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Economics of Growing Tea Organically in the Initial Years in Terai Zone of West Bengal Condition

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A B S T R A C T

In tea during last 50 years, considerable increase in production, productivity and quality of tea achieved because of using various chemical inputs like fertilizers and plant protection chemicals. However, indiscriminate use of chemical inputs degraded soil health and product quality and the environment. Organically produced tea without any hazardous chemicals and residues are better in quality and fetches premium price, make a perfect health drink. Organic tea cultivation is gaining momentum. The feasibility of organic cultivation depends right from planting though recommended dose for organic tea cultivation, particularly for terai region, is not there. So, the present investigation was carried out from 2015 to 2017 and to evaluate the economics of growing tea organically in the initial years among various treatments were - $T_{1:}$ Control (without any organic matter and inorganic fertilizer); $T_{2:}$ Conventional (NPK @ recommended doses); $T_{3:}$ Vermicompost @ 1.0 kg; $T_{4:}$ Vermicompost @ 1.0 kg + (*Azotobacter* + PSB + *Fl.pseudomonas* + *Azospirillum)* each @ 5.0 g/plant; $T_{8:}$ FYM @ 2.5 kg (Azotobacter + VAM + *Fl.pseudomonas* + *Azospirillum*) each @ 5.0 g/plant, replicated thrice and laid out in completely randomized block design. The Evaluation of economics including fixed costs and variable costs among the organic treatments T_4 was observed to be the best with an income per ha for two years was Rs. 67,876 followed by T_5 with Rs. 61,862 per ha. So, from the investigation, by observing the young tea plants only for two years, though it is premature to conclude, it was observed that T_4 was the most remunerative treatment of organics for *Terai* zone of West Bengal.

Introduction

Tea is the second most popular drink in the world after water (Van der Wal, 2008). It is made from young tender leaves and unopened buds of the evergreen tea plant (*Camellia sinensis* (L.) O. Kuntze), belonging to the family Theaceae. Over the last 20 years, India's world ranking as an exporter of tea has come down from number one to number four,

in the face of stiff competition from Sri Lanka, Kenya, and China (Majumdar *et al.*, 2012). Recent trends showed drastic reduction in tea exports from India, as the importing countries preferred residue free and superior quality tea. Only about one per cent of total tea produced in India was organic tea.

Application of chemical fertilizer as such without conservation of soil fertility, not only results in depletion of soil nutrient reserves but also disrupt the biological eco balance of soil - plant system, product quality and the environment. Tea is grown mainly for young tender apical two leaves and a bud, so, quality is very crucial with regard to human health. Organically produced tea without any hazardous chemicals and residues is better in quality and fetches premium price - about 30 to 40 % more than conventionally grown teas. Organically produced teas have longer shelf-life, better keeping quality, higher antioxidant activity and make them a perfect health drink (Parmar, 2008). Organic tea cultivation is gaining momentum and many tea plantations in the world including India are transforming to organic, conversion of traditional estate to organic estate is a complex operation involving risk and problems. A minimum of three years is needed for an established conventional garden to be converted to organic, which has to be certified by a certifying agency. The feasibility of organic tea cultivation depends right from the initial years after planting, maintaining health and vigour, development of a good frame, proper nutrition and protection from pests and diseases are utmost necessary (Barthakur, 2004, Phukan *et al.*, 2011). Organic manures and Biofertilizers are main source of plant nutrition in organic farming due to its multiple functions in soil (Mamaril *et al.*, 1986). Various organic amendments are crop residues, vermicompost, farm yard manure and green manure. Uses of these inputs are increasingly becoming important aspects of environmentally sound sustainable agriculture (Timsina and Connor, 2001). The use of biofertilizers and organic manure offer a great opportunity to increase the crop productivity with less cost. Therefore, inputs chosen for better establishment of young tea plants also play key role to guarantee the desired crop performance and economic returns to the farmers but in organic tea culture (Singh *et al.*, 2011). West Bengal, particularly Darjeeling is known all over the world for producing the best quality tea. Reports on systematic field experiments on integrated supply of nutrients through organic and bio-fertilizers are scanty and recommended dose for organic cultural practices is lacking, in West Bengal particularly for *Terai* zone, keeping this in view the present investigation was conducted.

