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Frontline Demonstration of Chickpea (*Cicer arietinum* L.) Under Integrated Crop Management Practices (ICM) in Central Dry Zone of Karnataka, India

B. O. Mallikarjuna[1*], T. N. Devaraja[2] and D. V. Kolekar[3]

[1]Department of Agronomy, [2]Department of Fisheries, ICAR-Taralabalu Krishi Vigyan Kendra, Davanagere - 577005, Karnataka, India
[3]Agriculture Extension, ICAR-ATARI, Zone XI, Bengaluru, Karnataka, India

**Corresponding author*

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A B S T R A C T

With an objective of improving the production and productivity of chickpea, Integrated Crop Management (ICM) practices were conducted in 125 farmers' fields covering an area of 50 hectares in Nymathi and Jagalurtaluk of Davanagere district in Central dry zone of Karnataka state during *Rabi* season during 2020-21 to 2022-23 for the period of three consecutive years with high yielding variety JAKI 9218. The Cluster frontline demonstration study findings revealed that ICM practices recorded an average yield of 1186 kgha^{1} which is 30.45 per cent higher than obtained with farmer's practice (non – ICM) (909 kgha^{1}). The mean for the three years of extension gap, technology gap and technology index were 277 kgha^{1}, 614 kgha^{1} and 31.40 per cent, respectively. An average net returns and benefit cost ratio of ₹24236 and 1.81 recorded in ICM plot as against ₹14290 and 1.53 in farmers practice respectively. The productivity of chickpea per unit area could be increased by adopting scientific and location specific technologies such as variety, optimum plant population, spraying of chickpea magic and timely integrated pest management practices. ICAR- Taralabalu KVK carried out ICM practices in a systematic and scientific manner on different farmer's field to show the worth of improved practices and convincing farming community about potentialities of improved production management technologies of chickpea for further adoption by the farming community of Davanagere district.

Introduction

Chickpea (*Cicer arietinum* L) is an important pulse crop and in the world it is grown in an area of 148.42 lakh hectares with production of 150.84 lakh tonnes and 1016 kg/ha of productivity (FAO STAT, 2020). In Karnataka the crop is grown in an area of 13.72 lakh hectares with the production of 8.97 lakh tonnes and 321kg ha^{1}. Vegetarian population in India is more and for these population the cheap source of protein is pulse crops. Chickpea being as leguminous pulse Crop has a unique position as a *rabi* crop. The chickpea is well known for fixing the atmospheric nitrogen and helps to restore the soil fertility. India shares 35.2 percent area and 27.65 percent of the global production in pulse crops. It helps in nitrogen fixation and the root nodules of this crop fix

about 103 kg of nitrogen from atmosphere. It helps in better aeration in the soil by opening due to its deep root system. Thus the crop of chickpea plays a vital role in improving soil health thereby ensuring environmental security. The area of the chickpea is declining day by day even though we find this crop as beneficial one. Chickpea commonly known as gram or Bengal gram is the most important pulse crops, the nutritive content is mainly 21.1 per cent protein, 61.1 per cent carbohydrate and 4.5 per cent fat. Gram is mainly used as a human food inform of vegetable and dhal. Gram flour is used in preparation of various type of sweets and other items like pakoda etc.

There are several biophysical, technical and socioeconomic constraints, which limit the productivity of chickpea in India. It leguminous crop as it requires less amount of nitrogenous fertilisers and it also adds atmospheric nitrogen to the soil and thus improving the soil fertility. It is winter crop the frost at the time of flowering will result in the flower drop and thus reduction in the yield. This chickpea is suited for the area rainfall ranges from 600 to 900 mm.

