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Popularization of organic ginger cultivation in the Eastern Ghat high land Zone of Odisha

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ABSTRACT

The present study was conducted in the Koraput district of Odisha in India during 2013-14 under National Horticulture Mission for popularization of organic ginger cultivation through frontline demonstrations. The average yield of fresh ginger rhizome cv. Suprabha in organic plots was found to be 70.4 q / ha in comparison with average yields 76.0 q / ha in inorganic plots in farmers practice during Kharif, 2013. The average cost of production of ginger per hectare was found to be Rs. 233600 and Rs. 235600 from organic and inorganic field respectively. The average gross return per hectare from FLD (organic) and inorganic field (Farmers Practice) was recorded as Rs. 563200 and Rs. 532000 respectively. However, the average net return/ ha of organic ginger in different FLD plots was obtained as Rs. 329600 in contrast to Rs.296400 in different farmers field under inorganic cultivation. The organic farming recorded higher net return than that of the Farmers Practice. The B:C ratio was found to be 1: 2.41 in organic ginger and 1: 2.26 in Inorganic ginger. High benefit: cost ratio advocated the economic viability of the demonstration and motivated the farmers towards adoption of interventions demonstrated.

***Keywords** : Ginger, organic cultivation, yield, net return, B:C ratio*

INTRODUCTION

Ginger (*Zingiber officinale*) a herb of Asian origin is a valued crop of India, contributes towards 30 % of global production. India is rightly called as “spice bowl of the world” for the production of variety and superior quality of spices. India is a major producer of ginger accounting for about 30 % of the global share followed by China, Nepal and Indonesia. India is the major producer of ginger having production of 655000 MT of ginger from 132000 ha area under its cultivation (National Horticulture Board, 2014). Productivity of ginger in India is more (3417 kg/ha) than the average productivity (2,546 kg/ha) in the world. In order to face competition and increase India’s market share in the world market India need to consistently supply variety of quality ginger at competitive prices.

Ginger is important cash crop cultivated by tribal farmers of Odisha for livelihood. Odisha is second largest in production of ginger area wise and also considered as best suitable after Kerala among the states in India (Parthasarathy *et al.*, 2008). Odisha not only covers the second largest area in ginger cultivation of the country but also exhibits good deal of variability among cultivated germplasm and considered best suitable state after Kerala. It has been noticed that a large number of tribal farmers still practice the traditional methods of ginger cultivation. Odisha is suitable environmentally and has the highest area under ginger cultivation in tribal belt of Kandhamal, Koraput and Keonjhar. However, the productivity (1.90 t / ha) is much below as compared to other states. This is because the crop is mainly grown by tribal farmers for their livelihood which followed traditional organic practices (Rath, 2004).Ginger farmers should treat ginger with organic manure so as to boost yield (Nmor, 2013). Organic cultivation of ginger has several advantages over the conventional one like protection of both the environment and human health, improved soil fertility, better water quality, prevention of soil erosion, generation of rural employment, etc. Organic manures in the forms of cow dung, poultry and pig manures have great tendency to increase growth characters and yield of ginger (Egbuchua and Enujeke, 2013). One possible reason for low yield of ginger in Eastern Ghat High Land zone of Odisha could be due to the poor nutrient

management practices adopted for this crop. The ginger production in the region is organic by default because the farmers of the region apply only the locally available farmyard manures (e.g., cow dung manure, pig manure and poultry manure).Due to increasing demand for organic products all over the world, the ginger farmers can receive higher returns from their produce if grown organically. Considering the above-mentioned facts in view, an attempt has been made to popularize organic cultivation of ginger in this zone for enhancing getting higher profit and obtaining quality produce of the farmers.

