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Evaluation of Promising Cultivars in Major Chickpea Cultivating Districts of Haryana State

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ABSTRACT

Background: Chickpea is one of the most important pulse crops grown in India. It is the cheapest source of protein and is an inseparable part of daily diets of every Indian. Chickpea seeds are used for food and feed purposes, not only for excellent nutritional value but also for rich bioactive compound contents, such as phenolics and flavonoids. It also plays an important role in sustainable agriculture by enriching soil through biological nitrogen fixation.

Methods: This study was conducted during the year 2021-22 and 2022-23 at College of Agriculture, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana to evaluate the economic performance of promising cultivars of chickpea using the data from 90 sampled farmers. Purposive multistage sampling technique was used for collection of data. Technical and economic assessment of the technology was done using parameters like Benefit-Cost Ratio; additional net return, incremental benefit-cost ratio and yield gap analysis.

Result: The results showed that cultivation of new varieties of chickpea yielded higher returns to the farmer with ANR of Rs.11129 ha^{-1} and IBCR of 3.20 at overall level. Farmers should be motivated for cultivation of pulses in Haryana by incentivizing on the purchase of farm inputs and making procurement arrangement at MSP.

Key words: Additional net monetary returns (ANMR), Incremental benefit-cost ratio, Yield gap.

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is an important pulse crop grown and consumed all over the world, especially in the Afro-Asian countries (Kumar *et al.*, 2019). Chickpea seeds are used for food and feed purposes, not only for excellent nutritional value but also for rich bioactive compound contents, such as phenolics and flavonoids. It is consumed for its protein-rich seeds especially in developing countries (Macar *et al.,* 2017). Chickpea is the largest produced food legume in South Asia and the third largest produced food legume globally, with a cultivated area of 14.84 million ha, a production of 15.08 million tonnes and an average yield of 1.01 tonnes ha^{-1} in 2020. It is also one of the major pulse crops cultivated and consumed in India and also known as Bengal Gram. India is the single largest producer of chickpea in the world, accounting for 73.00 per cent (11.08 million tonnes) of the total production and 65.36 per cent (9.70 million ha) of gross cropped area under chickpea (FAOSTAT, 2022).

Chickpea is one of the most important pulse crops grown in India (Kamboj *et al.,* 2025). It is the cheapest source of protein and is an inseparable part of daily diets of every Indian. It also plays an important role in sustainable agriculture by enriching soil through biological nitrogen fixation (Singh *et al.*, 2014). Madhya Pradesh followed by Rajasthan, Maharashtra, Karnataka and Gujarat are the major chickpea producing states of India (DESA, 2022). Chickpea is the major rabi (cool season) pulse crop grown in the Haryana (Kumar *et al.,* 2023). Haryana contributed only 0.30 per cent of total production and 0.36 per cent of total area in the country in 2021 (DESA, 2022). Chickpea is the most important pulses crop in Haryana accounting for about 59.85 per cent of the total pulses production and 53.22 per cent of the gross cropped area under pulses in the state. It was cultivated on an area of 40.5 thousand ha having production of 40.10 thousand tonnes with an average yield of 990 kg ha^{-1} in 2021. Bhiwani district (42.96 per cent) takes lead in growing chickpea followed by Hisar (23.95 per cent), Mahendragarh (20.25 per cent), Sirsa (9.38 per cent) and Fatehabad (1.97 per cent). Bhiwani, Hisar and Mahendrgarh district of Haryana were selected purposively on the basis of highest area under chickpea cultivation. In Bhiwani district, chickpea was cultivated on an area of 17.40 thousand ha having production of 16.00 thousand tonnes with an average yield of 919.54 kg ha^{-1}. The crop was grown on an area of 9.70 and 8.20 thousand ha in Hisar and Mahendragarh district producing 9.60 and 7.70 thousand tonnes with average yield of 989.69 and 939.02 kg ha^{-1}, respectively (DESA, 2022).

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After selection of villages, the list of those farmers who had adopted new cultivar and those who were growing old varieties was prepared. From each group, 45 farmers were selected purposely. Thus, total of 90 farmers were selected for detailed study to draw the inference. Majority of farmers were using tube well (56.67 per cent) as a source of irrigation and the remaining were using canal water (43.33 per cent). Around 31.00 per cent of the total land holding was under chickpea cultivation of sampled farmers. The adopters of new cultivar were cultivating varieties like GNG2171, CSJ515, GNG2207 and GNG2144 released in 2017, 2016, 2018 and 2016, respectively. The old varieties cultivators were found growing chickpea varieties HC-1, (1990) HC-5 (2005) and Karnal Chana1 (CSG 8962) released in 1997.

