***Original Research Article***

Analysis of technological gap and constraints in Adoption of Chickpea Production Technologies of UAS Dharwad in North Karnataka

## ABSTRACT:

Chickpea(*cicer arientinum L.*) is one of the major pulse crops in India as well as in Karnataka grown as a rabi season crops in major parts of Karnataka. This study was purposively conducted in Vijayapura (Vijayapura taluk and Basavana Bagewadi taluk) and Gadag (Gadag taluk and Ron taluk) districts of Karnataka state during 2021-22 with a sample of 120 chickpea growers. The data was elicited through personal interview method and *ex-post-facto* research design was used for the study. More than one fourth of chickpea growers belonged to medium technological gap (37.50 %), high technological gap (35.83 %) category and 26.67% of Chickpea growers were belonged to low technological gap category. No technological gap was noticed in practices like adoption of recommended soil, land preparation, varieties and harvesting time, season of sowing, very less technological gap was found in intercultivation (08.33%), chemical control of pod borer (19.17%). Huge technological gap was noticed in adoption of fusarium wilt resistant JG-11 variety (75.00%), application of FYM 2-3 weeks before sowing (75.00%) and chemical control of rust disease (80.00%) and intercropping with *rabi* sorghum (84.17%). This is due to lack of knowledge about specific practices of chickpea production. Inadequate knowledge about balanced fertilizer application, high risk of crop failure due to poor rainfall. Inadequate loan amount and fluctuation in market prices were the major constraints faced by the chickpea growers.

***Key words****: Technological gap, Knowledge, Adoption, Chickpea, Constraints.*

## INTRODUCTION

India is the world's top producer and consumer of pulses. Pulses are grown over 26.57 million hectares in India, where they are produced in quantities of 27.30 million tonnes annually (Seema Sharma, 2024). India makes up more than one-third of the entire area and produces more than 20 per cent of the world's pulses. Chickpea (47%), Pigeon pea (16%), Black gram (11%), Green gram (11 %), and other pulses (10%) (DES,MoA&FW,GoI,2024) are the main pulses cultivated in India. For the bulk of India's vegetarian population, pulses are the main source of protein. Bengal gram (*Cicer arietinum* L.), sometimes known as gram, is a member of the Leguminosae family and is a type of chickpea. Chickpeas contributes the single largest share in India’s export basket of pulses registering 49% share in the total pulses export during 2018-19 to 2022-23 followed by Pea (15%), Lentil (10%), Urd (7%),Tur (7%), Mung (5%) (DES, MoA & FW,GoI 2022-23).

In Karnataka, Chickpea is cultivated in 8.39 lakh hectares of area with an annual production of 5.45 lakh tonnes and having productivity of 663 kg/ha (DES 2022-23,MoA&FW, GoK). The main pulse crop in Karnataka is the chickpea, which has taken over farmers' economies in recent years, especially in the state's rainfed ecosystem. Annigeri-1 is the most popular and earliest desi cultivar cultivated by the farmers and it was released by UAS, Dharwad. This cultivar was spread on a large area across districts in the state and for long years. The lower productivity of chickpea is due to non-adoption of improved production technologies, thus severe incidence of pest and diseases, non-remunerative market prices for the produce in commensurate with high cost of cultivation and lack of area under irrigation. Thus, both production and marketing of chickpea was associated with various technological and economic constraints. These limitations may result from a lack of understanding of the set of procedures suggested by the University of Agricultural Sciences, Dharwad. In this regard, it is important to understand how the production technologies used by chickpea farmers differ from those advised by universities. So, an attempt has been made to explore technological gap in adoption of Chickpea production technologies of UAS Dharwad and constraints faced by farmers in adoption of Chickpea production technologies.

