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# ENHANCEMENT OF SOYBEAN PRODUCTIVITY THROUGH CLUSTER FRONT LINE DEMONSTRATIONS IN JHALAWAR DISTRICT OF RAJASTHAN STATE

**Arjun Kumar Verma[1], Mohmmad Yunus[2], Arvind Nagar[3], S. R. Rundala[4] and Sunita Kumari[5]**

*[1]Assistant Professor (Agronomy), [2]SMS (Extn. Edn.), [3]SMS (Horticulture), [4]SMS (Soil Science) and 5. Technical Assistant, Krishi Vigyan Kendra, Jhalawar, Directorate of Extension Education, Agriculture University, Kota (Rajasthan) 326001 (INDIA)*
*Corresponding author e-mail : arjunkumarverma@gmail.com*

**Abstract:** In India, soybean is predominantly grown as a rainfed crop covering the states of Madhya Pradesh, Maharashtra and Rajasthan; on vertisols and associated soils. India is largest importer of edible oils in the world and the domestic availability is just 50% of its production. Soybean is one of the important crops which can fulfil this increasing demand for the vegetable oils in the country. The productivity is less due to wide gap between improved package of practices & farmers practice. Present study was done to identify the gap and show of the CFLDs conducted by Krishi Vigyan Kendra, Jhalawar at 50 selected farmers' field in 20 ha area in the district. The yield under IP ranged from 16.50 to 21.00 with average 18.63 q/ha. The average B:C ratio observed under CFLDs was recorded 1.63.

***Keywords :*** Cluster Frontline demonstration (CFLD); Exixting farmer practices; Intervention practice.

## INTRODUCTION

The use of soybean dates back to the beginning of China's agricultural age. The utilization of this crop has been mentioned in Chinese medical compilations dating back 6000 years. a) For centuries, soybean has meant meat, milk, cheese, bread and oil to the people of China, Japan, Korea, Manchuria, the Philippines and Indonesia. In brief, soybean is a major source of vegetable oil, protein and animal feed. Soybean, with over 40 percent protein and 20 percent oil, has now been recognized all over the world as a potential supplementary source of edible oil and nutritious food. The protein of soybean is called a complete protein, because it supplies sufficient amounts of the kinds of amino acids required by the body for building and repair of tissues. Soybean is a rich source of edible oil containing no cholesterol and almost none of the saturated fats. Soybean oil surpasses all other oils because it is an ideal food for heart patients and those who wish to avoid heart disease. It also contains a large amount of lecithin and a fair amount of fat-soluble vitamins. In industry, soybean is used in the manufacture of edible lard, margarine, vegetable ghee, milk, pastries, as well as the manufacture of paints, varnishes, adhesives, etc. Soybean protein concentrate, protein isolate and textured protein have found their way into multifarious commercial food industries. Being a versatile crop with innumerable possibilities, soybean can support many agro-based industries.

In India, soybean is predominantly grown as a rainfed crop covering the states of Madhya Pradesh, Maharashtra and Rajasthan; on vertisols and associated soils. Extreme variation in rainfall both in time and space acts as a major impediment in successful cultivation of soybean and realizing higher productivity coupled with level of technology adoption and other factors.

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Estimated production of soybean during kharif 2016 is 13.79 million tons from an area of 11.39 million hectares with the productivity of over 1.2 t/ha. Madhya Pradesh, Maharashtra and Rajasthan together contribute to about 92-93% of area and production of soybean in India. In recent years, cultivation of soybean is fast expanding in the states of Telangana, Karnataka and Gujarat.

India has the fourth largest acreage of soybeans in the world but our production is almost half of the world's average. Additionally, consumption of edible oil in India is growing faster than its production. India is largest importer of edible oils in the world and the domestic availability is just 50% of its production. Soybean is one of the important crops which can fulfil this increasing demand for the vegetable oils in the country. We, at Bayer, are developing crop solutions which will help in increasing the yields. The biggest challenge faced by Soybean farmers is the control of weeds in the crop which can cause significant yield loss. The undesirable competition includes broad leaf weeds and grasses. Farmers need to apply different herbicides for the control of these weeds. Insects such as girdle beetle, semi-loopers, heliothis spp. and spodoptera are also a matter of concern for the farmers which impact the yields adversely.

## MATERIAL AND METHODS

Total 50 cluster front line demonstrations under NMOOP (National Mission on Oilseed and Oilpalm) by KVK, Jhalawar in 20.0 ha area during Kharif 2016 were demonstrated in three clusters of the Pidawa block of Jhalawar district. The village wise distribution of the CFLDS were as 15, 15 and 20 partners in the three adopted villages *i.e.* Gadiya, Salotiya and Chachlao, respectively. The selection of the villages were purposively done for the find out the reasons of wide gap between potential and local yield of soybean. To carry out cluster front line demonstration of soybean, partners were randomly selected in adopted villages of KVK based on packages of practices being followed by the farmers. Before CFLDs laid down, PRA, RRA survey and individual self interviews were done to identify the existing farmers' practices and finalized the interventions for demonstrations (Table – 1). On the basis of the identification of the interventions the critical inputs for supplied were finalized and timely demonstrated.