MATERIALS AND METHODS

The investigation was carried out in Koraput district of Odisha in India during 2013-14 under National Horticulture Mission for popularisation of organic ginger cultivation through frontline demonstrations. The rainfall in the current year was recorded as 1518.2 mm and during the cropping season it was recorded as 1410.8 mm. There was no dry spell observed during the investigation period. After preliminary survey, five randomly selected farmers were selected with adopted method of organic ginger cultivation. A total 05 frontline demonstrations were conducted at 05 farmer's fields. The selection of farmers was made in consultation with the local Assistant Agriculture Officers of Semiliguda area of Koraput district in Odisha and scientists of Krishi Vigyan Kendra, Koraput, Semiliguda, Odisha in India. The area considered under each demonstration was 0.5 ha. Procedure for site and farmers selection, layout of demonstration and farmers participation etc. were followed as per the methodology followed by Choudhury (1999). Visits of the farmers and extension functionaries were organized at demonstration plots to show the significance of large scale cultivation of ginger.The variety Suprabha was supplied to the farmers. The different organic inputs were supplied to FLD farmers to popularise the technology. Before planting ginger, weeds and bush regrowth were slashed manually and left on the soil as a mulch. The land is then hand hoed superficially. Farmers make drainage channels around the field. After covering the soil plant materials are burnt. Though it is not burn totally it helps in soil sterilization. In the study area, FYM (Farm Yard Manure) @ 25 t/ha, Vermicompost @ 5 t/ha, Neem cake @ 2 t /ha, Azotobacter @ 25 kg /ha, PSB @ 25 kg/ha, Potassium Mobilising Bacteria @ 25 kg/ha and biopesticides like *Trichoderma viride*@ 25kg and *Pseudomonas fluorescens* @ 25kg were used. Five kg each of Azotobacter, Phosphate solubilising bacteria and Potash mobilizing bacteria were also incorporated with FYM as basal dose for 1 ha area. The seeds were treated with *Trichoderma viridae* and *Psuedomonas fluorescens* for 30 minutes and shade dried for 3 to 5 hours as a safeguard against soft rot and to induce early sprouting. Planting of ginger was done in the month of May after receipt of pre-monsoon showers. Ginger rhizomes weighing 20 to 25g were used at a spacing of 30 cm x 25 cm at a depth of 4 to 5 cm with at least two viable healthy bud facing upwards. A seed rate of 15 q / ha was used for planting. Before planting seed rhizomes were broken into pieces to ensure each piece has 2-3 viable and sprout buds. The farmers used farm yard manure and vermicompost at the time of transplanting by the way of broadcasting. Neem cake was applied at the time of transplanting by mixing with FYM and Vermicompost. Application of neem cake dose was done as basal to reduce the incidence of soft rot of ginger and for increasing the yield. Mulching @ 25 t /ha was done in 3 splits as basal, at 45 days and at 90 days after sowing. Mulching of the ginger beds with green leaves is an essential operation to enhance germination of seed rhizomes and to prevent washing off soil due to heavy rain. The first mulching was done @ 15 t/ha at the time of planting. It is repeated @ 5 t/ha on 45th and 90th day after planting. Farmers were also cultivating green manure crops like dhanicha and sunhemp in the interspaces of beds, along with ginger and harvested the green manure crop during second mulching of ginger beds.Cow dung slurry and liquid manure poured on the bed after each mulching to enhance microbial activity and nutrient availability. Wood ash @ 50 kg / ha was also applied in the field as this is believed to enhance the potash content. The crop was irrigated at critical stage of water requirement. Generally weeding was done twice to keep the field free from weeds, the

first at 45 days of sowing and the next after 45 days of the first weeding. Neem oil was sprayed at the rate of 3 ml/l at 10-12 days interval after transplanting to control incidence of termites and shoot borer. For effective control of diseases 10 g each of *Trichoderma viridae* or *Pseduomonas fluorescens* per litre of water were used for spraying. Mixed spraying of *Trichoderma viridae* and *Pseudomonas fluorescens* was done three times at 20 days interval starting from 30 days after sowing.

Data on yield ha^{-1}, cost of production (Rs. ha^{-1}), gross return (Rs. ha^{-1}), net return (Rs ha^{-1}) and B:C ratio were taken in both organic and inorganic method of chilli cultivation and were presented in the tables. The B: C ratio was calculated by using the formula Gross returns / Cost of cultivation.

RESULTS AND DISCUSSION

Yield

It was revealed from the recorded data that rhizome yield of organic ginger in FLD plots was lower than the inorganic ginger rhizome yield in farmers practice (Table 1). The fresh ginger rhizome yield per FLD plots (Organic) from 0.5 ha varied from 32 to 37 q where as it varied from 35 to 40 q in Farmers practice (inorganic plots). The average fresh ginger rhizome yield in organic plots was 35.2 q in comparison with average yield of 38.0 q of inorganic plots in farmers practice from 0.5 ha area. Similarly, the average fresh ginger rhizome yield in organic plots was 70.4 q ha^{-1} in comparison with average yields 76.0 q ha^{-1} of inorganic plots in farmers practice. Shah and Zala (2006) obtained average yield of ginger in Gujarat as 133 q/ha under Gujarat condition while, Babu *et al*. (2015) obtained an average yield of 12-15 tons from 1 hectare area. But according to Singh and Dhillon (2015) yield of ginger on an average worked out to be 1467 kg/ha. Farmers believed that application of neem cake @ 2 t /ha as basal dose helps reduce the incidence of soft rot of ginger and thereby increased the yield. Neerja and Korla (2010) studied effect of organic manure and inorganic fertilizer on yield and quality of ginger and recorded highest yield of 11.59 t/ha with biofertilizer Azospirillum alone in comparision to inorganic fertilizers and the quality attributes significantly increased by all the organic fertilizer treatments under Solan condition (Himachal Pradesh).

