Asian Journal of Agricultural Extension, Economics & Sociology

18(2): 1-7, 2017; Article no.AJAEES.34651
ISSN: 2320-7027

Effect of Front Line Demonstrations of Chickpea Cv. RSG-888 on Farmers' Field in Rainfed Condition of Rajasthan, India

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/AJAEES/2017/34651
Editor(s):
(1) Kwong Fai Andrew Lo, Agronomy and Soil Science, Chinese Culture University, Taipei, Taiwan.
Reviewers:
(1) José Alfredo Villagómez-Cortés, Universidad Veracruzana Veracruz, Mexico.
(2) Utpal Barman, Assam Agricultural University, Jorhat, Assam, India.
Complete Peer review History: http://www.sciencedomain.org/review-history/19982

Original Research Article

Received 3rd June 2017
Accepted 5th July 2017
Published 10th July 2017

ABSTRACT

In the present study performance of chickpea variety (RSG-888) against local check was evaluated through front line demonstrations conducted at farmer's field during *rabi* season of 2013, 2014 and 2015. A total of 56 demonstrationswere laid on 9.0 ha in 20 villages across six blocks of Pali district. Sowing was done using residual soil moisture of dry condition from second week October to first week of November every year [1]. Package of practices as developed for the region were strictly followed. Recommended seed rate i.e. 70 kgha^{-1} against existing farmers' practices of using 100 kg ha^{-1} (local check) was broadcasted and nutrients i.e. N, P, and S in the ratio of 20:30:40 kg ha^{-1} were applied. The variety performed much better compared to local check (Pratap Channa) and an average grain yield of 16.7 q/ha was recorded which was 67.00% more than the local check. Straw yield also recorded an increase of 44.20% over local check. In spite of increase in yield both in grain and straw, technological and extension gaps existed which was 7.2 and 5.3 q/ha, respectively. The extension gap can be bridged by popularizing package of practices where in stress need to belaidon use of proper seed rate and balanced nutrient application. Economics of growing released high yielding variety of chickpea RSG-888 recorded a net income of Rs. 39208/, per hectare which is 83.30% more compared to net income from local check (Pratap Channa) Meena and Singh [2].

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Keywords: Arid region; chickpea; economics; FLD; rainfed; yield gap.

1. INTRODUCTION

Chickpea (*Cicer arietinum,* L.) is the premier pulse crop of India subcontinent. India is the largest chickpea producer as well as consumer in the world. India grows chickpea on About 7.11 million ha area producing 7.06 million tons which represents 37.00% and 42.74% of the national pulse acreage and production, respectively. Chickpea production has gone upfrom 3.65 to7.06 million tons between 1950-51 and 2015-16, registering a growth of 0.69% annually (ICRPC, [3]. During the period, area has marginally declined from 7.57 to 7.11 million hectare and the productivity has steadily increased to 844 kg/ha from 482 kg/ha. Not with standing its distribution throughout the country, six states viz., Madhya Pradesh, Rajasthan, Maharashtra, Uttar Pradesh, Karnataka and Andhra Pradesh together contribute 91% of the production and 90% of the area of the country. There has been a major shift in the area of chickpea in the country. The expansion of irrigation facilities in northern India has led to replacement of chickpea with wheat and mustard in larger areas. As a result, the chickpea area reduced from 3.2 m ha to 1.0 m ha in northern states.The medicinal value of chickpea is worth mentioning here also the leaves and seeds of the chickpea due to the presence of glandular secretions are commonly used as medicine. This plant holds a good repute in 'Ayurvedic' and 'Unani' system of medicine, and according to *ayurvedic* method of treatment, chickpea leaves are sour, astringent to bowels, and improve taste and appetite. Moreover the leaves are used to cure chronic bronchitis and the seeds are considered as antibilious, used as tonic, stimulant and aphrodisiac acid is also supposed to lower theblood cholesterol level [4].