**Table 1 : Points for low yield of Soybean and their recommended interventions solution.**

| *Parameters* | *Existing Farmers' practice* | *Recommended practices* |
|---|---|---|
| Variety | JS-93-05 and JS - 335 | JS-9560 |
| Seed rate | 90-100 kg/ha | 80 kg/ha |
| Seed Treatment | No or rare proper seed treatment | Seed treat with Thiram @ 4.5 g/kg seed or mixture of Thiram + Carbendazim 1:1 @ 3g/kg seed |
| Seed inoculation | No or rare proper seed treatment | Seed inoculation of 500 gm/ 80 kg seed Rhizobium culture + Phosphorus Solubilizing Bacteria 500 gm/ 80 kg seed |
| Weed Management | Injudicious use of weedicide (Imazethyper) | Spray of Sodium Acefluorfen 16.5 % + Clodinofop propargyl 8% EC (Ready Mixed product) @ 1000 ml/ha at 20-25 days after sowing. |
| Sowing Method | Sowing by Seed drill | Sowing seeds in 30 cm rows by Seed cum ferti drill |
| Nutrient Management | No Nutrient Management | 20 kg/ha $N_2$, 40 kg/ha $P_2O_5$, 20 kg/ha $K_2O$ and 20 kg/ha sulphur. |
| Pest Management | Improper use of insecticides | 1. Girdle Beetle: Spray chlorantrainiliprole (0.3 ml/ha) or profenofos (2ml/l) or thiacloprid (1.5 ml/l) or triazophos (1.5 ml/l),<br>2. Green semilooper: Spray profenofos (2 ml/l) or quinalphos (2 ml/l) and<br>3. Yellow Mosaic: Dimethoate 30 EC 1 lit. /ha |

On the basis of above table, the following critical input supplied to the partners: -

- Use of improved variety JS-9560 (80 Kg/ ha),
- Seed treatment with Thiram + Carbendazim 1:1 @ 3g/kg seed and
- Spray of Sodium Acefluorfen 16.5 % + Clodinofop propargyl 8% EC (Ready Mixed product) @ 1000 ml/ha at 20-25 days after sowing for weeds management.

**Table 2 : Characteristic of experimental site of Jhalawar district**

| *Parameters* | *Jhalawar District* | *Parameters* | *Jhalawar District* |
|---|---|---|---|
| Latitude | $23^0$ 40′ to $24^0$ 52′ N | Annual rainfall (Average) | 954.70 mm |
| Longitude | $75^0$ 29′ to $76^0$ 56′ E | Maximum temperature $^0$C | 43-48 $^0$C |
| Altitude | 258 m above mean sea level | Minimum temperature $^0$C | 01-2.6 $^0$C |
| Soil texture | Black shrink soil | Soil Nutrient status | Medium |

Before CFLDs conduction the, the partners well trained in the two 'On Campus Trainings' for their knowledge upliftment. During the crop season 'Off campus training' organized and field visits were made for proper inspection by the scientists of KVK as well as other dignitaries of the line departments. Three field days were celebrated at the time of fully bloomed crop as well as before harvesting; benefitting 1015 other neighbour farmers. The demonstrated variety's bold seeded sown during 26-30 June 2016 after onset of monsoon and harvested within 85-90 Days duration. The total rainfall was received during crop season was 1050 mm.

The data on output of Mustard and input used per hectare have been collected from the front line demonstrations (FLD) and farmers practices (FP). Technology gap over district, state and potential yield was calculated: -

1. Technology gap (a) = District Average yield (DAY) – Demonstration yield (DY)
2. Technology gap (b) = State Average yield (SAY) – Demonstration yield (DY)

## RESULT AND DISCUSSIONS

After conduction of CFLDs the data were conducted and summarized and analyzed. After analysis of the data, it is evident from table 3 and fig.-1 that the yield of demonstration plot ranged from 16.50 to 21.00 along with average 18.63 q/ha in variety JS-9560 of soybean which was 55.25 % higher than the farmer practice (12.00 q/ha). The B:C ratio was observed under CFLDs was 01.68 which is remunerative for farmer.