Cost of Production

From the data depicted in the Table 2, it was obvious that from 0.5 ha area, the cost of production of ginger ranged from Rs. 112500 to Rs. 120000 in different farmers filed under organic plots. Similarly it varied from Rs. 115000 to Rs. 122000 in different farmers' field under inorganic plots (farmers practice). The average cost of production of ginger was found to be Rs. 116800 and Rs. 117800 from organic and inorganic field respectively. Similarly, from the data presented in the Table 3, it was found that the cost of production ha^{-1} varied from Rs. 231000 to Rs. 240000 from organic ginger cultivation and from the inorganic ginger cultivation, it varied from Rs. 230000 to Rs. 244000. The average cost of production of ginger was found to be Rs. 233600 and Rs. 235600 from organic and inorganic field respectively (Table 3). Efficiency in production has to be increased so as to reduce unit cost of production and organic ginger cultivation can be promoted (Karthick *et al*., 2015). Shah and Zala (2006) reported that ginger is a highly capital intensive crop and the average cost of cultivation has been estimated to be Rs 2,02,260/ ha based on the data collected from ginger growers under Gujarat condition. Bhat *et al*. (2012) on the other hand reported that the cost of cultivation was higher in case of small (Rs. 89435.17) farmers compared to medium (Rs. 87203.30) and large (Rs. 87015.34) farmers. However, there were no substantial differences in the cost of cultivation between small, medium and large farmers.

Gross Return

From the data depicted in the Table 2, it was noted that from 0.5 ha area, the gross return varied from Rs. 256000 to Rs. 296000 in different farmers filed under organic plots. Similarly it varied from Rs. 245000 to Rs. 280000 ha^{-1} in different farmers' field under inorganic plots (farmers' practice). The average gross return was found to be Rs. 281600 and Rs. 266000 from organic and inorganic field respectively. Similarly, from the data presented in the Table 3, it was obvious that the gross return ha^{-1} varied from Rs. 512000 to Rs. 592000 from organic ginger cultivation and from the inorganic ginger cultivation, it varied from Rs. 491000 to

Rs.560000. The average gross return per hectare from FLD plot (organic) and inorganic field was recorded as Rs. 563200 and Rs. 532000 respectively (Table 4). Singh and Dhillon,(2015) obtained a gross return of Rs. 183408/ha in ginger and the returns over variable cost for ginger crop worked out at Rs. 113324/ha. Shah and Zala (2006) obtained the overall gross returns of Rs 3,82,600/- from ginger per hectare under Gujarat condition.

Net Return

It was noticed that the net return from different farmers' field ranged from Rs. 136000 to Rs.180000 from FLD farmers field (organic method) and from Rs. 128500 to Rs. 165000 from FLD farmers field (inorganic method) from 0.5 ha area. The corresponding average net return of Rs 164800 and Rs. 148200 was obtained from recommended practice and farmers practice respectively (Table 2). Similarly, from Table 3, it was clear that the net return varied from Rs. 272000 to Rs. 360000 from FLD farmers' field and from Rs. 257000 to Rs. 330000 from inorganic farmers field (Farmers practice) from 1 ha area. The average net return ha^{-1} of organic ginger in different FLD plots was obtained as Rs. 329600 in contrast to Rs.296400 in different farmers field under inorganic cultivation. The organic farming recorded higher net return than that of the Farmers Practice. Nath and Korala (2000) reported that the net returns and benefit:cost ratio was highest in ginger with Azofert treatment. However, Kumar *et al*., (2012) obtained an average net returns of Rs. 255258/- from the recommended practice in comparison to farmers practice/control plot (Rs.131677/-).