Chickpea is grown in many tropical, sub-tropical and temperate regions of the worldand one of the most important pulse crops of India due to its multiple functions in the traditional farming system [5]. Besides helping in the management of soil fertility, particularly in the dryland, it is an important source of human food and animal feed [6]. There are two types of gram, one is the 'Kabuli' white and other is '*deshi*' brown. Kabulity peis grown in temperate regions while the *'deshi'* type chickpea is grown in the arid and semi-arid tropics [7].

Pali district is located between 24.45 to 26.75 degree N latitude and 72.48 to 74.20 degree E longitude at an altitude ranging between 212 m to about 220 m above mean sea level with a total geographical area of 12,387 square kilometers [8]. In Pali district chickpea traditionally grown as a *rabi* crop. Arid region is considered to be the pulse bowls of Rajasthan as it to share about 55% area and 40% of total pulse production of state. The average pulses productivity in the arid region was low (520 kg/ha) against 725 kg/ha as the state average [9]. The regions are biotic, abiotic, and socio-economic constraints causing low productivity in pulses in this region. In addition, lack of improved varieties is reported asmost serious constraints among all biophysical constraints in pulses production [10]. Chickpea is most preferred pulse crop in the arid region and is consumed by people of all ranks mainly in the form of green leaves, green seed for vegetables, *sattu*, flour, roasted grain as well as for making local beverage known as Chhang [11]. Unfortunately use of local varieties and poor nutrient management results in very low yield. Keeping this in view chickpea variety cv.RSG-888 with a potential grain yield of 16.70 and straw yield of 20.5 q/ha [12] was used under front line demonstrations so as to encourage farmers to adopt high yielding variety.

2. MATERIALS AND METHODS

In the present study performance of chickpea variety, RSG-888 against local check was evaluated through front line demonstrations conducted at farmer's field during *rabi*season of 2014, 2015 and 2016. A total of 56 demonstrations were laid on 9 ha area in 10 adopted villages across 6 blocks (Sumerpur, Raipur, Jaitaran, Sojat, Rohat and Banli) of Pali district. Soils of the study area are mostly sandy loam in texture with low nitrogen, medium phosphorus and high available potassium besides being slightly saline in nature. During the crop growing season minimum and maximum temperature extremes ranged between 15.9℃ to 25.7℃ and 33.80℃ to 36.57℃, respectively. The region does not experience precipitation during the crop period. High-velocity winds and long photoperiods are the other characteristics featuresof the area. Sowing was done using residual soil moisture of drycondition from 15 October to 5 November every year. Package of practices as developed for the region were strictly followed. Recommended seed rate i.e.

70 kg /ha against existing farmers practice of using 100 kg/ha (local check) was broadcasting method and nutrients *i.e.* N.P.S in the ratio of 20: 30: 40 kg /ha applied through DAP, MOP and urea. Total amount of P and S and half of N was applied as basal dose and the remaining 50% of N was top dressed in two equal splits at 30 and 45 days after sowing. In control group (local check) farmers were no apply of any fertilizers in chickpea crop. Due to climatic conditions, no pest infestation was observed over the year. Before harvesting final plant height (cm) was recorded. At harvesting five random samples of one meter square area from each demonstration field were harvested and composite sample was weighed for total biological yield. After weighing grains were separated by beating ear heads and cleaned grains were weighed for grain yield. Harvest yield index, technological gap, extension gap and technology index were calculated using following equations [13].