Materials and Methods

The experiment was carried out form March, 2015 to May, 2017 at the Instructional Plots of the Department of Plantation Crops and Processing, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal, India. To evaluate the economics of growing tea organically in the initial years costs of all costs fixed and variable costs of the items were taken- Planting materials, land preparation, digging drains etc., digging pits and planting, application of organic manures, chemical fertilizers, rock phosphate, neem cake and bio-fertilizers, bringing up of young tea plants, irrigation, weed management, mulching, pests and disease management harvesting, etc.

Results and Discussion

Economics of growing young tea under organic cultivation

Various operations done from field preparation to harvesting have been listed in Table 1 under two broad groups – fixed costs

and variable costs. Treatment wise costs involved, yield of green leaf and income could have generated at the prevalent market price have been presented in Table 2.

It is evident from Table 2 that minimum cost per plot of Rs. 814.31 was involved in T_1 (control), while maximum cost of Rs. 978.31 was incurred in T_4, T_5, T_7, and T_8. When converted to per ha, there was an involvement of a minimum of Rs. 5,16,366.51 in T_1 (control) to a maximum of Rs. 6,20,361.44 in T_4, T_5, T_7, and T_8. Green leaf yield per plot during the whole period of experimentation, *i.e.* up to two years ranged from 0.91 kg (T_1) to 2.15 kg (T_4), which were equivalent to 571.94 kg/ha and 1,357.52 kg/ha respectively. Considering the price of organic green leaf @ Rs. 50.00 per kg and conventional leaf @ Rs. 20.00 per kg, income generated could have been minimum Rs. 40.40 per plot in T_2, and maximum Rs. 107.50 in (T_4).

Corresponding income per ha for two years were calculated to be from Rs. 25,498.60 in T_2 to Rs. 67,876.00 in T_4 respectively. Over all, in T_1 (control) total cost of cultivation Rs. 5,16,366.51 per ha, income Rs. 28,597.00 per ha, loss of Rs. 4,87,769.51 per ha. Among the organic plots T_3 and T_6 involved a total cost of cultivation Rs. 5,79,778.06 per ha, income generated Rs. 46,130.50 and Rs. 39,484.00 per ha respectively.

Table.1 Various costs involved of growing tea organically in the initial years

Fixed Costs
1. Land preparation
a. Tractor ploughing
b. Power tiller ploughing
c. Cleaning of weeds and stubbles
d. Layout of the field
2.Planting materials
3.Digging drains
4.Digging pits and planting
5.Intercultural operations
a. Bringing up of young tea
b. Weeding
c. Mulching
d. Application of organic manures, biofertilizers and fertilizers
e. Pests and disease management
f. Irrigation
g. Harvesting
Variable costs
1. Organic manures
a. FYM
b. Vermi compost
2. Biofertilizers
3. Fertilizers
Urea, SSP, MOP
4. Plant protection

Table.2 Evaluation of costs involved and income generated from organic cultivation of tea for two initial years

Treatments	Cost of cultivation/plot (Rs.)	Cost of cultivation/ha (Rs.)	Green leaf yield (kg/plot)	Green leaf yield (kg/ ha)	Income per plot * (Rs.) @50/kg)	Income per ha* (Rs.) @50/kg)
T_1 (Control)	814.31	5,16,366.51	0.91	571.94	45.50	28,597.00
T_2 (Conventional)	817.22	5,18,211.79	2.02	1274.93	40.40	25,498.60
T_3 (VC)	914.31	5,79,778.06	1.46	922.61	73.00	46,130.50
T_4 (VC+Az+P+Pf+As)*	978.31	6,20,361.44	2.15	1357.52	107.50	67,876.00
T_5 (VC+Az+V+Pf+As)**	978.31	6,20,361.44	1.96	1237.25	98.00	61,862.50
T_6 (FYM)	914.31	5,79,778.06	1.25	789.68	62.50	39,484.00
T_7 (FYM+Az+P+Pf+As)*	978.31	6,20,361.44	1.77	1122.16	88.50	56,108.00
T_8 (FYM+Az+V+Pf+As)**	978.31	6,20,361.44	1.61	1017.27	80.50	50,863.50