Not much work has been done so far for evaluation of performance of chickpea cultivars in Haryana. However, Meena *et al.* (2021) conducted a study in Rajasthan and found that adoption of improved technologies through frontline demonstrations has a long-term impact on production and productivity of chickpea and changing the knowledge, attitude and skills of farmers. Patel and Patel (2020) conducted a study in Gujarat and reported that the BCR of chickpea cultivation under improved practices were higher than under farmer practices. Leharwan (2023) conducted a study in eastern zone of Haryana and observed that various components like adjustment in sowing time, balanced fertilizers, high-yielding varieties, weed, insect-pests and disease management were important in achieving more productivity and maximum benefit. Overall, there is vast potential for farmers to earn more profits, ultimately enhancing the income and standard of living of the farming community. Therefore, the present study was undertaken to evaluate performance of promising cultivars of chickpea compared to old varieties and factors contributing their performance.

MATERIALS AND METHODS

Study area

The present study was conducted in Haryana state to achieve well-defined objectives of the study. Sudy was conducted during the year 2021-22 and 2022-23 at College of Agriculture, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana to evaluate the economic performance of new varieties to old varieties for chickpea. Purposive multistage sampling technique was used in collection of data. The selection of districts has been made on the basis of maximum area under crop in the state. Bhiwani, Hisar and Mahendragarh districts were selected. Also, the district which was bifurcated recently has been merged with the parent district. Charkhi Dadri was bifurcated from Bhiwani on 1st December 2016.

The selection of block formed second stage of sampling technique. From each district, three blocks having farmers cultivating both new and old varieties of were selected. From Bhiwani district, blocks Kairu, Badhra, Siwani, from Hisar district, blocks Hisar-I, Hisar-II and from Mahendragarh district block Satnali for chickpea were selected. The selection of villages formed third stage of sampling. From selected block, villages were selected purposively. Badrai from Badhra block, Mansarwas from Kairu block and from Siwani block Gurera village were selected of Bhiwani district. In Hisar district, Payal from Hisar-I block, Panihar and Sarsana villages from Hisar-II block were selected. In Mahendragarh district, from Satnali block Dalanwas, Nangla and Shampura villages were selected. Finally, from nine selected villages for each crop, 10 farmers were selected purposively from each village. The list of those farmers who had adopted new cultivars and those who were growing old varieties was prepared. From each group, 45 farmers were selected purposely representing 5 from each selected village. Thus, total of 90 farmers were selected for detailed study to draw the inference.

Analytical tools

Benefit-cost ratio was computed by dividing gross returns with total expenses incurred in cultivation of chickpea. The ANR represents the net additional returns received by the farmer who adopts the improved technology as compared to the farmer's traditional practice. To determine the benefits per additional rupee invested on improved technology, Incremental-Benefit-Cost Ratio (IBCR) has been calculated as per the following formula:

$$IBCR = \frac{AGRIT}{ACIDT}$$

Whereas:
AGRIT= Additional gross return from improved technology.
ACIDT= Additional cost involved in improved technology.

The nature and extent of the yield gaps in chickpea were analyzed by the difference between potential yield of varieties and yield at farmer's field. The functional form is;

$$\text{Technology Index (\%)} = \frac{(Yp - Yff)}{Yp} \times 100$$

Whereas:
Y_p = Potential yield of the variety.
Y_{ff} = Yield at farmer's field.

Regarding constraints analysis, the response (various constraints as perceived by the farmers in production of new and old cultivars of chickpea) were recorded on three-point continuum *i.e.,* very important, important and least important and subsequently assigned a weightage of 3, 2 and 1, respectively. The constraints score of each respondent as well as of all the respondents for each item pertaining to production constraints of new and old cultivars was worked out. The following formula was employed to calculate the Mean Per cent Score:

$$\text{Mean score} = \frac{\text{Sum of score (constraint) for all response}}{\text{Total number of respondents}}$$

$$\text{Mean per cent score} = \frac{\text{Mean of constraint for all responses}}{\text{Maximum score of constraint}} \times 100$$

RESULTS AND DISCUSSION

Gap analysis of inputs used and grain yield in chickpea cultivation

The average grain yield in Bhiwani, Hisar and Mahendragarh district exhibited 20.41, 15.78 and 22.10 per cent improvement in yield in case of new varieties compared to old varieties. Also higher grain yield was attained under new varieties (18.19 q ha^{-1}) over old varieties (15.23 q ha^{-1}) in the state as a whole and this might be due to use of quality seed (new variety), indicating 19.44 per cent rise in yield (Table 1 and Fig 1). This yield gap in Bhiwani, Hisar, Mahendragarh and at state level might be contributed by use of recommended chemical fertilizers, timely irrigation and less use of plant protection chemicals over old varieties as in old varieties higher incidence of pod borer was reported. Quantity of seed used was also found lower in case of new varieties in Bhiwani, Hisar, Mahendragarh and at state level. This might be due to better seed germination and vigour of new variety seeds.

The technology index for new varieties ranged 8.71 to 18.00 per cent, highest was observed in Hisar district and lowest in Mahendragarh. In case of old varieties, it varied from 49.35 to 52.16 per cent, highest in Hisar district and lowest in Mahendragarh. At overall level, technology index of new varieties (13.38 per cent) was also much less than old varieties (50.87 per cent) (Table 1). As such, lower technology index in new varieties cultivation compared to old varieties exhibited good performance of new varieties in the state. It could be concluded out that adoption of new varieties has a positive impact on yield and ultimately increase in returns. The advantage of cultivation of new varieties having tolerance to biotic stress reflected in terms of grain yield in the study area. The results were corroborated with the earlier findings of Patel and Patel (2020); Meena *et al.* (2021); Leharwan *et al.* (2023); Singh *et al.* (2021); Jyothi and Lahari (2022).

