Comparative study on performance of seed cum fertilizer drill, zero till drill and broadcasting method of sowing greengram

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Abstract: Pulses provide the required protein supplement to the vegetarian people. Pulse is the most important food crop in India and from all integral part of the cropping system farmers all over the country. Greengram or mung bean (*Vigna radiata* L.) is the major pulse crop of the state Odisha covering total area of 8.36 lakh ha with average productivity 434 kg per ha, which is about 40 percent of the total pulse area of the state. Present study was conducted for zero-till drill and seed- cum- fertilizer drill for sowing on the yield of greengram. It is found that zero-till drill is having highest benefit-cost ratio of 2.07 as compared to 1.90 with seed drill and 1.77 with broadcasting. Use of zero till drill for sowing of green gram was economical as the costs of fuel, labour and inputs are saved. It can save around Rs. 1750/- per hectare required for field preparation.

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1. Introduction

Pulses, the food legume has been grown since millennium and it has been a vital ingredient of the human diet in India. Pulses provide the required protein supplement to the vegetarian people. Pulse is the second most important group after cereals in agriculture. In year 2016 -17 the total pulse area 238.56 lakh ha with production in India was 18.25 million tonnes with productivity 765 kg per ha. India is the largest producer and consumer of pulse in the world, accounting for 25 percent of global production and 15 percent consumption (Saraswati *et al.,* 2004). Pulse is the most important food crop in India and from all integral part of the cropping system farmers all over the country. Pulse crops are primarily grown under rain fed condition and a low fertility neglected soil in India. It can be grown on a variety of soil and climatic conditions as it is tolerant to drought (Malik *et al.,* 2006). Greengram or mung bean (*Vigna radiata* L.) is the major pulse crop of the state Odisha covering total area of 8.36 lakh ha with average productivity 434 kg per ha, which is about 40 percent of the total pulse area of the state. In coastal belt of Odisha greengram and blackgram are the major pulse. Rice - greengram cropping sequence is the dominant crop production system followed in the state of Odisha (Swain et al. 2020). Pulses like greengram and blackgram grown in all most all areas. Residual soil moisture is fully utilized by the farmers in the fields for cultivation of pulse crops. People generally go for rice- pulse cropping system. It improves the soil fertility and productivity of the soil. Greengram is one of the principal crops in Odisha after rice. Increase in production of crops with relatively less investment is the basic principle of agricultural science. In Jajpur, green gram is grown over an area of 25,939 hectares with a production of 1.2 lakh qtl. with an average productivity of 466 kg/ha during. Now-a- days line sowing is highly promoted as it maintains proper plant population, distance between the plants, which gives a better yield. Without going in for any cultivation, direct

sowing of crops is done in the field after harvesting of rice using zero-till drill. Zero-till drill was first introduced in Punjab for sowing wheat. But in Odisha it was used for sowing greengram after rice in an experimental basis. Zero-till drill minimizes the losses due to delayed sowing which requires no land preparation. Moreover, the cost involved in land preparation is also saved. Direct sowing of greengram is done in the rice field by using zero-till drill utilizing residual moisture. This advances the sowing of greengram as time required for field preparation is saved. It can be used in almost all types of soils except very heavy clayey soils. Muhtar (1986) stated that no-till reduces soil erosion, permits better timeliness of all crop management operations, reduces total inputs on the farm because of less time, labour and fuel consumption.

Zero tillage technology is well known in the form of Conservation in Agriculture, which involves continuous minimum mechanical soil disturbance, permanent organic soil cover with crop residues or cover crops and diversified, efficient and economically viable crop rotations and also provides opportunities for saving on inputs, improving resource use efficiency and mitigating greenhouse gas emission and climate change adaptation. The study has revealed that it is possible to save labour and irrigation water under zero tillage than under conventional method and this technology is an important alternative to save scarce resources and enhance net farm income (Gupta et al. 2019).

Monika et al. 2014 concluded that adoption of zero tillage technology had a positive impact on the overall economics of rapeseed and mustard cultivation and higher gross and net income has been got on the overall farms through increased productivity under zero tillage cultivation of rapeseed and mustard.

Prasad and Goverdhan (2008) studied on economic analysis of zero tillage technology for maize. As per Rout et al. (2012) direct sowing of greengram is done in the rice field by using zero-till drill utilizing residual moisture which advances the sowing of green gram as time required for field preparation is saved and zero till drill can be used in almost all types of soils except very heavy clayey soils. Wahid et al. (2003) studied the effect of zero tillage method for wheat sowing on bulk density of soil below ploughing depth, which was negligible. Swain et al. 2020 stated that the use of bullock drawn 3 row zero till drill (CIAE design) for line sowing of greengram during rabi season in rice based cropping system using animal power on small farms are found to be suitable considering the cost- economics while conservation farming is also followed. Rout et al. 2012 found that the yield of greengram sown by zero-till drill was 5.12% less than yield by seed drill, but the benefit cost ratio of zero-till drill was highest among all the three methods.