### OBJECTIVES

1. To assess the technological gap in adoption of Chickpea production technologies of UAS Dharwad
2. To elicit the constraints in adoption of Chickpea production technologies

## MATERIALS AND METHODS

The study was conducted during 2021-2022 with the purpose to investigate the technological gap in adoption of chickpea production technologies of UAS Dharwad in north Karnataka. Thestudy was conducted in Gadag and Vijayapura districts of Karnataka during 2021-2022. These districts were purposively selected keeping in view that maximum area under chickpea cultivation. The main objective of the study was to find out the technological gap in adoption of chickpea production technologies of UAS Dharwad Since the things have already occurred the ***ex-post facto*** research design was used for conducting the proposed study. In Gadag and Vijayapura districts, keeping the criteria of maximum area under chickpea cultivation, two talukas from each district *viz.,* Ron (58,731.00 ha), Gadag (40,573.00 ha), Vijayapura (55,674.00 ha) and Basavana Bagewadi (33,384.00 ha) were selected. 2 villages were selected from each selected taluk. Thus, total of 8 villages were selected for the study. Further, from the selected 8 villages 15 chickpea growing farmers were randomly selected from each village to constitute a total sample size of 120. The data from Chickpea growers was collected by personal interview method with the help of structured interview schedule. And the data was systematically tabulated and analyzed statistically by using mean, frequency, percentage, standard deviation and correlation.

## RESULTS AND DISCUSSION

### Technological Gap in Adoption of Chickpea production technology

The results presented in the Table 1 revealed the technological gap in respect of recommended cultivation practices of chickpea among chickpea growers.

It is interesting to note from Table 1 that no technological gap was noticed in adoption of recommended soil, land preparation, varieties and harvesting time, season of sowing, while very less technological gap was found in intercultivation (08.33 %) and chemical control of pod borer (19.17 %).

It is also revealed that less than one third (30.00 %) technological gap was found in installation of bird perches, more than one third of technological gap was observed in crop rotation to escape from cutworm infestation (38.33%) and manual hand weeding (39.17 %). Further, more than half technological gap was found in Application of FYM (50.84 %), early sowing in the month of October to escape from rust infestation (59.17%) and use of recommended seed rate (67.50 %).

Huge technological gap was noticed in adoption of fusarium wilt resistant JG-11 variety (75.00 %), application of FYM 2-3 weeks before sowing (75.00 %), field sanitation (75.83%) chemical control of rust disease (80.00%), intercropping with *rabi* sorghum (84.17 %), application of recommended dosage of chemical fertilizer (85.83 %), seed treatment with rhizobium and PSB (86.67 %), recommended spacing (90.00%), nipping (90.83 %), spraying 2.00 per cent urea at flowering stage (92.50 %), chemical control of cutworm infestation(93.33 %) and seed treatment with fungicide to control fusarium wilt disease (95.83 %).

However, cent per cent technological gap was observed in use of chemicals for weed control and intercropping with linseed and safflower, spraying crop with 20ppm of NAA @ 2 ml/ 100 liters of water, spraying cycocel @10 ml/100 liter of water.