$$Harvest\ index(\%) = \frac{Grain\ yield}{Biological\ yield} \times 100$$

$$Technology\ gap = Potential\ yield - Demonstration\ yield$$

$$Extension\ gap = Demonstration\ yield - Farmer's\ yield$$

$$Technology\ index(\%) = \frac{Technology\ gap}{Potential\ yield} \times 100$$

3. RESULTS AND DISCUSSION

Performance of chickpea variety RSG-888 during different years from 2014 to 2016 in different blocks of arid region is depicted in Table 1. From the results of 56 front line demonstrations, it is clear that plant height recorded an average of 40.9 cm with maximum 41.6 cm recorded in Raipur and minimum of 40.7 cm in Jaitaran block. Straw yield recorded an average of 19.9 q/ha against an average of 13.8 q/ha in local check, thereby recording an increase of 44.20% over local check. In different blocks yield of straw recorded a range of 17.7 to 21.3 q/ha, respectively. Grain yield in RSG-888 recorded an average of 16.7 q/ha against a potential yield of 24.0 q/ha. Local check recorded an average yield of only 10.0 q/ha. Yield varied in different blocks with maximumbeing recorded in Sojat (18.0 q/ha). There was a difference between harvest index (%) of RSG-888 and local check were recording a harvest index of ranges from 44.5 to 47.3 in demonstrated and 40.9 to 44.4 in local check (Table 1) clearly demonstrates the superiority of RSG-888 over local check, respectively.

Data pertaining to total grain yield, yield gaps, technological gap, extension gap and technology index (%) is presented in Table 2. Demonstration yield was recorded maximum in Raipur block (18.0 q/ha) whereas on an average demonstration yield in aridregionwas16.7 q/ha increase of 67.00% over local check, where the grain yield harvested was only 10.0 q/ha. Technological gap, which is the difference between potential and demonstration yield was maximum in Rohat block (8.4 q/ha) and lowest in Sojat block (5.2 q/ha), respectively. The findings confirm with the findings of [14,15] they were reported that the more yield under FLD plots as compared to farmers (control plot) in the different study.

However, overall average technological gap in the region was 7.2 q/ha. Similarly, huge extension gap of 5.3 q/ha was recorded in the region with maximum extension gap Recorded in Jaitaran and Sojat blocks (6.4 and 6.3 q/ha). Extension gap indicates that there is a tremendous scope of extension activities in the region. Mass awareness through print media (folder, leaflets and handbills) is the need of the hour. Package of practices for the chickpea crop as devised need to be followed strictly particularly seed rate, optimum application of nutrients and other management practices. The recommended packages of practices will definitely increase the yield and subsequently reduce the extension gap. Technology index shows the feasibility of evolved technology at the farmer's fieldand lower the value of technology more is the feasibility of the technology [16]. Technology index in the present caser varied between 20.00 to 32.31% and average 27.50% over six blocks of arid region. Table 3 gives the economics of growing RSG-888 in the region. The data clearly indicates the advantage of growing released variety over local check. The findings confirm with the findings of [13,16,-24] they were found that the improved pracites gives higher yield than the local chack under pulses crops.

Since grain yield as well as straw yield is more in the variety used under front line demonstrations, therefore naturally income generated is also more. Total gross income from both grain and straw is Rs.42125/- hectare as against only

Rs. 27500/- in the local check. Net income obtained under FLD was Rs.39208/-which was 83.30% more the local check, where the net income was only Rs.21390/- per hectare, respectively (Table 3). The findings confirm with the findings of [25-30]. [31-37] they

Table 1. Comparative study of chickpea variety RSG-888 and local check under front line demonstration in arid condition of Rajasthan