2. Materials and Methods

A field experiment was conducted at farmer's field of village- Niladeipur and Achyutpur of Jajpur district, Odisha to know the effect of zero-till drill and seed-cum- fertilizer drill for sowing on the yield of greengram. The field experiment was conducted with 5 farmers. Here rice-greengram cropping system is the prevailing practice. The soil type of the field was clay loam/ alluvial. Annual rain fall of Jajpur district is 1559.9 mm and temperature ranges from 40.2 (max) to 13.3 (min). The line sowing of greengram during Rabi season following kharif rice and it was compared with conventional method. Two tillage operations were conducted as land preparation for broadcasting and seed -cum- fertilizer drill for sowing of greengram. Greengram variety SML -668 of 60 days duration was sown in three different fields by three

different methods and the result was studied. Greengram was grown by the residual moisture. No irrigation was applied. No weeding or weedicide application was done. Land preparation was required for sowing by seed- cum - fertilizer drill and broadcasting. Two tillage operations by tractor drawn cultivator were done before sowing by these two methods. But the zero-till drill was operated without any tillage operation in the field as shown in Fig. 3. A tractor drawn 9- row fertilizer cum zero-till seed drill was used for sowing the greengram as shown in (Fig.2) and farmers traditional practice of broadcasting is shown in Fig. 1. The specifications of the used zero-till drill are given in the Table 1. The functional parameters, plant growth parameters and yield parameters were recorded to compare the performance of both the methods of establishment of greengram.

3. Results and discussion

Before harvesting, the plant samples from five different locations of farmer's field were collected to study the biological parameters of greengram sown by broadcasting, zero-till and seed- cum-fertilizer drill. Average number of plants per square meter was found to be 33.5 in case of seed- cum fertilizer- drill and 31 in case of zero till drill where as it was 42.3 plants/sq. m in case of broadcasting. Parameters of greengram establishment is shown in Table 1 and biological parameters of greengram in different sowing methods in Table 2. Table 3 shows the comparative analysis of investment, return and benefit-cost ratio of all the three sowing methods. It is evident from the table that zero-till drill is having highest benefit-cost ratio of 2.07 as compared to 1.90 with seed drill and 1.77 with broadcasting. Use of zero till drill for sowing of green gram was economical as the costs of fuel, labour and inputs are saved. It can save around Rs. 1750/- per hectare required for field preparation. As the time required for field preparation is saved, sowing of green gram can be advanced by 10-15 days.

Fig. 1 Broadcasting

Fig. 2 Seed- cum -fertilizer drill

Fig. 3 Zero-till drill

Table 1: Parameters of greengram establishment

Treatment	Field capacity(ha/h)	Cost of sowing (Rs/ha)	Seed rate (Kg/ha)	Labour requirement (mandays/ha)
Broadcasting	0.2	300	35	1
Seed- cum-fertilizer drill	0.4	2000	20	1
Zero till drill	0.4	2000	20	1

Table 2 Biological parameters of greengram in different sowing methods

Treatment	Av. No. of plants per sq mt.	Av. Plant height (cm)	Av. No of pods per plant	Av. No. of grains per pod	Yield (q/ha)
Broadcasting	42.3	35.2	10.3	9	4.4
Seed-cum - fertilizer drill	33.5	40.1	14	12	5.6
Zero till drill	31	31.5	8.5	9	4.9

Table 2 comparative study of economics of greengram sowing in different methods

Sl. No.	Items	Broadcasting	Seed-cum- fertilizer drill	Zero till drill
1	Land preparation (Rs/ha)	1750	1750	0
2	Sowing (Rs/ha)	300	2000	2000
3	Seed (Rs/ha)	2100	1200	1200
4	Fertilizer (Rs/ha)	2250	2250	2250
5	Harvesting (Rs/ha)	7500	7500	7500
6	Threshing (Rs/ha)	1000	1000	1000
7	Total cost of cultivation (Rs/ha)	14900	15950	14200
8	Gross return (Rs/ha)	26400	33600	29400
9	Net return (Rs/ha)	11500	17650	15200
10	B:C ratio	1.77	1.90	2.07

4. Conclusions

Use of zero till drill for sowing of green gram is economical as the costs of fuel, labour and inputs are saved. It can save around Rs. 2000/- per hectare which is required for field preparation. As the time required for field preparation is saved, sowing of greengram can be advanced by 10-15 days. Improved seeding equipment coupled with efficient input management present an opportunity for higher and more consistent yields. Weed infestation is comparatively less due to non-availability of nutrients from well placed fertilizers near the greengram seed. Though the yield in case of zero till drill is less but the benefit cost ratio is higher as the cost of land preparation is saved.

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