Cost structure of chickpea cultivation

In case of new varieties total cost of cultivation was highest in Mahendragarh district and in old varieties; it was highest in Bhiwani district. The share of variable cost as well as fixed cost in total cost of cultivation of new varieties was observed higher compared to old varieties all the three major districts. At overall level, the share of variable cost as well as fixed cost in total cost of cultivation of new varieties was observed 62.43 and 37.57 per cent while 60.67 and 39.33 per cent of old varieties. The variable cost of new varieties was higher due to costlier seed, higher uses of chemical fertilizers and irrigation. In cultivation of new as well as old varieties in Bhiwani, Hisar, Mahendragrh and at state level, the highest share of variable cost was estimated to be on harvesting operation (more than 10 per cent), followed by weeding operation in Bhiwani and Hisar district due to manual weed management and preparatory tillage in Mahendragarh district. In case of new varieties cultivation, seed cost shared 5.00 to 7.00 per cent of the total cost

Table 1: Gap analysis of inputs used and grain yield in chickpea cultivation in Haryana (2021-22).

Particulars	Bhiwani district			Hisar district			Mahendragarh district			Overall		
	New varieties	Old varieties	Increase/ decrease	New varieties	Old varieties	Increase/ decrease	New varieties	Old varieties	Increase/ decrease	New varieties	Old varieties	Increase/ decrease
Inputs	Qty	Qty	(%)	Qty	Qty	(%)	Qty	Qty	(%)	Qty	Qty	(%)
Seed (kg)	42.83	44.33	-3.38	38.00	40.17	-5.40	44.17	46.08	-4.14	41.67	43.53	-4.27
FYM (q)	12.17	8.33	46.10	-	-	-	53.33	30.83	72.98	21.83	13.06	67.15
Chemical fertilizer (kg)	86.17	78.33	10.01	85.83	80.83	6.19	83.17	78.33	6.18	85.06	79.17	7.44
Irrigation (No.)	2.13	2.07	2.90	1.67	1.53	9.15	2.87	2.8	2.5	2.22	2.13	4.23
Plant protection chemicals (No. of sprays)	1.07	1.13	-5.31	1.07	1.33	-19.55	1.00	1.07	-6.54	1.04	1.18	-11.86
Grain yield (q ha^{-1})	18.25	15.17	20.3	17.17	14.83	15.78	19.17	15.70	22.10	18.19	15.23	19.44
Technology Index (%)	13.10	51.06		18.00	52.16		8.71	49.35		13.38	50.87	

Table 2: Cost structure of chickpea cultivation in Haryana: 2021-22. (Rs. /ha)

