J. Farm Sci., 30(1): (132-134) 2017

RESEARCH NOTE

Response of summer groundnut (*Arachis hypogaea* L.) to improved agronomic practices on farmer's field

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(Received: January, 2016 ; Accepted: March, 2017)

Adaption of improved agronomic practices such as timely sowing during December with optimum plant spacing of 30 x 10 cm (seed rate: 150 kg/ha), seed treatment with capton @ 2 g/kg of seed, recommended dose of fertilizer *i.e.,* NPK @ 25: 75 : 25 kg/ha at the time of sowing and top dressing of 12.5 kg nitrogen per ha at the time of flowering, application $ZnSO_4$ and $FeSO_4$ @ 25 kg/ha at the time of sowing and eight irrigations i.e. pre–sowing irrigation followed by an irrigation at 25 DAS, 4 irrigations at 10 days interval and final two irrigations at 15 days interval would effectively reduce the technology gap.

Key words: Groundnut, Irrigation, Technology

Groundnut is considered as one of the universally preferred oilseed crops and is grown throughout the world. Commercially, groundnut is the world's fourth most important source of edible oil and third most important source of vegetable protein. Currently, groundnut is grown on nearly 25.46 m ha around the world with an annual production of 45.31 m tons of nuts-in-shell with a productivity of 1780 kg/ha. India occupies 20 per cent of global area (5.25 m ha) and contributes 21 per cent (9.47 million tons) of total groundnut production (Anonymous, 2014). Gujarat is the leading producer contributing 50.84 percent of total production followed by Andra Pradesh (12.76 %), Tamil Nadu (9.99 %), Rajasthan (9.37 %) and Karnataka (6.80 %). In Karnataka normal area under groundnut during summer is 1.65 lakh hectares with a production of 1.36 lakh tons with productivity of 865 kg/ha (Anon., 2014). Bagalkot is one of the districts where groundnut is being grown in primarily during summer season as the district groundnut area falls under Krishna river bank with assured irrigation facilities and favorable soil and climate conditions. However, here too there exists wide gap between the production potential and the actual production realized by the farmers. This may be due to partial adoption of recommended package of practices by the groundnut growers. Technology gap is a major problem in increasing groundnut production. Keeping this in view and to show the productivity potentials and profitability of improved groundnut production technologies under real farm situations, front line demonstrations (FLDs) were conducted in selected adapted villages during summer seasons of 2009-10, 2010-11 and 2011-12.

The FLDs were conducted by Krishi Vigyan Kendra, Bagalkot (Dharwad Agricultural University) during *rabi*/summer season from 2009-10 to 2011-12(three consecutive years) in the farmers field of adopted villages (Mangalgudda, Yankanchi, Basarikatti, Sorakoppa and Kiresur) of Bagalkot district. During this three year of study, an area of 7 ha was covered with plot size 0.4 ha under Front-line demonstration with active participation of 18 farmers. Before conducting FLDs, a list of farmers was prepared from group meeting and specific skill training was given to the selected farmers regarding package of practices of groundnut. The difference between demonstration package and existing farmers practices are given in Table 1. In general the soils under study were medium black soil in texture with a pH range in between 6.8 to 8.0. The available nitrogen, phosphorous and potassium varied between low to medium. However, the soils were deficient in micro nutrients particularly zinc and iron. The technological difference between demonstration and farmer's practice was furnished in Table 1. The data output were collected from both FLD plots as well as control plot and finally the extension gap, technological gap, technological index along with the benefit-cost ratio were calculated as given below.

Technology gap = Potential yield- Demonstration yield

Extension gap = Demonstration yield- Farmers yield

$$\text{Technology index} = \frac{\text{(Potential yield - Demonstration yield)}}{\text{Potential yield}}$$

Table 1. Difference between demonstration package and existing practices under groundnut crop

Sl.No.	Particulars	Demonstration	Farmer practice(Control)
1	Farming situation	Irrigated	Irrigated
2	Time of sowing	December	December 4th week to January 3rd week
3	Method of sowing	Seed drill sowing with 30 X 10 cm (333333 plants/ha) with seed rate of 150 kg/ha.	Seed drill sowing with 37.5 x 10 cm(266666 plants/ha) with seed rate of 120 kg/ha
4	Seed treatment	Seed treatment capton @ 2 g/ kg of seed	Without seed treatment
5	Fertilizer application	NPK @ 25: 75 : 25 kg/ha and top dressing of 12.5 kg nitrogen per ha at the time of flowering	NPK @ 18: 46 : 0 Kg/ha and top dressing of 23 kg nitrogen per ha at 45 days after sowing
6	Micronutrient application	Application $ZnSO_4$ and $FeSO_4$ @ 25 kg/ha at the time of sowing	Without application of micronutrients
7	Water management	Eight irrigations *i.e.,* pre–sowing irrigation followed by an irrigation at 25 DAS, 4 irrigations at 10 days interval and final two irrigations at15 days interval.	Application of water at an interval of 8-10 days from sowing to 7 days before harvesting