In Southern Karnataka, Davanagere district Chickpea occupying an area of 5070 hectares with the production of 5226 metric tonnes and productivity of 1031.06 kgha[1]. The different factors that influence the potential yield of the crop is mainly due to unconventional methods like sowing of traditional varieties, lack of knowledge on high yielding varieties, seed treatment with bio fertilisers and bio pesticides, spraying of the macro nutrients, integrated pest and disease management (pod borer – Helicoverpa) and mainly chickpea/Bengal gram is grown in *rabi* season and with available moisture (under rain fed farming). National food Security Mission for pulses (2007-08) to increase the pulse production and productivity through the cluster frontline demonstration (CFLD) program. Under the CFLD activity main aim is to select the districts to implement the improved technologies like introduction of high yielding varieties, integrated nutrient management (INM), integrated pest management (IPM), Popularising the chickpea magic, method demonstration, training and mass media campaign. CFLD's were conducted to show the worth of high yielding variety with integrated crop management practices for higher yield. It is a drought-resistant crop suitable for *rabi* season and it requires less critical inputs. For the benefit of farmers in nationwide NFSM-CFLD programs initiated by The Ministry of Agriculture and Farmers Welfare, Government of India. The extent of adoption of improved agricultural technologies is a crucial aspect under innovation diffusion process and the most important for enhancing agricultural production at a faster rate. Large number of technologies evolved in the field of agriculture is not being accepted and adopted to its fullest extent by the farmers. The gap between recommendations made by the scientists and actual use by farmers is frequently encountered.

Materials and Methods

National Food Security mission - Cluster Frontline Demonstrations (CFLD) are used to assess the integrated crop management (ICM)practices of Chickpea conducted at Davanagere district during 2020-2022 for three consecutive years. CFLDs were conducted in 125 farmer's field in different villages are Rameshwara, Kallederapura and Kattegehalli of Davanagere district under central dry zone. The main objective is to popularise the improved the production technologies for the productivity enchantment of chick pea with integrated crop management practices. The integrated crop management practices like use of high yielding variety JAKI 9218, seed treatment with rhizobium and Phosphorus solubilising bacteria(PSB), bio pesticide *(tichoderma)* along with recommended dose of fertiliser (10 kg N, 25 kg P2O5), spraying of water soluble fertilisers chickpea magic, integrated pest management practices and timely harvesting and threshing. The extension methods for diffusing the technologies conducted the off campus and on campus training program, providing the literature and method demonstration. The extension gap, technology gap, technology index, % increase in the yield over farmer practice and benefit cost ratio were calculated using the following formula as suggested by Pandey *et al.,* (2011).

Extension gap = Demonstration yield - Local check yield …(1)

Technology gap = Potential yield - Demonstration yield …(2)

$$\text{Technology Index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100 \quad \ldots(3)$$

$$\text{Percent increase in yield} = \frac{\text{Demo yield} - \text{check yield}}{\text{Check yield}} \times 100 \quad \ldots(4)$$

$$\text{Benefit cost ratio} = \frac{\text{Gross return } (\square.ha^{-1})}{\text{Gross Cost } (\square.ha^{-1})} \quad \ldots(5)$$

Results and Discussion

Grain yield

The highest grain yield of 1415 kgha^{1} recorded in demonstration (ICM) plot during the year 2021-22 as against 1049 kg ha^{1} in farmer's practice (Non-ICM). The percent increase in the grain yield in demonstration over farmers practice was 35.76, 34.89 and 20.71 during the years 2020, 2021 and 2022 respectively with an average increase of 30.45 %.

With all the best improved technologies the average yield of chickpea under demonstration plot recorded 1186 kgha^{1} in comparison with 909 kgha^{1} in farmers practice. The increase in the yield in demonstration over farmers practice is mainly due integrated crop management practices like high yielding variety, seed treatment and spraying of chickpea magic were followed. The similar finding were found by Goudappa *et al.,* 2019; Dhruw *et al.,* (2012) and Keshavareddy *et al.,* (2018).