Inputs	Bhiwani District				Hisar District				Mahendragarh District				Overall			
	New varieties		Old varieties		New varieties		Old varieties		New varieties		Old varieties		New varieties		Old varieties	
	No./ Qty	Value (Rs.)	No./ Qty	Value (Rs.)	No./ Qty	Value (Rs.)	No./ Qty	Value (Rs.)	No./ Qty	Value (Rs.)	No./ Qty	Value (Rs.)	No./ Qty	Value (Rs.)	No./ Qty	Value (Rs.)
Total variable cost																
Preparatory	2.87	4700.00	2.80	4583.33	3.07	4816.67	3.00	4500.00	3.40	5363.33	3.40	5366.67	3.11	4960.00	3.07	4816.67
Tillage (No.)		(7.43)		(7.77)		(7.85)		(7.84)		(8.41)		(9.29)		(7.91)		
				(8.34)												
Seed (kg)	42.83	4457.17	44.33	2425.17	38.00	3928.33	40.17	2074.17	44.17	3645.00	46.08	2382.50	41.67	4010.17	43.53	2477.56
		(7.05)		(4.11)		(6.40)		(3.61)		(5.71)		(4.12)		(6.39)		(4.29)
Sowing		1650.00		1650.00		1566.67		1533.33		1566.67		1566.67		1594.44		1583.33
		(2.61)		(2.80)		(2.55)		(2.67)		(2.46)		(2.71)		(2.54)		(2.74)
FYM (qtls)	12.17	537.50	8.33	458.33	-	-	-	-	53.33	3104.17	30.83	1750.00	21.83	1213.89	13.06	736.11
		(0.85)		(0.78)						(4.87)		(3.03)		(1.93)		(1.27)
Chemical	86.17	2147.83	78.33	1815.83	85.83	2048.33	80.83	1916.67	83.17	1979.50	78.33	1958.33	85.06	2053.00	79.17	1896.94
Fertilizer (kg)		(3.40)		(3.08)		(3.34)		(3.34)		(3.10)		(3.39)		(3.27)		(3.28)
Irrigation (No.)	2.13	3535.00	2.07	3494.33	1.67	1473.33	1.53	1369.17	2.87	4625.83	2.80	3788.33	2.22	3211.39	2.13	2883.94
		(5.59)		(5.92)		(2.40)		(2.39)		(7.25)		(6.56)		(5.12)		(4.99)
Weeding		4800.00		4666.67		4883.33		4700.00		4250.00		4133.33		4600.00		4266.67
		(7.59)		(7.91)		(7.96)		(8.19)		(6.66)		(7.15)		(7.33)		(7.38)
Plant protection	1.07	2923.33	1.13	3283.33	1.07	2595.00	1.33	2733.33	1.00	2585.00	1.07	2858.33	1.04	2701.11	1.18	2958.33
		(4.62)		(5.57)		(4.23)		(4.76)		(4.05)		(4.95)		(4.31)		(5.12)
Harvesting		6616.67		6433.33		6166.67		5750.00		6750.00		6166.67		6566.67		6116.67
		(10.47)		(10.90)		(10.05)		(10.02)		(10.58)		(10.67)		(10.47)		(10.59)
Threshing		4525.00		4221.67		4425.00		4016.67		4941.67		4083.33		4630.56		4107.22
		(7.16)		(7.16)		(7.21)		(7.00)		(7.74)		(7.07)		(7.38)		(7.11)
Sub-Total		37215.83		34007.00		32908.33		29961.67		39837.83		35031.67		36609.56		32766.78
		(58.86)		(57.64)		(53.64)		(52.20)		(62.44)		(60.63)		(58.35)		(56.71)
Interest on working		2605.11		2380.49		2303.58		2097.32		2788.65		2452.22		2562.60		2293.67
capital @7 per cent		(4.12)		(4.04)		(3.75)		(3.65)		(4.37)		(4.24)		(4.08)		(3.97)
Transportation		-		-		-		-		-		-		-		-
Total		39820.94		36387.49		35211.92		32058.98		42626.48		37483.88		39172.22		35060.45
		(62.98)		(61.68)		(57.39)		(55.85)		(66.81)		(64.87)		(62.43)		(60.67)
Total fixed cost																
Management factor		3982.09		3638.75		3521.19		3205.90		4262.65		3748.39		3917.22		3506.05
@10 per cent		(6.30)		(6.17)		(5.74)		(5.59)		(6.68)		(6.49)		(6.24)		(6.07)
Rental value of land		19083.33		18666.67		22416.67		22000.00		16916.67		16550.00		19472.22		19072.22
		(30.18)		(31.64)		(36.54)		(38.33)		(26.51)		(28.64)		(31.04)		(33.01)
Total		23402.09		22608.42		26139.86		25340.57		21179.31		20298.39		23569.00		22724.16
		(37.02)		(38.32)		(42.61)		(44.15)		(33.19)		(35.13)		(37.57)		(39.33)
Total cost (A+B)		63223.04		58995.91		61351.78		57399.55		63805.80		57782.27		62741.22		57784.61
		(100.00)		(100.00)		(100.00)		(100.00)		(100.00)		(100.00)		(100.00)		(100.00)

Note: 1 Figures in parenthesis is percentages, 2. Risk factor charge included as premium paid by the farmer @ Rs. 505.95 ha^{-1}.

while it was only 3.00 to 4.00 per cent in old varieties cultivation. Preparatory tillage operation cost was more than 7.00 per cent in the state. Irrigation cost ranged between 2.00 to 7.00 per cent of total cost and it was found lowest in the Hisar district in both the varieties (2.40 per cent in new varieties and 2.39 per cent in old varieties) and highest in Mahendragarh district in both the varieties (7.25 per cent in new varieties and 6.56 per cent in old varieties). This might be due to method of irrigation used (flood irrigation in Hisar and sprinkler method in Mahendragarh) and higher number of irrigation in Mahendragarh district (2.87 in new varieties and 2.80 in old varieties). Plant protection cost was slightly higher in old varieties (around 5.00 per cent) as compared to new varieties (around 4.00 per cent) cultivation. Chemical fertilizers consumption was found higher in new varieties compared to old varieties as per recommendation by SAU's. In case of fixed cost, maximum cost incurred on rental value of land ranged from 26.00 to 38.00 per cent and found highest in Hisar and lowest in Mahendragarh (Table 2). The cost of cultivation results was found to be in close support of findings of Chavan *et al.* (2020) and Yadav *et al.* (2020).

Returns from chickpea cultivation

Per hectare gross returns in Bhiwani, Hisar, Mahendragarh and at state as a whole were higher in cultivation of new varieties. Also higher net returns were found in case of new varieties in comparison to old varieties. As far as benefit-cost ratio is concerned, cultivation of new varieties was comparatively more profitable over old varieties in Bhiwani, Hisar district, Mahendragarh district and at overall level (Table 3 and Fig 2). Considering the inputs used the new varieties yielded high return due to higher grain yield and low investment of plant protection. The results were found to confirm with findings of Chavan *et al.* (2020), Yadav *et al.* (2020) and Raghav *et al.* (2021).