The data in Table 2 showed that the pod yield of groundnut fluctuated successively over the years in demonstration plot. The maximum pod yield was reported (32.00 q/ha) during the year 2010-11 and minimum pod yield was reported in the year 2009-10(15.60 q/ha) and the average pod yield of three year was reported 24.53 q/ha over control (21.23 q/ha). During three year of study, the increase in percent of pod yield was ranging from 10.34 % to 23.81 %. The increased pod yield in demonstration was mainly attributed to improved agronomic practices Sl. No. 2 to 7 listed in Table 1 under similar local condition and single management. The results are similar with the findings of Veeranna and Shreenivasa (2013), Katare *et al.* (2011) and Tiwari *et al.* (2003) who also reported that superiority of improved practice over farmers practice. The data indicated that the positive effect of front line demonstration over the existing practices towards increasing the pod yield of groundnut.

The extension gap ranging between 1.90 to 5.00 q/ha during the period of study emphasis the need to educate the farmers through various techniques for adoption of improved agricultural production to reverse the trend of wide extension gap. The technological gap *i.e.,* the difference between potential yield and yield of demonstration plot were 19.40, 3.00 and 9.00 q/ha during the year 2009-10, 2010-11 and 2011-12, respectively. The average technology gap in all the years was 10.47 q/ha.

The variation in technology index (8.57 to 55.43 percent) during the study period in certain area may be attributed to dissimilarity in the soil fertility condition and local management practices namely for pest-diseases attack, non availability and poor quality of irrigation water and weather condition. Further, the technology index shows the feasibility of the evolved technology at the farmer's fields. The lower the value of technology index more is the feasibility of the technology. As such, reduction of technology index from 55.43 (2009-10) to 25.71 per cent (2011-12) exhibited the feasibility of technology demonstrated (Table 2).

The comparative profitability of groundnut cultivation with adoption of improved agronomic practices and farmers practices has been presented in Table 3. With the adoption of improved agronomic practices under demonstrations recorded higher average gross returns (₹ 70067/ha) and net returns (₹ 52475/ha) compared to farmers practice. These results were in conformity with the findings of Hiremath, *et al.* (2009). Hence, by conducting front line demonstrations of proven technologies, yield potential of groundnut crop could be enhanced. This will subsequently leads to positive trend in income level as well as the livelihood of the farming community.

The increase in cost of cultivation in both demonstrations as well as farmers practice over the year was mainly due to hike in prices of fertilizer and other inputs and partial withdrawal of fertilizer subsidy which has reflected on B: C ratio of 2011-12. During 2011-12 although gross and net returns were higher in demonstration over farmers practice but due to hike in prices of inputs reduced the proportion of benefit per unit of cost of cultivation. This clearly demonstrates that operation of law of diminishing marginal returns in agriculture at certain point of investment and or production level.

On the basis of the result obtained in present demonstrations over the year it could be concluded that adaption of improved agronomic practices such as timely sowing during December with optimum plant spacing of 30 x 10 cm (seed rate: 150 kg/ha), seed treatment with capton @ 2 g/kg of seed, recommended dose of fertilizer *i.e.,* NPK @ 25: 75 : 25 kg/ha at the time of sowing and top dressing of 12.5 kg nitrogen per ha at the time of flowering, application $ZnSO_4$ and $FeSO_4$ @ 25 kg/ha at the time of sowing and eight irrigations *i.e.,* pre–sowing irrigation followed by an irrigation at 25 DAS, 4 irrigations at 10 days interval and final two irrigations at 15 days interval would effectively reduce the technology gap thus leading to increased productivity of groundnut in the district. Extension gap need to be reduced by giving emphasis on education the farming community through various means of extension tools such as training, demonstration, field visit, providing short message tips through mobile at critical stage of the crop and by other means.

Table 2. Productivity, technology gap, extension gap and technology index in groundnut under frontline demonstration

Year	Area (ha)	No. of farmers	Pod yield (q/ha)			Percent increase over control	Technology gap(q/ha)	Extension gap(q/ha)	Technology Index (%)
			Potential	Demonstration	Control				
2009-10	3	8	35	15.60	13.70	13.87	19.40	1.90	55.43
2010-11	2	5	35	32.00	29.00	10.34	3.00	3.00	8.57
2011-12	2	5	35	26.00	21.00	23.81	9.00	5.00	25.71
Average			35	24.53	21.23	16.01	10.47	3.30	29.90

Table 3. Economics of groundnut production under front line demonstration and existing practices

Year	Pod yield(q/ha)		Cost of cultivation(₹/ha)		Gross returns(₹/ha)		Net returns(₹/ha)		B:C ratio	
	Demonstration	Control	Demonstration	Control	Demonstration	Control	Demonstration	Control	Demonstration	Control
2009-10	15.60	13.70	8550	7550	37400	32880	28850	25330	4.37	4.35
2010-11	32.00	29.00	21925	21025	89600	81200	67675	60175	4.09	3.86
2011-12	26.00	21.00	22300	14700	83200	67200	60900	52500	3.50	4.10
Average	24.53	21.23	17592	14425	70067	60427	52475	46002	3.99	4.10

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