### Table 1: Technological gap in recommended specific cultivation practices of chickpea

**(n=120)**

| **Sl.**  **No** | **Practices** | **Technological gap (%)** |
| --- | --- | --- |
| **1.** | **Soil:** Black soil | 0.00 |
| **2.** | **Land preparation:** 2-3 times ploughing before sowing | 0.00 |
| **3.** | **Varieties** | 0.00 |
| **4.** | **Season of sowing** (October-November) | 0.00 |
| **5.** | **Seed rate** (20 Kg/acre) | 67.50 |
| **6.** | **Spacing:** 45x10 cm | 90.00 |
| **7.** | **Seed treatment**  Soak the seeds in 2.00 per cent Cacl2 solution for half an hour or with 25.00 per cent cow urine for 8 hrs, then shade dry for 7 hrs, after that treat the seeds with Rhizobium and Phosphate Solubilizing Bacteria (PSB) | 86.67 |
| **8.** | **Application of organic manures**  i. Apply FYM @2t/acre | 50.84 |
| ii. Apply FYM before 2-3 weeks sowing | 75.00 |
| **9.** | **Application of chemical fertilizers**  i. Total dose of recommended fertilizer- 4:10:0 NPK | 85.83 |
| ii. Method of application- placement method | 0.00 |
| **10.** | **Weed control**  i. Manual hand weeding: 2 times hand weeding | 39.17 |
| ii. Use of chemicals: Pendimethalin 30 EC @ 1.3 litre/ 300 litres of water | 100.00 |
| **11.** | **Intercultivation** (2 times) | 8.33 |
| **12.** | **Nipping** (35-40 DAS) | 90.83 |
| **13.** | **Intercropping**  Chickpea+ Linseed | 100.00 |
| Chickpea+ Safflower | 100.00 |
| Chickpea+ *rabi* sorghum | 84.17 |
| **14.** | **Growth regulators usage**  i. 35 DAS, Spray the crop with 20 ppm of NAA @ 2ml/100 litre of water | 100.00 |
| ii. At flowering stage, Spray the crop with 100 ppm of Cycocel @ 10ml/100 litre of water | 100.00 |
| **15.** | To get higher yield, spray 2.00 per cent Urea (20g/litre of water) at the flowering stage | 92.50 |
| **16.** | **Plant protection measures A) Pest control**  **i) Pod borer**  a) 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. | 30.00 |
| b) Spray 0.075 ml of Flubendiamide 39.35 SC or 0.15 ml of Chloranthrinaliprole 18.5 SC or 0.2 gm of Emamectin benzoate 5 SG or 0.1 ml of Spinosad 45 SC or 0.3 ml of Indoxacarb 14.5 SC or 4 gm of Carboryl 50 DWP or 1 ml of Methyl parathion 50 EC or 2 ml of Quinalphos 25 EC or 2 ml of Methomyl 40 SP or 2 ml of Prophenophos 50 EC or 1 gm of Acephate 75 SP or chilli garlic extract @ 20 ml per litre of water. | 19.17 |
| **ii) Cutworm**  a) Intercropping with linseed | 100.00 |
| b) Adopt crop rotation | 38.33 |
| c) Spray Deltamethrin 2.8 EC @ 0.5 ml or Quinalphos 25 EC @ 2 ml per litre of water | 93.33 |
| **B) Disease control**  **i) Fusarium wilt**  a) Field sanitation | 75.83 |
| b) 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 | 95.83 |
| c) Adopt resistant chickpea cultivar JG-11 | 75.00 |
| **ii) Rust**  a) Early sowing on the month of October may escape infection | 59.17 |
| b) Spray hexaconazole @ 1 ml or propiconazole @ 1 ml per litre of water | 80.00 |
| **17.** | **Harvesting** (90-110 days) | 0.00 |

**Table 2: Distribution of the chickpea growers according to their overall technological gap**

**(n=120)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl.No** | **Category** | **f** | **%** |
| 1 | Low (<53.58) | 32 | 26.67 |
| 2 | Medium (53.58-57.50) | 45 | 37.50 |
| 3 | High (>57.50) | 43 | 35.83 |
|  |  | **Mean=55.54** | **SD 4.60** |

***SD****= Standard Deviation* ***f****=Frequency* ***n****= Number of Respondents*

**3.2 Constraints in adoption of chickpea cultivation practices**

**3.2.1 Technical constraints:** It is evident that among the technical constraints, inadequate knowledge about bio fertilizer and bio pesticide is the major technical constraints faced by majority (78.33 %) of the farmers, followed by inadequate knowledge about balanced fertilizer application (75.00 %), non-availability of seeds of improved varieties in time (73.33 %), more than half (55.00 %) of the farmers expressed inadequate knowledge about pest and disease management as technical constraint , whereas, 43.33 per cent and 31.67 per cent of the farmers expressed inadequate knowledge about chickpea cultivars and lack of timely advisory services by extension personnel as a technical constraint, respectively. Among the improved chickpea cultivars, farmers know about only JG11, JAKI-9218 and negligible ones knows GBM-2 cultivar of chickpea. Farmers were unaware of further proposed improved chickpea varieties. Additionally, a lack of timely availability of enhanced varieties may be caused by a limited supply of seeds for those types through the appropriate departments.

**3.2.2 Production constraints:** Among production constraints enlisted, majority (93.33 %) of the farmers expressed high risk of crop failure due to poor rainfall as a major production constraint, followed by high cost of plant protection chemicals (90.00 %), non-availability of farm labour in time (89.50%), while, an equal percentage (83.33 %) of them expressed high cost of chemical fertilizers and high cost of seeds as a constraint, more than half (58.33 %) of chickpea growers expressed high labour wages as a production constraint. A significant factor influencing chickpea seed emergence and early growth is moisture content upon sowing. Farmers identified low rainfall over the previous three years in the study area as a significant output restriction. High labor costs also one of the production constraints. It is intimately connected to the labor market. Intercultivation methods will result in a strong demand for labor and a high wage.