Additional net return was attained highest in Bhiwani district (Rs.10798 ha^{-1}) from the cultivation of newer varieties and lowest in Hisar district (Rs. 7631 ha^{-1}). The ANR for the state as a whole was found Rs.11129 ha^{-1}. The return to investment determines the profitability. From each rupee invested on new varieties adoption, additional benefit of 3.60 rupees in Bhiwani district, 2.90 rupees in Mahendragarh district and 2.80 rupees in Hisar district. So, new varieties cultivation was found to be more profitable as they generated higher benefit for each rupee invested.

Labour utilization pattern in chickpea cultivation

In Bhiwani district, higher human labour was used in both new and old cultivated varieties for harvesting followed by weeding, irrigation, preparatory tillage, threshing, fertilizer

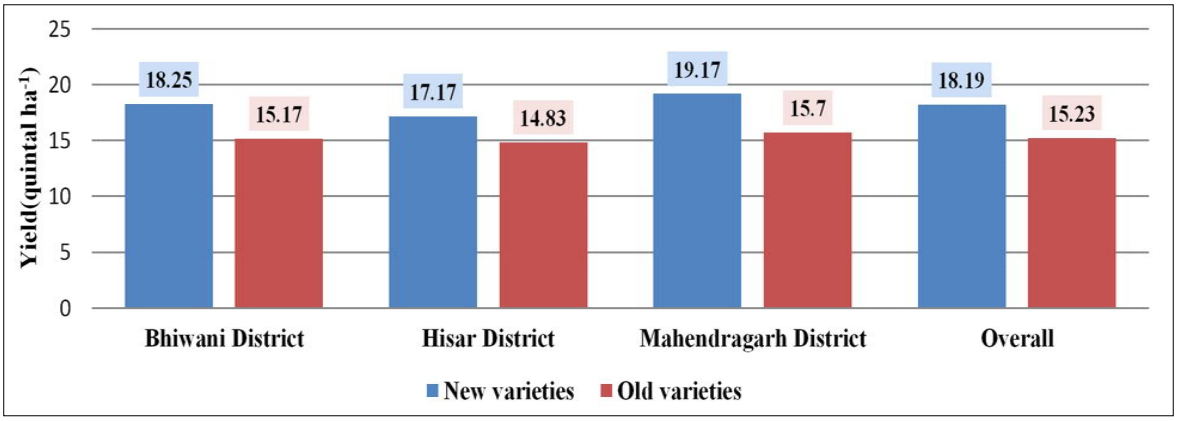

Fig 1: Grain yield of new and old cultivars of chickpea in Haryana: 2021-22.

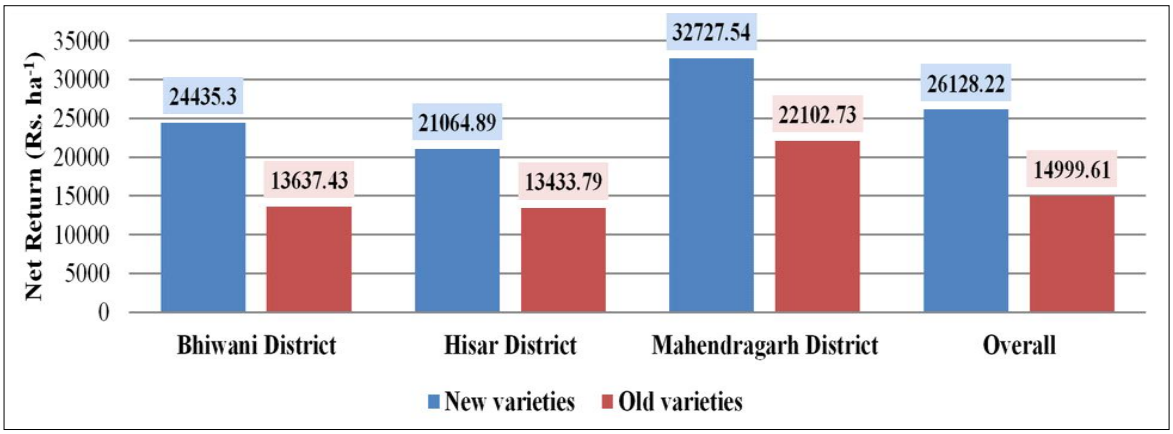

Fig 2: Net return of new and old cultivars of chickpea in Haryana (2021-22).

Table 3: Returns from new and old cultivars of chickpea in Haryana: 2021-22.