**Table 3: Yield performance of soybean variety JS-9560 under CFLDs & farmers practice of the Jhalawar district**

| *Area (ha)* | *No. of Demo.* | *Yield Obtained (q/ha)* | | | | *% Increase over Farmer Practices* | *B:C Ratio* |
|---|---|---|---|---|---|---|---|
| | | *Maximum* | *Minimum* | *Average* | *Farmer Practices* | | |
| 20.0 | 50 | 21.00 | 16.50 | 18.63 | 12.00 | 55.25 | 1.68 |

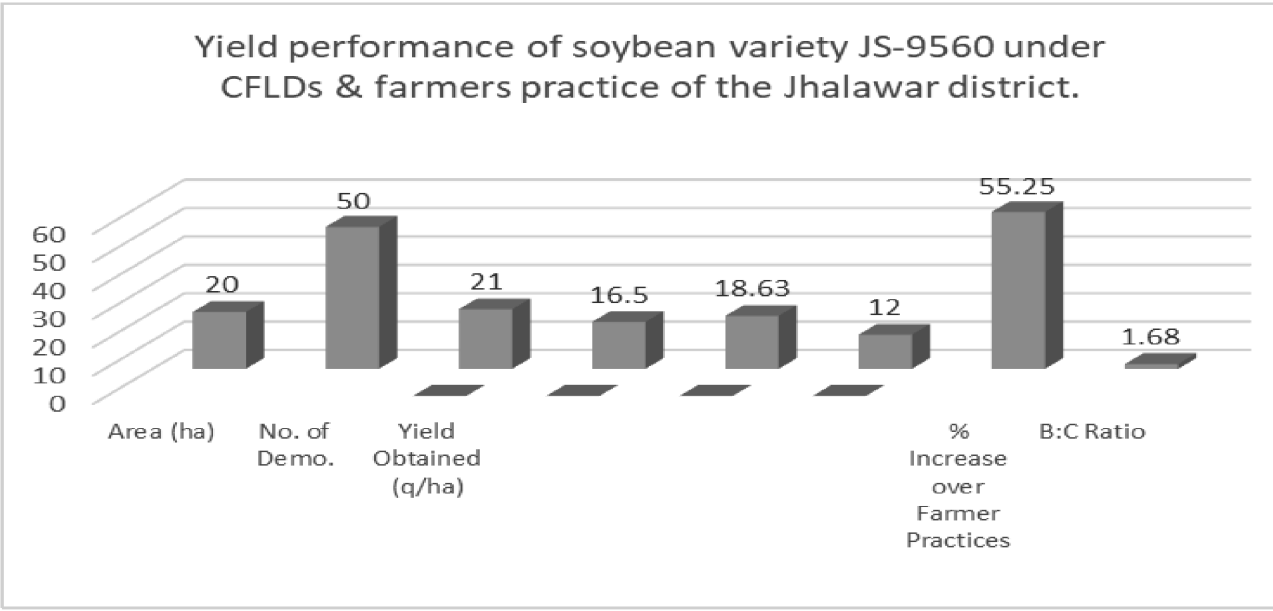


**Figure 1: Yield performance of soybean variety JS-9560 under CFLDs & farmers practice of the Jhalawar district**

The enhancement in the productivity of the soybean was observed due to the technology demonstrated and supplied critical inputs with time to time field visits. Obviously, the increased outputs can be attributed through improved practices (IP) followed in FLDs conducted by the KVK, Jhalawar. The levels of yield are considerably low under district and state because of considerable variation in the extent of adoption of recommended package of practices depending upon the amount of risk involved in terms of cost, skill and knowledge about the concerned practices. Besides these the factors responsible for the yield difference were improved variety, weed management, pest management, time and method sowing, appropriate plant geometry, proper nutrient management at appropriate time with scientific backup by the help of KVK scientists. Similar findings were also observed by Dhaka *et al.* (2010) and Chand Suresh *et al* (2002) and Verma, *et al* (2016).

**Table 4 : Gross Cost (Rs/ha), Gross Return (Rs/ha), Net Return (Rs/ha) and B:C Ratio of CFLDs of Soybean in Jhalawar district**

| *Farmers' Existing Plot* | | | | *Demonstration Plot* | | | |
|---|---|---|---|---|---|---|---|
| *Gross Cost (Rs/ ha)* | *Gross Return (Rs./ha.)* | *Net Return (Rs./ ha.)* | *B:C Ratio* | *Gross Cost (Rs/ha)* | *Gross Return (Rs./ha.)* | *Net Return (Rs./ha.)* | *B:C Ratio* |
| 31256 | 45301 | 14045 | 1.45 | 32890 | 55256 | 22366 | 1.68 |