**3.2.3 Financial constraints:** Among financial constraints ,majority (83.33 %) of the chickpea growers expressed inadequate loan amount as the major financial constraint, equal per cent (80.00%) of them expressed difficult to repay the loan on time and partial utilization of borrowed loan as constraint, more than three fourth (78.33 %) of the farmers expressed lack of credit facilities and insufficient repayment period of credit (76.67%) while an equal per cent (75.00 %) of them expressed loan waive off facility not obtained and non-availability of credit in time, more than half (60.00 %) of them expressed informal sources of credit as the financial constraint. Further 43.33 per cent and 40.00 per cent of the farmers expressed inadequate subsidies for agricultural inputs and high rate of interest as the constraint respectively. The budgetary restriction was due to inadequate subsidies for agricultural inputs i.e higher subsidised costs in RSKs. Bank will not extend the repayment period. Further, complex procedures and demand for more documents by official bodies to avail loans might be the reason for lack of credit facilities.

**3.2.4 Marketing constraints:** Among the marketing constraints enlisted ,large majority(6.67 %) of the farmers expressed fluctuation in market prices as the major marketing constraint, followed by lack of remunerative prices (91.67 %), lack of procurement from government with minimum support price, non satisfactory MSP for chickpea crop (80.00 %), more than half (55.00%) of the farmers expressed grading not followed as the marketing constraint, less than half (48.33 %) expressed lack of adequate market information.

### Table 3: Constraints in adoption of chickpea cultivation practices

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl.**  **No** | **Constraints** | **f**  **(Frequency)** | **%** |
|  | **Technical constraints** |  |  |
| 1 | Inadequate knowledge about bio fertilizer and bio pesticide | 94 | 78.33 |
| 2 | Inadequate knowledge about balanced fertilizer application | 90 | 75.00 |
| 3 | Non-availability of seeds of improved varieties in time | 88 | 73.33 |
| 4 | Inadequate knowledge about pest and disease management | 66 | 55.00 |
| 5 | Inadequate knowledge about chickpea cultivars | 52 | 43.33 |
| 6 | Lack of timely advisory services by extension personnel | 38 | 31.67 |
|  | **Production constraints** |  |  |
| 1 | High risk of crop failure due to poor rainfall | 112 | 93.33 |
| 2 | High cost of plant protection chemicals | 108 | 90.00 |
| 3 | Non-availability of farm labour in time | 104 | 86.67 |
| 4 | High cost of seeds | 100 | 83.33 |
| 5 | Non-availability of seed/fertilizers/PPC in time | 100 | 83.33 |
| 6 | High labour wages | 70 | 58.33 |
|  | **Financial constraints** |  |  |
| 1 | Inadequate loan amount | 100 | 83.33 |
| 2 | Difficult to repay the loan on time | 96 | 80.00 |
| 3 | Partial utilization of borrowed loan | 96 | 80.00 |
| 4 | Lack of credit facilities | 94 | 78.33 |
| 5 | Insufficient repayment period of credit | 92 | 76.67 |
| 6 | Loan waive off facility not obtained | 90 | 75.00 |
| 7 | Non-availability of credit in time | 90 | 75.00 |
| 8 | Loan availed from informal agency | 72 | 60.00 |
| 9 | Inadequate subsidies for agriculture inputs | 52 | 43.33 |
| 10 | High rate of interest | 48 | 40.00 |
|  | **Marketing constraints** |  |  |
| 1 | Fluctuation in market prices | 116 | 96.67 |
| 2 | Lack of remunerative prices | 110 | 91.67 |
| 3 | Lack of procurement from Government with MSP | 108 | 90.00 |
| 4 | MSP for this crop is not satisfactory | 96 | 80.00 |
| 5 | Grading not followed | 66 | 55.00 |
| 6 | Lack of adequate market information | 58 | 48.33 |
| 7 | Exploitation by the middle men | 44 | 36.67 |
| 8 | Lack of storage facilities | 38 | 31.67 |
| 9 | Markets are far away | 34 | 28.33 |

# CONCLUSION

The findings of the study depicted that nearly an equal percentage of chickpea growers belonged to medium technological gap and high technological gap category. Majority of chickpea farmers had a medium level of knowledge with the best methods for growing chickpeas and still there is a huge gap in adoption of those practices. This suggests that there is a significant opportunity for the developmental departments to get involved and raise the level of knowledge among chickpea growers regarding production practices by setting up of various extension activities like training sessions, exhibits, field trips, study tours, farmers field schools, and other educational events. In order for farmers to learn about the advised methods, awareness should also be raised about ICT tools like mobile applications.

