SUMMARY
Farming system has undergone drastic changes from time to time with the introduction of new technologies. Food production is directly linked with nutrient supply. Production of more and more food for increasing population, increase dependency on chemical fertilizers as a result, heavy doses of fertilizers and other agrochemicals are being applied. These practices though increased yield, but made the plant system more vulnerable to various stresses like infestation to pests and drought. The effects of chemical fertilizers on the soil physical properties are complex and variable. The major nutrients applied routinely as fertilizer to agricultural soils are N, P and K. Their application affects soil physical properties by influencing process like flocculation/ dispersion, and thus dictated by nature, quantity, ratios and mode of application etc. Fertilizers, rightly applied in balanced amounts, improve crop yields, thereby increasing organic matter return to soil. The soil organic carbon build up in returns helps in the improvement of soil physical properties and productivity

The last three decades, however, observed decline in growth of food production, in spite of use of HYVs and increased amount of chemical fertilizers. Besides this it has a deleterious effect on the environment. Because of the effect of synthetic chemicals in association with the degradation of environmental quality, some ecologists and environmentalists have promoted the other extreme, i.e. to demand agricultural commodities which are produced in accordance to a specialized system that is totally free from any form of synthetic chemical influences. This has led to the emergence of a movement towards specified farming concept based on the traditional farming philosophy which popularly is known as ‘organic farming’ with slogans like ‘back to nature’.

Keeping in view the ecosystem and health hazards caused due to the intensive use of chemicals (fertilizer/ pesticide), availability of plenty indigenous resources for preparing compost and vermicompost for organic manuring, and remunerative prices of organic products, the present study is proposed to be under taken with the following objectives:

- To quantify the bio-resources and residue available in tea plantation for composting and vermicomposting for organic farming.
• To evaluate the nutrient status of compost and vermicompost from different resources.
• To study the response of young tea plantation in term of growth, development and quality as influenced by different bio-resources (compost and vermicompost) and organic manure.
• To study the uptake of nutrients (N, P and K) in young tea plants following organic manure application from different resources.
• To monitor changes in physico-chemical properties of soil following organic manure application from different resources.
• To generate the information on judicious dose of organic manure for optimum growth and quality production in young tea plantation from different bio resources.

In order to achieve these objectives a field and pot experiment were carried out. The experiment was laid out in Randomized Block Design (RBD) with (1+9) treatment combinations at three levels (1.50 t/ha, 3.00 t/ha and 4.50 t/ha) of organics (vermicompost and compost) from 3 sources (tea skiff, albizzia and weed flora) each, replicated thrice and on control. Field data were recorded during the different growing seasons viz; Summer season (S-I from April-June), Monsoon season (S-II from July-August) and Back end season (S-III from September-October) during 2007 and 2008 (after application of manure) on various growth parameters like collar diameter, shoot growth, number of branches and leaf area index. In case of pot study data were recorded for root volume, fresh and dry weights of plants. The physico-chemical properties like bulk density, saturated hydraulic conductivity, pH, organic carbon and available & total N, P, K; of the soil from different plots under study were determined by using standard methods. Leaf analysis for N, P, K and nutrient analysis of compost and vermicompost (analytical studies on N, P, K, OC and C:N, C:P ratio) was also carried out using standard procedures. For the estimation of quality parameters of made tea chemical composition of shoots (Polyphenols and caffeine) and quality parameters [theaflavins (%TF), thearubigins (%TR), total colour (%TC) and brightness (%B)] were analyzed. Lastly the data emanating from the proposed investigations were analyzed statistically and conclusion was derived by using data processor (Gomez and Gomez, 1984).
MAIN FINDINGS

- The recovery of biomass in the form of vermicompost was recorded maximum in case of tea skiff (70%) and minimum (58%) in case of bio-organic waste (weed flora). In regard of compost, the recovery of tea skiff compost was again maximum in case of tea skiff (74%) and bio-organic waste showed minimum recovery (64%).

- On the basis of per cent recovery there is a need of about 1.35-1.43 ton of tea skiff, 1.4-1.54 ton albizzia and 1.56-1.72 ton of bio-organic waste on dry weight basis to produce one ton of vermicompost and compost, respectively.