Blocks of the district/evaluation parameters	Years	Sumerpur	Raipur	Jaitaran	Sojat	Rohat	Banli	Total/ mean
No of demonstration								
	2013	3	4	4	3	2	2	18
	2014	4	2	3	3	4	4	20
	2015	3	3	4	3	3	2	18
	Total	**10**	**9**	**11**	**9**	**9**	**8**	**56**
Total area (ha)		1.5	1.5	1.5	1.5	1.5	1.5	09
Plant height (in cm)	2013	40.1	42.4	39.0	40.0	41.7	42.1	40.9
	2014	42.4	40.5	40.8	41.3	40.7	40.2	41.1
	2015	39.8	41.8	42.3	39.0	39.9	41.1	40.7
	Mean	**40.8**	**41.6**	**40.7**	**40.1**	**40.8**	**41.3**	**40.9**
	Local check	35.6	36.9	33.6	36.2	35.7	37.2	35.9
Straw yield (q/ha)								
	2013	19.3	21.1	17.6	20.8	21.9	22.1	20.5
	2014	18.4	22.0	16.6	21.7	19.3	19.7	19.6
	2015	19.0	19.7	18.9	19.6	18.1	22.0	19.5
	Mean	**18.9**	**20.9**	**17.7**	**20.7**	**19.8**	**21.3**	**19.9**
	Local check	14.7	13.9	13.3	12.9	13.6	14.5	13.8
Grain yield (q/ha)								
	2013	16.3	17.9	15.7	16.5	17.7	17.9	17.0
	2014	15.5	18.7	14.8	17.8	15.7	16.0	16.4
	2015	16.9	17.5	16.8	15.6	14.5	18.0	16.6
	Mean	**16.2**	**18.0**	**15.8**	**16.6**	**16.0**	**17.1**	**16.7**
	Local check	10.4	09.9	09.4	08.9	10.1	11.6	10.0
Harvest index (%)								
	2013	45.8	45.9	47.1	44.2	44.7	44.8	45.4
	2014	45.7	46.0	47.7	45.1	44.9	45.3	45.8
	2015	47.1	47.0	47.0	44.3	45.7	46.2	46.2
	Mean	**46.2**	**46.3**	**47.3**	**44.5**	**45.1**	**45.4**	**45.8**
	Local check	40.9	41.6	41.4	40.7	42.6	44.4	41.9

Table 2. Yield, yield gaps and technology index of chickpea variety RSG-888

Name of the blocks	Potential grain yield (q/ha)	Demonstration yield(q/ha)	Local check yield (q/ha)	% increase over local check	Technological gap (q/ha)	Extension gap (q/ha)	Technology index (%)
Sumerpur	24.0	16.2	10.4	28.77	7.3	4.2	28.08
Raipur	24.0	18.0	09.9	28.99	8.2	4.0	31.54
Jaitaran	24.0	15.8	09.4	49.61	6.7	6.4	25.77
Sojat	24.0	16.6	08.9	43.45	5.2	6.3	20.00
Rohat	24.0	16.0	10.1	46.67	8.4	5.6	32.31
Banli	24.0	17.1	11.6	36.96	7.1	5.1	27.30
Mean	**24.0**	**16.7**	**10.0**	**39.08**	**7.2**	**5.3**	**27.50**

Table 3. Economic analysis of chickpea variety RSG-888 in arid region

Name of blocks	Cost of cultivation (Rs./ha)				Gross income (Rs./ha)			Net income (Rs./ha)
	Seed	Fertilizers	Labour	Total	Straw	Grian	Total	
Sumerpur	4200	1200	1000	6400	3500	40500	44000	37600
Raipur	4200	1200	1000	6400	3400	45000	48400	42000
Jaitaran	4200	1200	1000	6400	3300	39500	42800	39500
Sojat	4200	1200	1000	6400	3800	41500	45300	38900
Rohat	4200	1200	1000	6400	3700	40000	43700	37300
Banli	4200	1200	1000	6400	3600	42750	46350	39950
Mean	**4200**	**1200**	**1000**	**6400**	**3550**	**41542**	**42125**	**39208**
Local check	4400	760	1000	6160	2350	25200	27500	21390

reported in frontline demonstration farmers have more benefit as compared to existing practices in pulses crops like gram, moong, pigeon pea and cluster bean crops in different areas.

4. CONCLUSION

It may be concluded that the drought tolerance released varieties of chickpea RSG- 888 performed better with an average grain yield of 16.7 q/ha that was 67.00% more than the local variety. Technological and extension gaps existed which can be bridged by popularizing package of practices with emphasis on use of proper seed rate and balanced nutrient application. Replacement of local variety with the released variety would increase the production and net income of by more than fifty thousand rupees.

ACKNOWLEDGEMENT

The authors acknowledge the Director, CAZRI, Jodhpur and ATARI, Zone VI, Jodhpur for providing financial assistance under Cluster Front Line Demonstrations on Pulses for all logistic support.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/19982