Particulars	Bhiwani District				Hisar District				Mahendragarh district				Overall			
	New varieties		Old varieties		New varieties		Old varieties		New varieties		Old varieties		New varieties		Old varieties	
	Qty	Value (Rs.)	Qty	Value (Rs.)	Qty	Value (Rs.)	Qty	Value (Rs.)	Qty	Value (Rs.)	Qty	Value (Rs.)	Qty	Value (Rs.)	Qty	Value (Rs.)
Production (q.)																
(a) Main product	18.25	83658.33 (95.44)	15.17	68683.33 (94.56)	17.17	77400.00 (93.91)	14.83	68066.67 (96.09)	19.17	92183.33 (95.49)	15.70	76410.00 (95.65)	18.19	84413.89 (94.99)	15.23	71053.33 (97.63)
(b) By-product		4000.00 (4.56)		3950.00 (5.44)		5016.67 (6.09)		2766.67 (3.91)		4350.00 (4.51)		3475.00 (4.35)		4455.56 (5.01)		3397.22 (4.67)
Gross return		87658.33 (100.00)		72633.33 (100.00)		82416.67 (100.00)		70833.33 (100.00)		96533.33 (100.00)		79885.00 (100.00)		88869.4 (100.00)		72784.22 (100.00)
Return over variable cost		47837.39		36245.84		47204.75		38774.35		53906.85		42401.12		49697.22		37723.77
Net return		24435.30		13637.43		21064.89		13433.79		32727.54		22102.73		26128.22		14999.61
ANR				10798.00				7631.00				10625.00				11129.00
B:C Ratio		1.39		1.23		1.34		1.23		1.51		1.38		1.42		1.26
IBCR				3.60				2.90				2.80				3.20

Note 1: Figures in parenthesis is percentages.

Note 2: ANR is additional net return.

Note 3: IBCR is incremental benefit-cost ratio.

Table 4: Human Labour and machine labour utilization pattern in chickpea cultivation in Haryana: 2021-22.

Activity	Human labour								Machine labour							
	Bhiwani district		Hisar district		Mahendragarh district		Overall		Bhiwani district		Hisar district		Mahendragarh district		Overall	
	New variety	Old variety	New variety	Old variety	New variety	Old variety	New variety	Old variety	New variety	Old variety	New variety	Old variety	New variety	Old variety	New variety	Old variety
Preparatory tillage	6.92	6.58	6.61	6.03	7.60	7.47	7.04	6.69	6.92	6.58	6.61	6.03	7.60	7.47	7.04	6.69
	(2.63)	(2.75)	(3.22)	(3.47)	(2.92)	(3.11)	(2.86)	(3.01)	(9.91)	(10.18)	(39.7)	(38.85)	(9.05)	(9.69)	(11.16)	(12.00)
Seed treatment	0.72	0.36	0.64	0.61	0.97	0.64	0.78	0.53	-	-	-	-	-	-	-	-
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.24)								
Sowing	1.75	1.73	1.71	1.69	1.78	1.63	1.74	1.70	1.75	1.73	1.71	1.69	1.78	1.63	1.74	1.70
	(0.67)	(0.72)	(0.83)	(0.97)	(0.68)	(0.68)	(0.71)	(0.77)	(2.51)	(2.68)	(10.27)	(10.89)	(2.12)	(2.11)	(2.76)	(3.05)
FYM (qtls)	2.00	1.33	-	-	7.08	6.67	3.03	2.67	1.00	0.67	-	-	5.08	3.50	2.25	1.39
	(0.76)	(0.56)			(2.72)	(2.77)	(1.23)	(1.20)	(1.43)	(1.04)		-	(6.05)	(4.54)	(3.57)	(2.49)
Fertilizer application	0.33	-	-	-	0.50	-	0.28	-	0.17	-	-	-	0.50	-	0.22	-
	(0.13)				(0.19)		(0.11)		(0.24)				(0.60)		(0.35)	
Irrigation	55.72	51.44	10.72	9.33	63.67	59.83	46.81	44.59	55.72	51.44	3.00	2.33	63.67	59.83	46.81	41.18
	(21.22)	(21.51)	(5.22)	(5.38)	(24.46)	(24.87)	(19.02)	(20.07)	(79.79)	(79.59)	(18.02)	(15.01)	(75.78)	(77.6)	(74.22)	(73.88)
Hoeing/ Weeding																
(a) Chemical	-	-	-	0.17	1.08	-	0.36	0.06	-	-	-	0.17	0.67	-	0.22	0.06
				(0.10)	(0.41)		(0.15)	(0.03)				(1.10)	(0.80)		(0.35)	(0.11)
(b) Manual	84.00	69.33	77.33	56.00	65.33	62.17	75.56	62.50	-	-	-	-	-	-	-	-
	(31.99)	(28.99)	(37.69)	(32.27)	(25.1)	(25.84)	(30.70)	(28.13)								
Pesticide application	3.64	4.33	3.25	3.92	3.33	3.72	3.41	3.99	2.22	2.42	3.25	3.58	2.19	2.86	2.56	2.95
	(1.39)	(1.81)	(1.58)	(2.26)	(1.28)	(1.55)	(1.39)	(1.80)	(3.18)	(3.74)	(19.52)	(23.07)	(2.61)	(3.71)	(4.06)	(5.29)
Harvesting	101.33	98.67	98.67	90.67	101.33	93.00	100.44	94.11	-	-	-	-	-	-	-	-
	(38.58)	(41.26)	(48.09)	(52.24)	(38.94)	(38.66)	(40.81)	(42.36)								
Threshing	6.21	5.37	6.25	5.13	7.58	5.42	6.68	5.31	2.05	1.79	2.08	1.72	2.53	1.81	2.22	1.77
	(2.36)	(2.25)	(3.05)	(2.96)	(2.91)	(2.25)	(2.71)	(2.39)	(2.94)	(2.77)	(12.49)	(11.08)	(3.01)	(2.35)	(3.52)	(3.18)
Transportation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	262.62	239.14	205.18	173.55	260.25	240.55	246.13	222.15	69.83	64.63	16.65	15.52	84.02	77.10	63.07	55.74
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Note: Figures in parenthesis is percentages.

