ACCELERATING THE CHICKPEA PRODUCTIVITY THROUGH SUITABLE TECHNOLOGICAL INTERVENTIONS

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ABSTRACT

Chickpea (Cicer arietinum L) is as one of the most important pulses crops of the Panchmahal district of Gujarat. However, its productivity of chickpea in the district is very low. Attempts are made to improve productivity and to increase area under chickpea by adopting HYVs (high yielding variety). In order to compare conventional chickpea with HYVs varieties, 100 front line demonstrations were carried out by the KVK during 2012 to 2015 in systematic manner on farmers' field to show the worth of a new varieties in comparison to local check and thereby convincing farmers about potentialities of improved production management practices of chickpea for further adoption, involving feasible and effective scientific package of practices. Maximum average yield, net return, was obtained 16.7 q/ha, and Rs 42080/ ha respectively under demonstrated technology as compared to farmers practices 11.1 q/ha and 23140/ha. The maximum average cost benefit ratio was obtained 3.4 under improved technology as compared to farmers' technology 2.6. Favorable cost benefit ratio is self explanatory of economic viability of the demonstration and convinced the farmers for adoption of imparted interventions. The technology suitable for enhancing the productivity of Chick pea crop and calls for conducting of such demonstrations under the transfer of technology by KVK.

Keywords*: chickpea, production technology, frontline demonstration*

INTRODUCTION

Chickpea (*Cicer arietinum L*) is most important pulse crop in Indian . Among the pulses highest average productivity was noted in chickpea 858 kg/ha (Anonymous 2009-10) at national level followed by pigeon pea, black gram, green gram etc. And several chickpea producing state Andhra Pradesh registered highest productivity 1559 kg/ha followed by Bihar 894 kg/ha, Gujarat 850 kg/ha and Madhya Pradesh 711.8 kg/ha((Anonymous 2011). While district Panchmahal (Gujarat) have more productivity of Chickpea 950 kg/ha as compared to Gujarat State and national level. Because a number of factors are responsible for low productivity i.e imbalance use of fertilizers, sowing of seeds without treated and improper manage of wilt and pod borer is an important. Under such circumstances KVK have demonstrated module to enhance the production and productivity of chickpea crop by application of balance dose of Nitrogen, Phosphorus and Potash as per soil test value along with seed treated with fungicide (Carbendazime and Thiaram @ 2+1 g/kg seed) and bacterial inoculation (Rhizobium and PSB @ 5 g/kg seeds) is of great importance for exploit their yield potential. Because chickpea is responded positively to balance dose of Nitrogen, Phosphorus and Potash and bacterial inoculation (Kushwaha, 2007) which play a vital role in making nitrogen, phosphorus and potash as per plants needs. The present investigation was carried out to find out the suitable package and practices for chick pea production under similar region.

OBJECTIVES

(1) To know the level of use and gap in adoption of chickpea production technologies in panchmahal

(2) To know the effect of improved variety along with package demonstration on Chick pea

(3) To know the effect of package on yield parameters of Chick pea

(4) To know the economics of improved variety along with package demonstration on Chick pea

METHODOLOGY

The study was carried out by KVK Panchmahal (Gujarat) during Rabi Season from 2011-12 to 2014 -15 at selected farmers field from seven villages of (who grew chickpea) were selected from three Talukas viz. Goghamba, Kalol, and Godhra for gathering the information. During study period 40 ha area was covered under front line demonstration with the 100 farmer is benefited. Before conducting FLD a list of farmer prepared by group meeting and specific skill training was imparted in the selected farmers regarding

different aspects of cultivation. In the demonstration one control plot was also kept where farmer practice was carried out. The module of improved practices demonstrated included i.e. use of balance dose of fertilizers (15:40:00 N:P205:K kg/ha) after adjustment with soil test values, use of disease resistant variety and seed treatment with fungicide (Carbendazime and Thiaram @ 2+1 g/kg seed) and seed inoculation with Rhizobium leguminosorum and phosphorus solubilizing bacteria (PSB) @ 5 g/kg seeds and one spray of Carbendazime (0.1%) and one spary of chlorpyriphos 50% and sypermethrin 5% EC @ 750 ml/ha. at pod initiation and their development stage. The performance of the crop was compared with the farmer's practice in the same location. The farmers practice included i.e. use of 50 kg DAP/ha, use of higher seed rate (90 kg/ha) with closer spacing of row to row and plant to plant (22 X 10 cm) and seed sown without seed treatment with fungicides and inoculation with Rhizobium legumenosorum and PSB. The chickpea crop where sown second to last week of October and harvest in March. The seed rate of recommended variety GJG-3 used was 75 kg per ha with recommended spacing row to row and plant to plant (45 X 22 cm). Production and economic data for FLDs and local practices were collected and analyzed. The technology gap and technology index were calculated using the following formulas as given by Samui et al. (2000):