The average gross cost, gross return and net return of ₹31866 ha^{-1}₹.56102 ha^{-1} and ₹24236 ha^{-1} were recorded for three consecutive years. The highest gross return and net return of Rs.61150 and Rs.28417 were recorded during the year 2018 and 2019 respectively. Highest Benefit cost ratio of 2.02 was obtained during 2022-23 and lowest B:C ratio was recorded 1.54 during the year 2021-22 under the demonstration (Table 3). In farmer's practice, the average gross cost (₹28676 ha-1), gross return (₹42966 ha^{-1}), net returns (₹14290 ha-1) and B: C ratio (1.53) were recorded. The difference in the net returns and B:C ratio varies mainly due to fluctuation in the market price and cost of critical inputs.

The additional returns obtained in the demonstration is mainly due to high yielding varieties, IPM practices and use of chickpea magic at time of 50% flowering. Similar studies were reported by (Keshavareddy *et al.,* 2018; Goudappa *et al.,* 2019 and Padma Veni *et al.,* 2018).

Yield gap analysis

The extension gap is obtained by deducting the farmers yield from demonstration yield. Table 3 depicts that the gap ranged from 186 to 336 kgha^{1} with an average gap of 277 kgha^{1}. The higher extension gap is mainly due to lack of awareness on improved production technology.

By this gap KVK needs to educate the non-beneficiary farmers through the extension methods like awareness, training, seed treatment, field days, method demonstration, field visit and timely farm advisory services.

The technology gap (kgha^{1}) difference between potential and demonstration yields ranging from 385 to 741 with an average of 614 kgha^{1}. The Higher technology gap may be due climatic change, soil fertility status, crop grown on marginal lands and local specific crop management problems faced in order to harness the yield potential of specific crop cultivars under demonstration plots. The new technologies will eventually lead to the farmers to discontinue the old technology and to adopt new technology.

The technology index shows the feasibility of the evolved technology at the farmer's fields and lower value of technology index more is the feasibility of the technology. The technology index ranges from 21.38 to 41.16 % with an average of 34.10%. It shows the adoption of the new technologies by the farmers for getting higher yield. Similar line of finding were reported by Goudappa *et al.,* (2019); Ashoka *et al.,* (2020).

The cluster Frontline demonstration conducted by ICAR-Taralabalu KVK, Davanagere recorded the higher yield and economics returns compared to the farmers practice. The average percent increase in the yield of about 30.45 over farmer practice.

However there is wide gap in potential yields, demonstration yields and farmers yields in all the years the technology gap and extension gap indicating that there is need of location specific technology embedded with high yielding variety with drought tolerant, wilt resistant and improved production technology like seed treatment with bio fertilizers, weed control, integrated nutrient management, implementation of IPM technologies.

KVK can play a vital role for non-beneficiary farmers through the trainings, field days, method demonstrations, exhibitions, field visit, seed melas and exposure visits to demonstrated plots for adopting the improved production technologies of crops.

Table.1 Technology Gap in adoption of improved production practices in Bengal gram

Si.No	Technology	Improved Practices	Farmer Practices	Gap in Adoption (100%)
1	Variety	JAKI 9218	JAKI 9218	100
2	Seed rate	62.5 kg/ha	70 kg/ha	High Seed rate
3	Seed Treatment	Bio fertilisers -Rhizobium and PSB @ 500g/ha . Bio pesticide –*Trichoderma* @4g/kg of seed	Not Followed	100
4	Macro Nutrients	DAP-75 kg/ha MOP- 50 kg/ha	DAP-50 kg/ha Urea-100kg/ha	59
5	Nutrient sprays	Chick pea Magic @ 5kg/ha	Not followed	100
6.	Nipping	Nipping – Mechanised	Not practised	100
8	Plant Protection Measures	Integrated Pest Management (Traps installation)	Untimely management of pests.	100

Table.2 Bengal gram yield under demonstration (ICM) and farmers practice (Non –ICM)