Majority of the chickpea growers expressed inadequate loan amount as the major financial constraint, equal per cent of them expressed difficult to repay the loan in time and partial utilization of borrowed loan as constraint. Chickpea farmers cited a lack of loans as a significant financial obstacle. In this situation, banks and cooperatives should raise the loan amount for the chickpea crop in accordance with the cost of chickpea production. Major marketing restrictions were fluctuating market prices, a lack of remunerative prices, and a lack of government procurement with MSP. Therefore, the government must increase purchases of chickpeas under the MSP program and concentrate on raising farmer awareness on how to take advantage of it. Formation of FPO on chickpea is the need of the hour. Department of Agriculture need to mobilize and encourage farmers to form chickpea farmers producer company. It will help the farmers to collectively do production, processing and marketing of their produce.

**FUTURE LINE OF WORK**

This study is a research work by the student, and hence there was a limitation of time and other resources. The investigation was confined to only two districts namely Gadag and Vijayapur. Therefore, the study cannot be generalized to all the chickpea growing districts of the state. A comprehensive study could be carried out in the near future including all the chickpea growing districts of Karnataka to draw the overall profile and conclusion.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during writing or editing of this manuscript.

## REFERENCES

Ahire R D, Karhale, R. S. and Kadam, R. P., 2015, Technological gap in pigeon pea production technology in Marathwada region. *Agriculture Update,* 10(4): 355-357.

Anonymous, 2015, State-wise area, production and productivity statistics 2015-16, Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Government of India, p. 1.

Anonymous, 2016, Pulses in India: Retrospect and Prospects 2016, Government of India, Ministry of Agriculture and Farmers Welfare, Directorate of Pulses Development, Vindhyanchal Bhavan, Bhopal (M.P.), p.27.

Arjun S P, 2015, Knowledge and adoption of recommended chickpea production technology by the grower, *M.Sc. (Agri). Thesis,* Vasanthrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India.

Ashok kumar B, Tulsiram J, Maraddi G N and Hulagar B, 2018, A Study on Adoption level of recommended cultivation practices of Blackgram growers in north-eastern Karnataka, India. *International Journal of Current Microbiology and Applied Science* 7(2): 567-574.

Brunda S, 2018, Study on economic impact of bengalgram technologies developed by UAS, Raichur in NEK region. *M.Sc. (Agri). Thesis,* University of Agricultural Sciences, Raichur, Karnataka, India.

DES, MoA&FW. 2023-24, Directorate of economics and Statistics. Fully revised estimates report on area, production and yield of principal crops in Karnataka 2022-23.

DES, MoA&FW. 2024, Directorate of economics and Statistics Government of india. Anuual port 2023-24.

Dubey S, 2011, Constraints and suggestions of chickpea production in Madhya Pradesh. *Advance Research Journal of Social Sciences,* 2(2): 261-262.

Garg R P, 2010, A study on technological gap about recommended chickpea production technology among growers of Sehore block of Jabalpur district of Madhya Pradesh.

Manjushree S, 2018, Diffusion of chickpea cultivars among the farmers in Dharwad district, *M.Sc. (Agri.) Thesis,* University of Agricultural Sciences, Dharwad, Karnataka India.

Mukesh C, Hanuman L J, Rajneesh Rajasree R and Vidya B, 2017, Constraints perceived by farmers in adoption of recommended production technology of Moongbean in Jaipur district of Rajasthan. *International Journal Current Microbiology and Applied Sciences,* 6(5): 2107-2114.

Suhasini P, 2010, A study on technological gap in cultivation of chickpea in Majhgawan block of Satna district, *M.Sc. (Agri.) Thesis,* Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, India.

Seema Sharma, Narinder Deep Singh 2024, Enhancing Chickpea(Cicer arientinumL,) production through frontline demonstrations in sub mountainous region of Punjab,India, *journal of food legumes, 37(1): 95-100.*

Tulshiram K S, 2019, Knowledge and adoption of recommended cultivation practices of gram by the farmers, *M.Sc. (Agri). Thesis,* Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra,India.