Extension gap = Demonstration yield-Farmers yield

Technology gap = Potential yield –Demonstration yield

$$\textbf{Technology index} = \frac{\text{Potential yield -Demonstration yield}}{\text{Potential yield}} \times 100$$

$$\textbf{Relative spread index} = \frac{\text{Area of maize crop expressed as \% of total cultivated area of the districts}}{\text{Area of the crop expressed as per cent of total cultivated crop area in districts}} \times 100$$

RESULTS AND DISCUSSION

Level of use and gap in adoption of Chick pea production technologies. Farmers in general use local or old varieties instead of the recommended improved varieties as the quality seed of improved varieties are not easily available (Table-1). Very few farmers were able to arrange improved variety of seed. Farmers followed broadcast method of sowing against the recommended line sowing. Therefore they applied higher seed rate (@ 90-100 kg/ha than the recommended seed rate @ 75 kg/ha. And application of nitrogen and phosphorus is either very low or no use of same as per recommendation. Full gap was observed in case of irrigation and plant protection majors of chickpea.

Table 1: Level of use and gap in adoption of chickpea production technologies in Panchmahal

Crop Operations	Recommended technologies	Existing technologies	Gap*
Variety	**GJG-3 (Wilt resistant)**	**Local (deshi)**	**Full gap**
Land preparation	One cultivator ploughing and 2 ploughing	One cultivator ploughing and 2 ploughings	Nil
Seed rate	@ 75 Kg/ha (GJG-3 with line sowing)	@ 90-100 Kg/ha (with line sowing)	Use of higher seed rate
Seed treated	@ 2 g Carbendazim with @1 g Thaiaram/kg seed	No use of fungicides for seed treatment	Full gap
Fertilizer	DAP @ 85 Kg/ha with dual inoculation of Rhizobium and PSB@ 10 g/ Kg seed	DAP @ 25-30 Kg/ha without inoculation of culture	60-55 Kg DAP/ ha, and No inoculation of culture
Weeding	One mechanical weeding or Pendimethelin @ 3.3 litre/ha	One mechanical weeding Chemical weeding is not done	Full gap
Irrigation	Two irrigation (first Last week of November and second Last week of December)	Nil	Full gap
Plant protection	one spray of Carbendazime (0.1%) and one spary of chlorpyriphos 50% and sypermethrin 5% EC @ 750 ml/ha	Nil	Full gap

Yield and yield attributes

Result indicated that the yield of Chick pea increased successively over the years in demonstration plots. During 2011to 2014 the average demonstration yield was recorded to be 15.38 q/ha, it was noted highest yield 16.7 q/ ha during 2013-14.The increase in percentage of yield was ranging between 31.2 to 41.9 during four years of study. The results clearly speak the positive effects of FLDs over the exiting practices towards enhancing the yield of Chick pea in Panchmahal districts (Gujarat) with its positive effect on yield attributes (table-3). The significantly highest average number of pods /plant (98.7), number of grains/ pod (2.0),Test weight (191.2g) and grain yield (16.7 q/ha), was observed under balance dose of fertilizers with the dual inoculation of Rhizobium and PSB @ 5 g/ kg as seed treatment as compared to conventional practices number of pod /plant (58.8), number of grain/pod (2.0),Test weight (168.4g) and grain yield (11.8 q/ha). Positively response of inorganic and biofertilizers which improves the physical and biological property of soil. And improvement of water holding capacity and the aeration with the incorporation of biofertilzer was corroborated with the earlier findings of (Aulakh and Malhi 2005, De *et al.*. 2006, Vinaya *et al.,* 2015 and Sardhara *et al.,* 2020). The year-to-year fluctuations in yield and cost of cultivation can be explained on the basis of variations in prevailing social, economical and prevailing microclimatic condition of that particular village. Mukherjee (2003) has also opined that depending on identification and use of farming situation, specific interventions may have greater implications in enhancing systems productivity. Yield enhancement in different crops in Front Line Demonstration has been documented by (Padmaiah et al 2009, Rai et. al. 2012, Tiwari et al, 2003 and Tomer et al, 2003 Singh et al, 2019)

Table 2: Effect of improved variety along with package demonstration on chick pea (n=100)

Year	No .of demo	Area ha.	Variety	Yield Potentional q/ha	Yield		Increase yield %	Horizontal spread of GJG-3 000ha
					RP	FP		
2011-12	25	10	GJG-3	20	14.9	10.5	41.9	1.5
2012-13	25	10	GJG-3	20	15.4	11.1	38.7	3.5
2013-14	25	10	GJG-3	20	16.7	11.8	41.5	6.5
2014-15	25	10	GJG-3	20	14.3	10.9	31.2	10.5
Average	-	-	-	-	**15.3**	**11.0**	**38.3**	-

Table 3: Effect of package on yield parameters of chick pea (n=100)