*****Sell price of green leaf organic tea cost Rs.50 and conventional cost Rs. 20 per kg

Table.3 Total cost of cultivation, income generated and profit/loss earned from organic cultivation of tea during intial years

Treatments	Total Cost of cultivation (Rs /ha)	Green leaf yield (kg/ ha)	Total income (Rs) (@50/kg)	Profit/Loss
T_1 (Control)	5,16,366.51	571.94	28,597.00	(-)4,87,769.51
T_2 (Conventional)	5,18,211.79	1274.93	25,498.60	(-)4,92,713.19
T_3 (VC)	5,79,778.06	922.61	46,130.50	(-)5,33,647.56
T_4 (VC+Az+P+Pf+As)*	6,20,361.44	1357.52	67,876.00	(-)5,52,485.44
T_5 (VC+Az+V+Pf+As)**	6,20,361.44	1237.25	61,862.50	(-)5,58,498.94
T_6 (FYM)	5,79,778.06	789.68	39,484.00	(-)5,40,294.06
T_7 (FYM+Az+P+Pf+As)*	6,20,361.44	1122.16	56,108.00	(-)5,64,253.44
T_8 (FYM+Az+V+Pf+As)**	6,20,361.44	1017.27	50,863.50	(-)5,69,497.94

T_4, T_5, T_7 and T_8 total cost of cultivation Rs. 6,20,361.44 per ha, however T_4 produced an maximum income of Rs. 67,876.00 per ha with a loss of Rs. 5,52,485.44 per ha. Minimum loss of Rs. 5,33,647.56 per ha was estimated in T_3 and maximum loss of Rs. 5,69,497.94 per ha was estimated in T_8 (Table 3). However, after due consideration of the trend in production of green leaf in T_4, after expending an amount of Rs. 6,20,361.44 per ha maximum income of Rs. 67,876.00 per ha could be generated, which was closely followed by T_5 (Table 3).

So, from the preceding results it could be observed that except T_1 (control) and T_2 (conventional) other treatments using organic fertilizers for commercial cultivation of organic tea in *terai* zone, T_4 (VC+Az+P+Pf+As) was

the most remunerative treatment combination, followed by T_5 (VC+Az+V+Pf+As). Various fixed costs and variable costs evaluated. Treatment wise costs involved, yield of green leaf, income generated and profit or loss per ha, during two years were estimated. So, from the preceding results it could be observed that except T_1 (control) and T_2 (conventional), using inorganic fertilizers for commercial cultivation of organic tea in *terai* zone, T_4 (VC+Az+P+Pf+As) was the most remunerative treatment combination followed by T_5 (VC+Az+V+Pf+As).

Ipinmoroti *et al.*, (2011) reported that in new planted garden, the readily availability of the organic fertilizer materials compared to NPK (25:5:5), their relatively cheaper procurement cost when used either sole or in combination with urea as organominerals and their better growth enhancement effects on tea plants suggests their inevitability for optimum tea production in Nigeria.

Evaluation of economics including fixed costs and variable costs among the organic treatments, T_4 was observed to be the best with an income per ha for two years was Rs. 67,876 followed by T_5 with Rs. 61,862 per ha. So, from the investigation, by observing the young tea plants only for two years, though it is premature to conclude, it was observed that T_4 [vermicompost @ 1.0 kg + (*Azotobacter* + PSB + *Fl. pseudomonas* + *Azospirillum*) @ 5.0 g each] was the most remunerative treatment of organics for Terai zone of West Bengal.

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