adoption of these practices might be that these practices were simple and doesn't require any technical skills which can be easily practiced by making use of the available knowledge and resources.

Three fourth of the Chickpea growers have adopted practices like inter-cultivation (76.67 %), seed treatment (74.17 %), intercropping (74.17 %) whereas more than three fifth of the farmers had adopted practices like FYM application (67.50 %), seed rate (60.00 %) followed by chemical control of wilt (55.00 %), chemical control of pod borer (47.50 %) and (43.33 %) early sowing to control rust (Manjushree, 2018). The reason might be that most of the respondents were convinced of the profitability and productivity of these practices.

Further, relatively less adoption was noticed in spacing (35.00 %), spraying of growth regulators like Chickpea magic (35.00%), chemical control of rust (30.83 %), recommended doses of NPK (29.17 %), use of growth regulators like NAA (15.00 %). The reasons for non adoption of above practices might be due to lack of knowledge, high cost and non availability of fertilizers and usually it is the tendency of farmers to follow the fertilizer and chemical dose as suggested by the fertilizer and input dealers and other farmer friends.

Table 3 also revealed that none of the farmers had adopted practices like chemical control of weeds, nipping, spraying of Cycocel, installation of bird perches for pod borer control and intercropping with linseed to control cut worm and chemical control of cutworm. The reasons might be due to less incidence of weeds in *rabi* season and no infestation of pests like cutworm and lack of knowledge regarding the growth regulators like cycocel. Moreover, practices like nipping and installation of bird perches were tedious and time consuming (Reddy *et al*., 2023).

It is evident from Table 4 that nearly half (49.17 %) of the Chickpea growers belonged to medium level of adoption category whereas 27.50 per cent and 23.33 per cent of the farmers belonged to low and high adoption categories, respectively. This result inferred that nearly half of the Chickpea growers belonged to medium adoption of recommended cultivation practices of Chickpea. Results were found in accordance with the findings of Tulshiram (2019). The probable reason might be due to the fact that majority of the farmers belonged to medium knowledge level regarding recommended cultivation practices, medium to large land holding, medium extension participation, scientific orientation and innovativeness might have kept them in these circumstances. Further, lack of awareness about innovation attributes such as its simplicity to understand, profitability, impact visibility and high cost of agricultural inputs

might also be the reason for such type of result.

Impact of the varietal interventions of KVK on farmers income

A cursory look into Table 5 indicated the positive effect of new improved variety of Chickpea (JAKI-9218) over the existing practices. The improved variety had a yield advantage of 5.48 % (Kassa *et al.*, 2021). The economic analysis of Chickpea variety (JAKI- 9218) showed higher net returns of Rs.51165/ ha over farmers practice which was Rs.44, 325 / ha and B: C ratio of 2.11 (Sharma *et al.,* 2021) under demonstrated practice while it was 1.78 under check practice. A perusal of Table 5 revealed that net returns of the Chickpea farmers had significantly increased after the adoption of improved Chickpea variety JAKI-9218 as compared to previous variety JG-11. There was an increment of income by 15.43 per cent after the adoption of improved variety. The probable reason for this might be its yield advantage over the existing variety. Further, there was a slight increase in the price of the produce by 2.85 per cent and this could be due to high market demand of improved variety due to quality produce and bold size of the seeds as compared to existing variety (Koushal *et al*., 2024; Gaur and Jadav, 2020).

Comparison of economic parameters of Chickpea farmers before and after the adoption of KVK interventions

The ‘t’ test values presented in Table 6 between Chickpea varieties JG-11 and JAKI-9218 indicated significant difference in economic parameters such as yield, price and net returns at 1 per cent level of significance.

CONCLUSION:

Innovations in pulse breeding, exemplified by JAKI-9218, showcased the immense potential of targeted agricultural research by empowering farmers with options that can withstand environmental challenges while improving yield quantity and quality. The adoption of Jaki-9218 has not only enhanced chickpea productivity but also contributed to the overall sustainability of agricultural practices in Karnataka. As we continue to face the ever-growing challenge of feeding a growing population under the threat of climate change, these gram varieties stand as evidences to human ingenuity and foresight. They not only promise a brighter future for farmers but also strengthen the pillars of global food security and nutrition. Thus, it is

suggested that more number of CFLD's are to be organized effectively on improved varieties of various crops. By providing farmers with robust and high performing improved varieties, agricultural research and extension services could pave the way for increased food security, economic stability and environmental sustainability in the region.