Year	Potential yield (q/ha)	Demonstrated plot JAKI 9218 –ICM	Farmers Practice Non – ICM(JAKI 9218)	Increase in yield over Farmers Practice (%)
2020-21	18	10.59	7.80	35.76
2021-22	18	14.15	10.49	34.89
2022-23	18	10.84	8.98	20.71
Average	18	11.86	9.09	30.45

Table.3 Comparison of economics of Bengal gram cultivated under Demonstration and farmers field (check)

Year	Demonstration Plot				Farmers Practice				Additional returns (₹ha^{-1})
	Gross Cost (₹ha^{-1})	Gross Return (₹ha^{-1})	Net Return (₹ha^{-1})	B :C	Gross Cost (₹ha^{-1})	Gross Return (₹ha^{-1})	Net Return (₹ha^{-1})	B:C	
2020-21	27536	51362	23826	1.86	25671	37830	12159	1.47	11667
2021-22	43200	66514	23314	1.54	36872	49312	12440	1.34	17202
2022-23	24861	50429	25569	2.02	23486	41757	18271	1.78	7298
Average	**31866**	**56102**	**24236**	**1.81**	**28676**	**42966**	**14290**	**1.53**	**12056**

Table.4 Table showing the Extension gap, Technology gap and Technology index in Bengal gram

Year	Potential yield (q/ha)	Demonstration yield (q/ha)	Extension Gap (q/ha)	Technology Gap (q/ha)	Technology Index (%)
2020-21	18	10.59	2.79	7.41	41.16
2021-22	18	14.15	3.66	3.85	21.38
2022-23	18	10.84	1.86	7.16	39.77
Average	**18**	11.86	**2.77**	**6.14**	**34.10**

Author Contributions

B. O. Mallikarjuna: Investigation, formal analysis, writing—original draft. T. N. Devaraja: Validation, methodology, writing—reviewing. D. V. Kolekar:—Formal analysis, writing—review and editing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

References

Ashoka1 P, Priya P and Sarojani J. Karakkannavar. 2020. Front Line Demonstration: A Technology Tool to Enhance the Millets Yield of North Karnataka. *Int.J.Curr.Microbiol.App.Sci*;*9*(6): 2804-2811 https://doi.org/10.20546/ijcmas.2020.906.339

Dhruw, K. S., Sengar, R. S. and Yadaw, K. N., Level of knowledge and adoption about recommended maize production technology. *Agriculture Update*, 7(3&4): 311-315 (2012).

Goudappa S. B., Preeti and Yusufali. A. Nimbargi (2019). Production Potential of Chickpea (*Cicer arietinum* L.) Under Integrated Crop Management (ICM) in North Eastern Dry Zone of Karnataka Int. J. Pure App. Biosci. 7 (1): 507-510. http://dx.doi.org/10.18782/2320-7051.7644

Keshavareddy, G., Kamala Bai, S., Nagaraj, K. H. and Ranganath, S. C., (2018). Impact of Front Line Demonstration on Yield and Economics of Pigeon Pea, *Cajanus cajan* in the District of Ramanagara, Karnataka, India. International Journal of Current Microbiology and Applied Sciences 7(1):472-478 https://doi.org/10.20546/ijcmas.2018.701.056

Padma Veni C., BandaruVenkata Rajkumar, D. Vijaya Lakshmi, M. Swetha, P. Vijay Kumar, M. Bhavya Manjari and K. Dattatri 2018. Food Security by Promotion of Pulses through KVK Methodology – A Way of Doubling the Farmers Income *Int.J.Curr.Microbiol.App.Sci.* 7(10): 2585-2596 https://doi.org/10.20546/ijcmas.2018.710.300

Pandey, S. K., U. S. Gautam, D. P. Rai and Mohd. Mustafa 2011. Knowledge and Adoption of Gram Production Technology Indian Journal of Extension Education Vol.47, No. 3 & 4, 2011 (37-39)

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