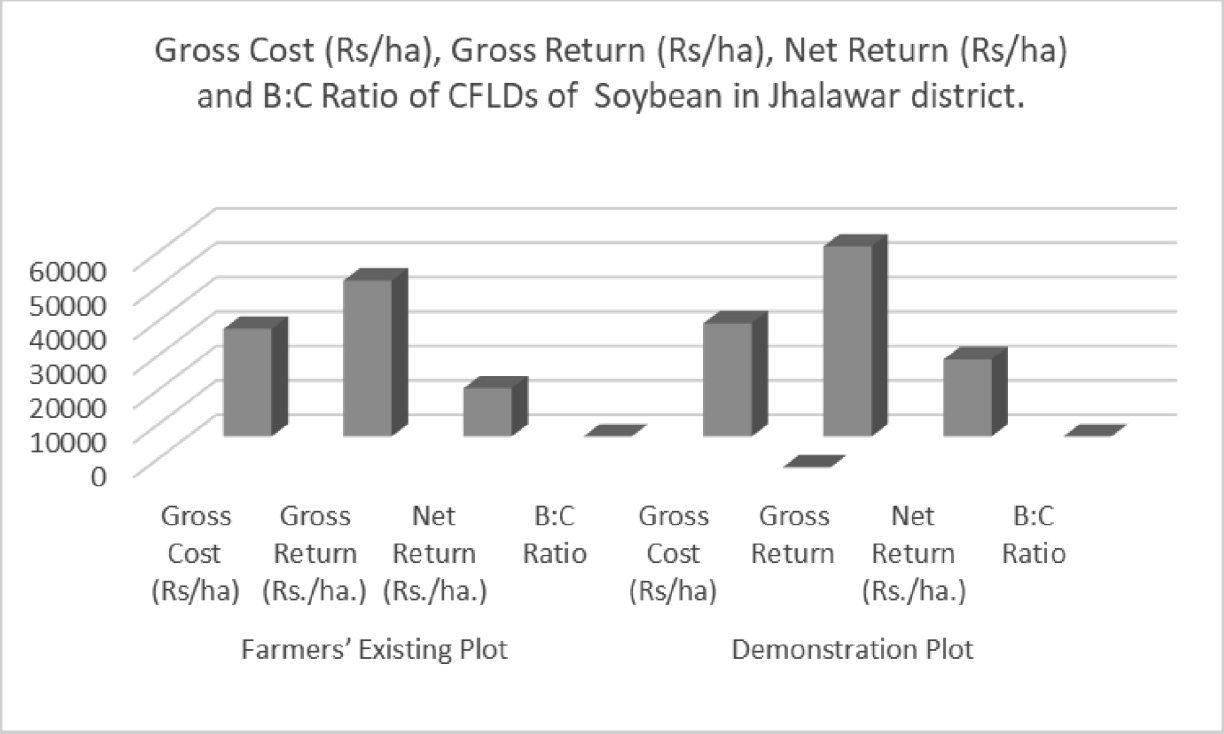


**Figure 2 : Gross Cost (Rs/ha), Gross Return (Rs/ha), Net Return (Rs/ha) and B:C Ratio of CFLDs of Soybean in Jhalawar district.**

The data presented in table 4 and fig – 2 indicated that the increment in Gross Return (Rs/ha) ranges 55256; Net Return (Rs/ha) ranges 22366; B:C Ratio 1.68 was recorded under cluster front line demonstrations (CFLDs) over the Gross Return (Rs/ha) 45301; Net Return (Rs/ ha) 14045; B:C Ratio 1.45 under farmers' existing plots, respectively. It might be due to adoption of interventions and use of critical inputs at right time, right place and right way of the resources by the selected partners. The results were in the same line of the findings of Dhaka *et al*. (2010), Chand *et al* (2002) and Verma *et al* (2016).

**Table 5 : Technology gap over district, state and potential yield of Soybean under CFLDs in Jhalawar district**

| *Yield (q/ha)* | | | | *Technology Gap* | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *District yield (D)* | *State Yield (S)* | *Potential Yield (P)* | *Average Yield of CFLDs* | *District* | | *State* | | *Potential* | |
| | | | | *(q/ha)* | *(%)* | *(q/ha)* | *(%)* | *(q/ha)* | *(%)* |
| 12.00 | 11.50 | 22.00 | 18.63 | 06.63 | 55.25 | 07.13 | 62.00 | (-) 03.37 | (-) 15.32 |

The data presented in table 5 indicated that the Technology Gap over district and state were 06.63 & 07.13 q/ha while in potential yield it was found (-) 03.37 q/ha. It might be due to the very good transfer of technology among partners and keen inspections. The same results were found by the Dhaka *et al*. (2010), Chand *et al* (2002) and Verma *et al* (2016).

## COCLUSION

On the basis of above study, it was concluded that yield gap in soybean can be overcome, to make the soybean more remunerative, through the wide publicity of the interventions by adoption of various extensions methodologies, methods including cluster front line demonstrations with technology backup need to be done. Therefore, the number of the demonstrations with proper supervision would be enhanced for self sufficiency in the oilseed production of district.

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