B: C ratio

The B:C ratio from different farmers filed ranged from 1: 2.13 to 1: 2.56 from the front line demonstrated farmers field (organic ginger) and from 1 : 2.10 to 1 : 2.43 from inorganic ginger fields . The average B: C ratio was recorded as 1: 2.41 and 1:2.26 from organic and inorganic ginger cultivation respectively (Table 2). High benefit: cost ratio also advocated the economic viability of the demonstration and motivated the farmers towards adoption of interventions demonstrated. Shah and Zala (2006) reported that the net profit per hectare over cost has been found as Rs 1,80,338 and input-output ratio as 1:1.97 in ginger under Gujarat condition. However, Kumar *et al*., (2012) concluded that the benefit: cost ratios of demonstration plots were significantly higher over control (5.79 in recommended practice to 3.54 in farmers practice) under Gangtok condition. The variation of benefit: cost ratio may be related to the yield performance and other inputs and production management in both organic and inorganic method of ginger cultivation under different agro climatic conditions.

Market development for the organic ginger is a crucial factor to promote domestic sales. The results of frontline demonstrations showed that organic cultivation of ginger could be popularized with the help of innovative intervention coupled with the proper management and application of organic inputs. It has been widely acknowledged that synthetic fertilizers, pesticides and fungicides are more effective and regularly used for the management of crop for yield all over the world. However, these chemicals are harmful to the ecosystem and it also reduces development of microbial activities in the soil. Considering all these facts and overcome theses problem, alternative method of crop management using organic method is also equally effective tool for crop management. High benefit: cost ratio also advocated the economic viability of the demonstration and motivated the farmers towards adoption of interventions demonstrated. Although, the use of organic manures is associated with problems like slow nutrient release however, its uses will somehow minimize total reliance on mineral fertilizers which are not only too costly for poor resource farmers to acquire, but are associated with problems relating to soil acidity, nutrient imbalance, inadequate supply of macro and micro nutrients and ineffectiveness due to the blanket method of application.

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Table 1: Yield Performance of organic ginger in comparison to inorganic ginger cultivation

Sl No.	Farmer	Area (ha)		Plot Yield of fresh rhizome obtained (q)		Yield per ha (q)	
	FLD	FP	FLD	FP	FLD	FP	
1	Farmer 1	0.5	0.5	36	39	72	78
2	Farmer 2	0.5	0.5	35	37	70	74
3	Farmer 3	0.5	0.5	36	40	72	80
4	Farmer 4	0.5	0.5	37	39	74	78
5	Farmer 5	0.5	0.5	32	35	64	70
	Average	0.5	0.5	35.2	38.0	70.4	76

FLD- Front Line Demonstration (Organic ginger cultivation)

FP- Farmers Practice (Inorganic ginger cultivation)

Table 2: Cost: Benefit analysis from organic in comparison to inorganic ginger cultivation from 0.5 ha area

Sl No.	Farmer	Total cost of production (Rs.)		Gross return (Rs.)		Net return (Rs.)		C:B ratio	
		FLD	FP	FLD	FP	FLD	FP	FLD	FP
1	Farmer 1	120000	122000	288000	273000	168000	151000	2.40	2.24
2	Farmer 1	115500	118000	280000	259000	164500	141000	2.42	2.19
3	Farmer 1	112500	115000	288000	280000	175500	165000	2.56	2.43
4	Farmer 1	116000	117500	296000	273000	180000	155500	2.55	2.32
5	Farmer 1	120000	116500	256000	245000	136000	128500	2.13	2.10
	Average	116800	117800	281600	266000	164800	148200	2.41	2.26

Selling Price of organic ginger = Rs. 8000/- per q & inorganic ginger = Rs.7000/- per q.

Table 3: Cost: Benefit analysis from organic ginger in comparison to inorganic ginger cultivation (Rs. ha^{-1})

Sl No.	Farmer	Total cost of production (Rs.)		Gross return (Rs.)		Net return (Rs.)		C:B ratio	
		FLD	FP	FLD	FP	FLD	FP	FLD	FP
1	Farmer 1	240000	244000	576000	546000	336000	302000	2.40	2.24
2	Farmer 1	231000	236000	560000	518000	329000	282000	2.42	2.19
3	Farmer 1	225000	230000	576000	560000	351000	330000	2.56	2.43
4	Farmer 1	232000	235000	592000	546000	360000	311000	2.55	2.32
5	Farmer 1	240000	233000	512000	491000	272000	257000	2.13	2.10
	Average	233600	235600	563200	532000	329600	296400	2.41	2.26

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