Table 5: Constraints in chickpea cultivation in new variety adopted and old cultivar in Haryana.

Constraints/Problems	New varieties (n=45)			Old Varieties (N=45)		
	MS	MPS	Rank order	MS	MPS	Rank order
High yielding varieties						
Costlier seed of new varieties	1.29 (1.32)	42.96	IV	-	-	-
Vulnerable to pests and diseases	-	-	-	1.29 (1.06)	42.96	IV
Field preparation and soil treatment						
Poor knowledge about techniques for seed treatment	-	-	-	0.93 (1.21)	31.11	VI
Unawareness about use of bio-fertilizers for seed treatment	1.16 (2.01)	38.52	VI	-	-	-
Fertilizer application						
Non-adoption of recommended doses of chemical fertilizers	1.76 (1.00)	58.52	I	1.53 (0.94)	51.11	I
Shortage of chemical fertilizers at the peak season	1.64 (0.91)	54.81	II	1.36 (1.05)	45.19	II
Non-availability of sufficient quantity of FYM	1.00 (1.22)	33.33	VIII	0.84 (1.07)	28.15	VIII
Unawareness about use of micro-nutrients	1.62 (1.07)	54.07	III	0.73 (0.96)	24.44	IX
Plant protection measures						
Higher cost of plant protection chemicals	1.13 (1.20)	37.78	VII	1.31 (1.36)	43.70	III
Harvesting, threshing and storage						
Shortage of labour at the time of harvesting and threshing	1.24 (1.35)	41.48	V	0.98 (1.10)	32.59	V
Loss of produce due to stray animals and nilgai	-	-	-	0.67 (1.07)	22.22	X
Natural calamities						
Losses to crop due to high temperature	0.89 (1.09)	29.63	IX	0.89 (1.03)	29.63	VII
Economic constraints						
Procurement of produce by government agencies	0.82 (1.17)	27.41	X	-	-	-

MS = Mean Score, MPS= Mean Per cent Score

Note: Figures in parenthesis is Standard Deviation.

application, pesticide application, FYM. In Hisar and Mahendragarh district as well as at overall level, higher human labour hours were used in both new and old cultivated varieties for harvesting tracked by weeding, irrigation, preparatory tillage, threshing and pesticide application. In Bhiwani district, highest farm machine usage was found in cultivation of both varieties for irrigation followed by preparatory tillage, pesticide application, threshing, sowing and FYM. In Hisar district, highest machine hours were utilized in both new and old varieties for preparatory tillage tracked by pesticide application, irrigation, threshing and sowing. In Mahendragarh district, highest machine hours were used in both new and old varieties for irrigation followed by preparatory tillage, FYM, threshing, pesticide application and sowing. At overall level, highest farm machine hours were utilized in new as well as old varieties cultivation for operations like irrigation tracked by preparatory tillage, pesticide application, FYM, threshing and sowing (Table 4). From the above discussion it is clear that human labour utilization was higher in cultivation of chickpea particularly for harvesting operation which also contributed maximum to cost of cultivation, followed by weeding and pesticide application. The major reason for utilization of human labour for harvesting is that the varieties cultivated by farmers are not suitable for mechanical harvesting. This necessitates development of such varieties to reduce dependency on labour and ultimately reduction in cost of cultivation.

Constraints encountered in cultivation of chickpea in Haryana

Most of the selected respondents facing problems like non-adoption of recommended doses of chemical fertilizers, acute shortage of chemical fertilizers at the peak season, unawareness about use of micro-nutrients, higher seed cost of new varieties, shortage of labour at the time of harvesting and threshing, less use of bio-fertilizers for seed treatment, higher cost of plant protection chemicals, non-availability of sufficient quantity of FYM, losses to crop due to high temperature and procurement not made by government agencies in cultivation of new varieties (Table 5). Non-adoption of recommended doses of chemical fertilizers, shortage of fertilizers at the peak season, higher cost of plant protection chemicals, vulnerability to pests and diseases, shortage of labour at the time of harvesting and threshing, knowledge about techniques for seed treatment, loss of crop due to high temperature, non-availability of sufficient quantity of FYM, unawareness about use of micro-nutrients and loss of produce due to stray animals and nilgai constraints were faced by old variety cultivators (Table 5). The results were in consonance with the findings of Thakur *et al.* (2016) and Singh *et al.* (2021).