Year	Plant population/m²		No. of pods/plant		No. of grains/pod		Test wt(gm)	
	RP	FP	RP	FP	RP	FP	RP	FP
2011-12	9.8	12.5	88.7	54.8	2	2	187.8	164.7
2012-13	10.5	11.9	98.7	46.8	2	2	191.2	163.7
2013-14	11.4	11.7	95.4	52.4	2	2	188.4	168.4
2014-15	10.6	12.6	91.6	50..0	2	2	179.4	165.1
Average	**10.6**	**12.2**	**93.6**	**51.0**	**2**	**2**	**186.7**	**165.5**

RP-Recommended practices, FP-Farmers practices

Economics of frontline demonstrations

The economics of chickpea production under front line demonstrations were estimated and the results have been presented in table 4. Economic analysis of the yield performance revealed that front line demonstrations recorded higher gross returns (Rs. 59285 ha-1 in 2013-14) and net return (Rs. 42085 ha-1 in 2013-14) with higher benefit ratio (3.4 in 2013-14) compared to farmer practices (table 5). These results are in line with the findings of Rai et.al. (2015), Kumar et.al. (2015), Gurumukhi and Mishra (2003), Hiremath et al. (2007), Hiremath and Nagaraju (2009) in case of pigeonpea, okra, potato and onion crop. The data clearly revealed that the maximum increase in yield and cost benefit ratio was observed under recommended practices as compared to farmer's practices. The variation in cost benefit ratio during different years may mainly be on account of yield performance and input output cost in that particular year.

Table 4: Economics of improved variety along with package demonstration on chick pea (n=100)

Year	Cost of cultivation (Rs ha-1)		Gross return (Rs ha-1)		Net return (Rs ha-1)		Benefit cast ratio	
	RP	FP	RP	FP	RP	FP	RP	FP
2011-12	15900	13800	48425	34125	32525	20325	3.0	2.5
2012-13	16700	14600	52360	37740	35660	23140	3.1	2.6
2013-14	17200	15300	59285	39334	42085	24034	3.4	2.6
2014-15	18400	16700	51480	39240	33080	22540	2.8	2.3
Average	**17050**	**15100**	**52888**	**37610**	**35838**	**22510**	**3.1**	**2.5**

RP-Recommended practices, FP-Farmers practices

Extension gap

The extension gap showed on increasing trend. the extension gap ranging between 3.4 to 4.9 q/ha during the period of study emphasize the need to educate the farmers through various means for the adaptation of improved agricultural production technique to reverse the trend of wide extension gap.

Technology gap

The trend of technology gap ranging between 3.3 to 5.7 q/ha respected the farmers cooperation in carrying out such demonstration with encouraging results in subsequent year. The technology gap observed may be attributed to the dissimilarity in soil fertility status and weather condition.

Technology index

The technology index showed the feasibility of the evolved technology at the farmers fields. The lower the value of technology index more is the feasibility of the technology. As such reduction in technology index from 16.5 to 28.5 per cent during 2011-128 to 2014-15 exhibitated the feasibility of the demonstrated technology in this region. The finding of the present study is in consonance with the findings of Hiremath and Nagaraju (2009) in case of onion crop.

Spread of improved technology

During 2011-12 to 2014-15 total horizontal spread was increased 2.4 times and slightly changing of district cropped area under Chick pea 1.15 times and no change of relative yield index). The drastic changes were observed in percentage area under its variety (GJG-3).The increase percentage area under the variety was increased 16.5-38.6 per cent during 2011-12 to 2014-15. It was noted that variety GJG-3 was such type of varieties which dominate the Panchmahal district for adoption and yield in both the points. It is suggested that Chick pea cultivar GJG-3 maximum adopted in Panchmahal district and with the cultivation of these variety farmers can improve productivity.

Impact of technology

The achievements and outcomes of the organized FLDs programmers' rewarding. Chickpea has registered significant increase productivity and B: C ratio. The mean yield of 100 FLDs conducted has exhibited 31.2 to 41.9 per cent increased yield at different location against to farmer practice. Which is primarily due to release of high yielding and disease resistant varieties and improved technology against farmer practices. This technology adopted additional 2500 ha area and obtained 8600 quintals additional yield and in terms of money 11,6,00,000 from this area. These can possible by quickly spreading of this technology in Practicing farmers & farm women and RAEOs through training and provide literature related to package and practices of Chick pea.

CONCLUSION

From the above findings its can concluded that use of scientific method of Chick pea cultivation can reduce the technology gap to considerable extent thus leading to increased productivity of Chick pea in the Districts. The results of FLDs convincingly brought out that the yield of Chickpea could be increased by 31.2 to 41.9 per cent with the intervention on balanced nutrition coupled with the insect pest management in Panchmahal. Favorable cost benefit ratio is self explanatory of economic viability of the demonstration and convinced the farmers for adoption of intervention imparted. The technology suitable for enhancing the productivity of Chick pea crop and calls for conduct of such demonstrations under the transfer of technology programmed by KVKs.

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