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Table 1: Knowledge of chickpea farmers in respect of individual recommended cultivation practices of chickpea (n = 120)

Sl. No	Practices	Knowledge level			
		Known		Not known	
		f	%	F	%
1.	**Land preparation: [**2-3 times ploughing before sowing]	120	100.00	0	0.00
2.	**Variety:** JAKI 9218, JG-11	120	100.00	0	0.00
3	**Season of sowing:** October-November	120	100.00	0	0.00
4	**Seed rate:** 20kg/acre	92	76.67	28	23.33
5	**Spacing:** 30 x 10 cm	48	40.00	72	60.00
6	**Seed treatment: [**with Cacl2, *Rhizobium* and	120	100.00	0	0.00

	Phosphate Solubilizing Bacteria (PSB)				
7	**Application of organic manures** Apply FYM @2 tonne/acre before 2-3 weeks of sowing	120	100.00	0	0.00
8	**Application of chemical fertilizers (kg/acre)** i. 4:10:0 NPK/ acre	41	34.17	79	65.83
	ii) placement method	120	100.00	0	0.00
9	**Weed control:** i) manual weeding:2 times hand weeding	120	100.00	0	0.00
	ii)chemical control with Pendimethalin 30 EC @ 1.3 litre/ 300 litres of water before the day of sowing.	48	40.00	72	60.00
10	**Inter-cultivation**: Intercultivate the crop for 2 times at 25-30 DAS and 50 DAS	120	100.00	0	0.00
11	**Nipping (35-40 DAS)**	120	100.00	0	0.00
12	**Irrigation:** 45 DAS – Flowering stage 75 DAS- Pod formation stage	120	100.00	0	0.00
13	**Inter cropping.** Chickpea + linseed (4:2) / Chickpea + safflower (3:1) / Chickpea + rabi sorghum (2:1)	120	100.00	0	0.00
14	**Growth regulators usage** i. 35 DAS, Spray the crop with 20 ppm of NAA @ 2ml/100 litre of water	30	25.00	0	75.00
	ii. At flowering stage, Spray with 100 ppm of Cycocel @ 10ml/100 lt of water	13	10.83	107	89.17
	iii. To get higher yield, spray 2.00 per cent Urea (20g/litre of water) or Chickpea magic @ 1.6 kg/ ha at the flowering stage	120	100.00	0	0.00

15	**Plant protection measures** **i) Pest management** **a) Pod borer** i. Installation of bird perches or at the time of sowing mix 20 gm of sunflower seeds and 20 gm of sorghum seeds with chickpea seeds. Later at the stage of pod development cast 10 kg of puffed rice per acre to encourage bird to feed on insects.	72	60.00	48	40.00
	ii. Spray 0.075 ml of Flubendiamide 13.35 SC or 0.15 ml of Chloranthrinaliprole 18.5 SC or 0.2 gm of Emamectin benzoate 5 SC or spraying of chilli garlic extract @ 20 ml per litre of water.	77	64.17	43	35.83
	b) Cutworm i. Intercropping with linseed	29	24.17	91	75.83
	ii. Spray Deltamethrin 2.8 EC @ 0.5 ml or Quinalphos 25 EC @ 2 ml per litre of water	37	30.83	83	69.17
	ii) Disease Management **a) Fusarium wilt** Seed treatment with carboxin 37.50 %+ Thiram 37.50% @ 2.5g/kg or captan 80 WP @ 2g/kg or carbendazim @ 2g/kg or Trichoderma harzianum @ 4-6 g/kg	74	61.67	46	38.33
	iii. Adopt resistant chickpea cultivar	120	100.00	0	0.00
	b) Rust i. Early sowing on the month of October may escape infection	98	81.67	22	18.33
	ii. Spray hexaconazole @ 1 ml or propiconazole @ 1 ml per litre of water	66	55.00	54	45.00

16	**Harvesting:** i. JAKI 9218 - 100 days ii. JG-11 - 90- 100 days	120	100.00	0	0.00

Table 2: Distribution of the chickpea farmers according to their overall knowledge (n = 120)

Category	Frequency	Percentage
Low (<19.50)	31	25.83
Medium (19.50-20.62)	48	40.00
High (>20.62)	41	34.17
Mean=20.06	SD=1.31	

Table 3: Adoption level of chickpea farmers in respect of individual recommended cultivation practices (n=120)

Sl. No	Practices	Adoption level			
		Adopted		Not Adopted	
		f	%	f	%
1.	**Land preparation: [**2-3 times ploughing before sowing]	120	100.00	0	0.00
2.	**Variety:** JAKI 9218, JG-11	114	95.00	6	5.00
3	**Season of sowing:** October-November	120	100.00	0	0.00
4	**Seed rate:** 20kg/acre	72	60.00	48	40.00
5	**Spacing:** 30 x 10 cm	42	35.00	78	65.00
6	**Seed treatment: [**with Cacl2, *Rhizobium* and Phosphate Solubilizing Bacteria (PSB)	89	74.17	31	25.83