- The per cent N content increased with the progress of composting process as compared to the fresh material. The N content of tea skiff after completion of composting was 3.8 per cent which was reported to be the highest in comparison of other bio-recourses. Phosphorus and potassium content varies from 0.10-0.30 per cent & 0.50-0.72 per cent in compost from different bio-material (Tea skiff, Albizzia litter and Bio-organic waste).

- There was a reduction of organic carbon with the progression of composting and reduce to 18.6-22.5 per cent after the completion of decomposition. A gradual reduction in C/N ratio of different biomaterial was also observed with the advancement of composting period.

- Maximum collar diameter was recorded under T6 (141.34%) and T3 (128%) at the end of second year growth (S3) over the control. The application of 4.50 ton manure/ha resulted in maximum collar diameter.

- Among the different treatment of organic manure, the treatment T3 (4.50 t/ha tea skiff vermicompost and compost) resulted in highest number of primary branching and registered increase of 89.58 per cent and 128.6 per cent at the end of first year (S3) during 2007 over the initial. The application of 3.00 t/ha and 4.50 t/ha of compost an vermicompost respectively, resulted significant increase in number of primary branches over the control.

- The manure prepared from tea skiff proved to be superior in term of branching of tea plant followed by manure from bio-organic waste (weed flora) and albizzia shade litter.

- The maximum numbers of secondary branches (53.70) were recorded with 4.50 t/ha c tea skiff vermicompost (T3) with maximum increase of 647.56 per cent (vermicompost) and 604.41 per cent (compost) at the end of second year (S3) over the early growth period (S1) of planting year.
The tea skiff vermicompost application at the rate of 4.50 t/ha resulted in highest shoot growth (42.03%) over the control followed by tea skiff compost (38.22%) under same rate.

The maximum root volume (21.00 cc) during 2007 and (31.67 cc) during 2008, plant height (52.00 cm) during 2007 and (69.18 cm) during 2008 and plant fresh & dry weight during both years under study, were recorded in treatment where organic manure at the rate of 4.50 t/ha (T3) has been incorporated through tea skiff vermicompost and compost.

The influence of vermicompost on the shoot and root growth parameters was superior over the compost application. The vermicompost treated pots were recorded to produce significantly higher length of plant, fresh & dry weight and root volume as compared to corresponding compost treatment.

Maximum bush spread, 257.14 per cent & 339.21 per cent during 2007 and 2008 under vermicompost (T3) and 200 per cent and 223 per cent during 2007 & 2008 under compost (T3) were recorded during the study.

With the increase of bush spread, a negative improvement was recorded for the LAI during second year over first year, whereas, a positive relationship was observed between the number of leaves and leaf area on the LAI.

A significant increase in total biomass and yield of made tea was observed in all the treatments during both the years over the control. The maximum total yield of made tea 87.23 kg/ha and 77.36 kg/ha, was observed with T3 (vermicompost) and T3 (compost) respectively, during 2008.

T3 treatment under compost and vermicompost resulted in maximum total biomass production during both the years, whereas application of organics 3.00 t/ha and 4.50 t/ha from different resources were statistically at par with each other but significant over 1.5( t/ha. The per cent increase with vermicompost & compost (T3) over control amounted to 106.04 per cent and 90.14 per cent during 2008, respectively.

The maximum nitrogen uptake per cent over the control during first year, that is, 241.27 per cent was observed with T3 (vermicompost) and 199.99 per cent with T3 (compost) whereas it was maximum (302.73% and 257.27%) during second year under same treatments. Vermicompost showed dominant effect over the compost for nitrogen uptake during both the years.

A positive effect of different organics types and levels on phosphorus and potassium uptake by tea crop in young plantation as compare to control during both years, except T4 (compost) during 2008.
The phosphorus uptake by different treatments (T1-T9) was to the tune of 37.04-193.6 per cent (vermicompost) & 41.56-160.12 per cent (compost) over the control during first year, whereas the corresponding increases during second year were 66.51-247.85 per cent and 60.04-221.29 per cent, respectively, whereas the uptake of potassium was to the tune of 43.07-196.45 per cent (vermicompost) & 0.48-161.03 per cent (compost) over the control. The corresponding increases during second year were 69.15-243.76 per cent and 64.38-205.04 per cent over the control.