CONCLUSION

The study shows that there are differences between the varieties with respect to their technical advantage and

economic potential. Cultivation of new varieties of chickpea yielded higher returns to the farmer with ANR of Rs.11129 ha^{-1} and IBCR of 3.20 at overall level. Cultivation of new varieties for the crop yielded positive returns to the additional investment undertaken for adoption of variety. Efforts should be made to bridge yield gap between potential yield and realized yield at farm level by educating the farmers for use of quality seed and adoption of recommended doses of fertilizers etc. Usage of bio-fertilizers, bio-control agents as well as micro-nutrients should be promoted to improve the productivity of chickpea. Human labour utilization was higher in cultivation of chickpea particularly for harvesting operation which also contribute maximum share around 10.00 per cent of cost of cultivation followed by weeding. Therefore, technology adoption in the form of newer varieties could have significant impact on the production and productivity of chickpea in Haryana and contribute towards enhancing self-sufficiency and nutritional security in pulses in the state.

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Conflict of interest

All authors declare that they have no conflicts of interest.

REFERENCES

Chavan, R.V., Shelke, R.D. and More, S.S. (2020). Analysis of cost and return structure of chickpea cultivation. *International Journal of Current Microbiology and Applied Sciences*. **9(5):** 3009-3013.

Department of Economic and Statistical Affairs, Haryana. (2022). Statistical Abstract of Haryana. Department of Economic and Statistical Affairs, Government of Haryana, Chandigarh.

Food and Agriculture Organization of the United Nations. (2022). FAOSTAT statistical database. [Rome]: FAO. https://www.fao.org/faostat/en/#data.

Jyothi, V.S. and Lahari, K. (2022). Cluster front line demonstrations in chickpea for higher productivity and profitability in anantapuramu district of Andhra Pradesh. *Scientist*. **1(3):** 5902-5909.

Kamboj, E., Dhaka, A.K., Kumar, S., Singh, B. and Hooda, V.S. (2025). Growth and yield performance of chickpea (*Cicer arietinum*) as influenced by irrigation levels and genotypes: A review. *Agricultural Reviews*. **46(4):** 663-670. doi: 10.18805/ag.R-2693.

Kumar, A., Kumar, N., Devi, S. and Dhaka, A. K. (2023). Studies on leaf characteristics of chickpea (*Cicer arietinum* L.) and their contribution to seed yield under different temperature stress in north west India. *Legume Research*. **46(12):** 1641-1646. doi: 10.18805/LR-5227.

Kumar, H., Bhatt, S. and Kumar, R. (2019). Growth and decomposition analysis of chickpea production in India. *Journal of Food Legumes*. **32(3):** 186-188.

Leharwan, M., Singh, M., Kumar, R., Saraswat, P.K., Kumar, Y. and Kumar, T.V. (2023). Assessment of yield gaps and economics through frontline demonstration in participatory mode on Chickpea (*Cicer arietinum* L.) under Eastern zone of Haryana. *Legume Research-An International Journal*. **46(2):** 191-195. doi: 10.18805/LR-4779.

Macar, T.K., Macar, O. and Mart, D.I. (2017). Variability in some biochemical and nutritional characteristics in desi and Turkish kabuli chickpea (*Cicer arietinum L.)* types. *Celal Bayar University Journal of Science*. **13(3):** 677-680.

Meena, R.K., Singh, B., Chawla, S., Meena, R.K. and Shinde, K.P. (2021). Evaluation of frontline demonstrations of chickpea under irrigated North Western Plain Zone-1b of Rajasthan. *Journal of Pharmacognosy and Phytochemistry*. **10(1):** 1240-1244.

Patel, B.K. and Patel, R.A. (2020). Impact of cluster frontline demonstration programme on the yield of Chickpea (*Cicer arietinum* L.) In Mehsana district of Gujarat, India. *International Journal of Environment, Agriculture and Biotechnology*. **5(4):** 901-906.

Raghav, D.K., Indrajeet, D.K., Kumar, A., Singh, A.K. and Chauhan, J.K. (2021). Role of frontline demonstration on chick pea for enhancing the production in district Ramgarh of Jharkhand. *Indian Research Journal of Extension Education*. **21(1):** 30-34.

Singh, D., Patel, A.K., Baghel, M.S., Singh, S.K., Singh, A. and Singh, A.K. (2014). Impact of front line demonstration on the yield and economics of chickpea (*Cicer arietinum* L.) in sidhi district of Madhya Pradesh. *Journal of Agri Search*. **1(1):** 22-25.

Singh, G., Bali, Y. and Lal, M. (2021). Impact of cluster frontline demonstrations on yield of chickpea in Bhiwani district of Haryana. *Journal of Food Legumes*. **34(2):** 124-126.

Thakur, S.S., Kumar, S. and Rathi, D. (2016). Resource use efficiency of Chickpea production in Sagar district of Madhya Pradesh. *International J. of Agricultural Science and Research*. **6(2):** 101-106.

Yadav, P.K., Jat, M.K., Singh, B., Kaushik, N., Kumar, J., Singh, R. and Kumar, A. (2020). Enhancement of productivity and profitability of chickpea (*Cicer arietinum* L.) as well as soil fertility of coarse textured soils through potassium fertilization. *International Journal of Agricultural and Statistical Sciences*. **16(1):** 1053-1058.