7	**Application of organic manures** Apply FYM @2 tonne/acre before 2-3 weeks of sowing	81	67.50	39	32.50
8	**Application of chemical fertilizers (kg/acre)** i. 4:10:0 NPK/ acre	35	29.17	85	70.83
	ii) placement method	120	100.00	0	0.00
9	**Weed control:** i) manual weeding:2 times hand weeding	120	100.00	0	0.00
	ii)chemical control with Pendimethalin 30 EC @ 1.3 litre/ 300 litres of water before the day of sowing.	0	0.00	120	100.00
10	**Inter-cultivation**: Intercultivate the crop for 2 times at 25-30 DAS and 50 DAS	92	76.67	28	23.33
11	**Nipping (35-40 DAS)**	0	0.00	120	100.00
12	**Irrigation:** 45 DAS – Flowering stage 75 DAS- Pod formation stage	120	100.00	0	0.00
13	**Inter cropping.** Chickpea + linseed (4:2) / Chickpea + safflower (3:1) / Chickpea + rabi sorghum (2:1)	89	74.17	31	25.83
14	**Growth regulators usage** i. 35 DAS, Spray the crop with 20 ppm of NAA @ 2ml/100 litre of water	18	15.00	102	85.00
	ii. At flowering stage, Spray with 100 ppm of Cycocel @ 10ml/100 lt of water	0	0.00	120	100.00
	iii. To get higher yield, spray 2.00 per cent Urea (20g/litre of water) or Chickpea magic @ 1.6 kg/ ha at the flowering stage	78	65.00	42	35.00
15	**Plant protection measures** **i) Pest management**	0	0.00	120	100.00

	a) Pod borer i. Installation of bird perches or at the time of sowing mix 20 gm of sunflower seeds and 20 gm of sorghum seeds with chickpea seeds. Later at the stage of pod development cast 10 kg of puffed rice per acre to encourage bird to feed on insects.				
	ii. Spray 0.075 ml of Flubendiamide 13.35 SC or 0.15 ml of Chloranthrinaliprole 18.5 SC or 0.2 gm of Emamectin benzoate 5 SC or spraying of chilli garlic extract @ 20 ml per litre of water.	57	47.50	63	52.50
	b) Cutworm i. Intercropping with linseed	0	0.00	120	100.00
	ii. Spray Deltamethrin 2.8 EC @ 0.5 ml or Quinalphos 25 EC @ 2 ml per liter of water	26	21.67	94	78.33
	ii) Disease Management **a) Fusarium wilt** Seed treatment with carboxin 37.50 %+ Thiram 37.50% @ 2.5g/kg or captan 80 WP @ 2g/kg or carbendazim @ 2g/kg or *Trichoderma harzianum* @ 4-6 g/kg	66	55.00	54	45.00
	iii. Adopt resistant chickpea cultivar	120	100.00	0	0.00
	b) Rust i. Early sowing on the month of October may escape infection	52	43.33	68	56.67
	ii. Spray hexaconazole @ 1 ml or propiconazole @ 1 ml per liter of water	37	30.83	83	69.17
16	**Harvesting:** i. JAKI 9218 - 100 days ii. JG-11 - 90- 100 days	120	100.00	0	0.00

Table 4: Distribution of the chickpea farmers according to their overall adoption (n = 120)

Category	Frequency	Percentage
Low (<14.32)	33	**27.50**
Medium (14.32-15.49)	59	**49.17**
High (>15.49)	28	**23.33**
Mean=14.91	**SD=1.37**	

Table 5: Impact of KVK promoted technologies on income and productivity of chickpea growers:

Parameters	JG-11	JAKI-9218	% increase
Yield (q/ha)	14.60	15.40	5.48
Price (Rs/q)	4750	4885	2.85
Cost of cultivation (Rs/ha)	24850	24185	-2.68
Gross returns (Rs/ha)	69175	75350	8.93
Net returns (Rs/ha)	44325	51165	15.43
B:C	1.78	2.11	

Table 6. Comparison of economic parameters of Chickpea farmers before and after the adoption of KVK intervention (n=120)

Sl. No.	Parameters	JAKI-9218 vs JG-11
		t- value

1.	Yield	2.45**
2.	Price	5.32**
3.	Net returns	3.76**

** significant at 1%