Available nitrogen status increased significantly as compared to control during both years except T6 (vermicompost) during 2007. Maximum built up in available nitrogen was 58 kg/ha in treatment T3 (vermicompost), whereas 500 kg/ha was recorded in treatment 1 (compost).

The application of organics at the rate of 4.50 t/ha significantly increased the available phosphorus status in the soil in comparison with the control, whereas, available phosphorus was non-significant at the rate of 1.50 t/ha and 3.00 t/ha during first year. Maximum available phosphorous (25 kg/ha & 29 kg/ha) was recorded under treatment 1 (compost) during 2007 and 2008, respectively.

Maximum available potassium, 267 kg/ha in T3 (vermicompost) and 235 kg/ha in T (compost) was reported with corresponding increase of 147.22 per cent and 117.59 per cent over the control. The per cent increase of available potassium over the first year ranged from 9.21-40.00 per cent &10.44-26.36 per cent for vermicompost and compost application, respectively.

The different organics levels resulted in significant improvement in organic carbon per cent over the control during both the years. Maximum organic carbon (2.49% & 2.82%) was observed under the T3 treatment of both vermicompost and compost respectively during 2008. Per cent change of organic carbon during 2008, over the first year, range between 3.77-30.19 per cent in vermicompost and 2.90-10.46 per cent in case of different compost application.

All the parameters (bulk density, saturated hydraulic conductivity and soil aggregate) were significantly influenced by the organics treatments over the control. It was observed that bulk density of soil decrease with the increase of organic levels. The per cent increase of saturated hydraulic conductivity ranged from 0.046-0.101 per cent & 0.00-0.10 per cent over the initial under vermicompost and compost treatments, respectively. A significant improvement in the soil aggregates was reported by the application of compost and vermicompost.
- The maximum polyphenol content was observed (20.57%, 16.77% & 18.50% during first, second and third season, respectively) with the application of tea skiff vermicompost at the rate of 4.50 t/ha (T3), which showed an increase of 20.71 per cent, 12.23 per cent & 22.25 per cent over the control.

- Caffeine content of made tea, which is one of the important quality parameter also significantly influenced by seasonal variation as well as by different organics treatments. Maximum caffeine content i.e. 4.62 per cent, 3.51 per cent and 3.94 per cent was recorded with tea skiff vermicompost at the rate of 4.50 t/ha (T3) during first, second and third season, respectively, which was 34.47 per cent, 19.55 per cent & 21.75 per cent higher over the control.

- The theaflavin content of made tea was significantly influenced by application of different organic manure during all three seasons of crop. The significant difference of vermicompost treatments ranged from 42.91-91.09 per cent, 28.76-89.27 per cent & 28.57-87.76 per cent, whereas, in compost application it varies from 41.30-86.23 per cent, 10.73-52.36 per cent & 20.75-81.63 per cent, over the control during three growing seasons, respectively.

- Maximum thearubigin content to the tune of 7.49 per cent, 6.89 per cent & 6.76 per cent was recorded in treatment T3 (vermicompost), which resulted in an increase of 42.15 per cent, 58.32 per cent & 39.86 per cent over control during, first, second and third season, respectively. It was reported that variation in climatic parameters greatly influenced the thearubigin content in made tea.

- The different organics treatment levels influenced the total colour of tea liquor during all growing seasons of tea crop. Maximum total colour i.e. 0.35 per cent, 0.28 per cent & 0.31 per cent was observed with the application of tea skiff vermicompost at the rate of 4.50 t/ha during first, second and third season, respectively.

- The per cent brightness of tea liquor significantly increased due to different treatments of organics during all the seasons of crop over the control. Maximum brightness content (17.61%, 13.28% & 16.42%) was noticed with the application of tea skiff vermicompost at the rate of 4.50 t/ha during first, second and third seasons of tea crop, respectively, which showed an increase of 70.39 per cent, 88.86 per cent & 61.01 per cent over the control.