STUDIES ON BIODYNAMIC SYSTEM AND VERMITECHNOLOGY FOR SUSTAINABLE AGRICULTURE

BY

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Centre for Rural Development and Technology

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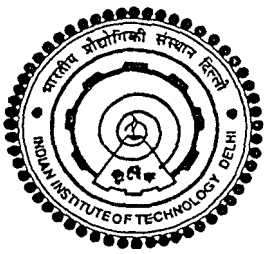
in fulfilment of the requirements
of the degree of

DOCTOR OF PHILOSOPHY

to the



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CERTIFICATE

This is to certify that the thesis entitled, "STUDIES ON BIODYNAMIC SYSTEM AND VERMITECHNOLOGY FOR SUSTAINABLE AGRICULTURE", being submitted by **Mr. APPACHANDA THIMMAIAH**, to the Indian Institute of Technology, Delhi for the award of the degree of Doctor of Philosophy is a record of bonafide research work carried out by him. Mr. Appachanda Thimmaiah has worked under my guidance and supervision, and has fulfilled the requirements for the submission of this thesis, which to my knowledge has reached the requisite standard.

The results contained in this dissertation have not been submitted in part or full to any other university or institute for award of any degree or diploma.

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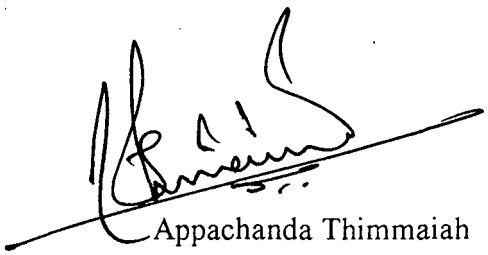

Appachanda Thimmaiah

Abstract

The reductionistic strategy of modern agriculture, which paved a way to green revolution, has proved unsustainable. Use of hybrid seeds, pesticides and fertilizers to rejuvenate the soil with a view to increase food production have mired the farmers in the labyrinth. Though agricultural production has continued to increase, rate of yield per hectare has started to decline. Indiscriminate use of chemicals and intensive cropping have robbed the soil of its nutrients, poisoned the ground water and contaminated the food. This has resulted in springing up of deserts, biological imbalance and innumerable health problems related to human and animals. Agriculture being not only an industry but also a way of life, goes hand in hand with the world view-the knowledge systems that support it. Amongst the various alternatives in agriculture, selecting an alternative farming system, which is ecologically sound, economically feasible and socially just and explain the intrinsic interrelationship of man and nature in a holistic way is the need of hour.

Biodynamic Agriculture system offers such an alternative. It is an enhanced state of organic farming based on system approach wherein the farm is viewed as a living whole, in which each farm activity is related to other in a complimentary manner. It provides an economic way of farming and offers a solution to the conflicts between economics and environment.

Thus the main objectives of the present study has been defined as,

i) *To study the principles and practices of biodynamic agricultural system and characterize biodynamic preparations.*

ii) *To assess the field efficiency of biodynamic manure and other types of manures for soyabean -wheat crop rotation.*

iii) *To study the feasibility of utilization of flyash and problematic weed (Argemone mexicana) by vermitechnology for soil fertility management.*

The thesis entitled " Studies on Biodynamic System and Vermitechnology for Sustainable Agriculture" (organised in 7 chapters), starting with a brief introduction on the theme, present extensive literature survey on relevant aspects and R&D gaps are visualized. It then goes on to understand the basic concepts of biodynamic agriculture system, its feasibility through field trials and utility of vermitech for utilising pollutant like flyash and poisonous weed A. mexicana as plant nutrient in sustainable agriculture. Results of the field experiments on wheat-soyabean crop rotation with two cultivars carried out at Betma village in Indore region, pilot scale experiments on hybrid composting at Micromodel complex, IIT Delhi and analytical work on BD preparations, manure etc. are presented. All the data is statistically analyzed and discussed.

The results of soyabean crop revealed that the grain yield by complete biodynamic package was higher than the recommended dose of chemical fertilizers. On the other hand the yield in wheat was slightly lower than soyabean. Though the yield of wheat was less in the recommended biodynamic package, the harvest index was 0.21 more than the recommended dose of chemical fertilizers. The earthworm counts in the post harvest soils were also higher in the biodynamic treatment indicating the enhanced biological activity of soil in biodynamic plots.

In wheat grown by BD treatment, stored under natural conditions without using any chemical/botanical pesticide, no grain damage in both the varieties Lok-1 and WH-147 was observed after one year of storage period, even at the end of second year, 3.2 % damage in Lok-1 and 8.4 % damage in WH-147 was noticed. The wheat grains grown by

chemical fertilizers showed 12 % damage in Lok-1 and 18% in WH-147 after one year of storage, which increased, to 100% damage after 2 years of storage. The data indicates local variety (Lok-1) was found more sturdy than HYV (WH-147).

The techno-ecomomic analysis based on survey data collected from a few farmers clearly indicates the economical feasibility of the new system, as the economic return was high in comparison to the conventional system. Further, on considering the quality of produce and environmental aspect, the new system stands superior over the conventional one.

Preliminary studies on microbial characterization of the biodynamic preparations 500 and 502-507 shows that biodynamic preparations inhabit a significant number of beneficial microflora. Experiments to study the effect of BD preparations as inoculum in different composting methods reveal very interesting facts in terms of enhanced NPK content in the resultant compost. Flyash and A.mexicana were resourcefully utilized by vermitechnology. Flyash (~33%) in combination with various feed substrates was found suitable for earthworms E.foetida. Similarly, A. mexicana (~18%), in different feed substrate combinations was successfully vermicomposted.

In toto, the present study suggests a path towards food-nutritional security, environmental protection and enrichment of nature. The study based on experimental work and personal visits to several NGO's practicing biodynamic agriculture system has certainly helped us in acquiring a 'vision' in understanding the future trends in biodynamic agriculture system especially in India. The present work is a humble step in the direction, which is full of opportunities and challenges.

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