

PRODUCTION OF TEA BY ORGANIC FARMING SYSTEMS

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INTRODUCTION

Agricultural practices have gone through various stages of transition and different innovative technologies have been introduced from time to time, to help improve productivity. Since of late, resource depletion and environmental abuse have been subjects of much concern amongst agricultural industries throughout the world.

The "green revolution" and the subsequent re-assessment of the harmful consequences have been part of such transitions. The publication of the book entitled "Silent Spring" by Rachel Carson in 1962, stimulated a world-wide consciousness about the harmful effects of various agro-chemicals, more particularly those of pesticides, used widely in agriculture. The public was cautioned about the dangers of ecological deterioration that is set in motion by such large-scale and indiscriminate use of these biocides, with the further inevitable damaging effect to human health, as a consequence of the magnification of the chemical residues in biological food-chains.

Crops that are grown on a commercial scale are often treated to heavy dressings of chemical and other mineral fertilizers and in some instances are even treated to various growth promoting substances, with the object of enhancing growth towards very high productivity.

Such manipulations lead to an acceleration in normal growth, but makes the plant even more vulnerable to attack by various pests and diseases. To avert such enhanced damage from pests and diseases and to help maintain productivity at peak levels, the crops are progressively treated to higher doses of various biocides. Over-fertilization with chemical fertilizers also leads to excessive weed growth requiring additional applications of various herbicides.

THE CARELESS TECHNOLOGY

The success in increasing productivity using the new technology has been accompanied by a lack of adequate control of inputs. The approach has often been a careless one where much more is applied than is actually required. Over-fertilization has often been applied to monoculture systems where a single genetic selection is used. Such selections have been made on the basis of response to fertilizer. However, in the process, the crop environment is placed on a chemical treadmill, with deleterious consequences to the environment.

THE RE-AWAKENING

Having become conscious of such over-dependence on chemicals in agricultural production and the associated deleterious ecological consequences, some ecologists and environmentalists have now taken the other extreme stand. They have embarked upon a crusade demanding agricultural produce farmed in accordance with a system that is totally devoid of any synthetic chemical influence. This has led to the emergence of a farming concept based on old traditional farming philosophy that has now come to be popularly referred to as "organic farming".

Traditional agricultural productivity depend on relatively few external inputs, accumulate and cycle natural nutrients effectively, protect soils and rely on genetic diversity. There is no way that one could totally substitute traditional farming methods with modern agricultural technologies that are dominated by chemical influences. Traditional systems should serve as the very foundation on which one needs to build-up adaptive technologies that will reconcile environmental protection and economic benefits.

Contrary to the mistaken belief that organic farming means leaving growth almost entirely to nature, the development of such a farming concept requires much care and attention to evolve a growing environment that would almost mimic natural ecological processes, generating adequate bio-mass inputs. At the same time, since the growth process has to be enhanced towards commercially viable limits, this would require additional nutrient inputs, provided by other organic supplements containing sufficient levels of the essential nutrients, such as oil cakes, bone and blood meal, fish meal, etc.

The underlying principle for the development of such a technology is the evolution of an ecologically compatible and partially sustainable farming system that is commercially viable and assures sustained productivity. Besides furnishing the required nutrient needs, this system of farming also provides conditions favourable to help regenerate an active "living soil", with high soil microbial and other biological activity that help to improve and enhance soil fertility to its maximum possible limits. Such a situation further provides the necessary environmental conditions to establish a proper ecological balance to maintain potential pests and diseases at limits below their respective economic damage threshold levels.

The above situation is more feasible in an annual crop situation, where alley farming, multi-cropping and appropriate crop rotations are possible. On the other hand, the evolving of such a farming concept in a perennial, monoculture tree crop situation, though not impossible, is a far more complex task.

Further, to achieve the desired results, such farming is best carried out in an isolated situation, surrounded by natural forest cover. In the alternative, there should be a community effort by all neighbouring farms, by which effort any drifts or movement of undesirable and unauthorized inputs could be avoided.

QUESTIONABLE CLAIMS

The cultivation of agricultural commodities by such sustainable farming principle is an ecologically sound practice that has the least amount of impact on the environment. However, there is no scientific evidence to support the belief that produce farmed by these principles are superior in quality and taste. In the merchandising of such commodities, various *ad hoc* health claims are made and there are moral issues that arises out of such claims in food advertising. The sale of such commodities should rightfully be based on consumer preference for such speciality produce.

Furthermore, there is no scientific evidence to substantiate the fact that since no chemical fertilizers are used and that all forms of pesticides are avoided, the end product would be of a superior quality, in respect to human health, in comparison with the regularly farmed produce generated through modern commercial farming systems that exercise adequate controls on the use of synthetic chemicals.

Fertilizers that are incorporated into the soil, whether in the biological form or as "synthetic chemical fertilizers", ultimately become available to the plant as soluble salts that are metabolised within the plant to form the various organic compounds needed for growth. The use of straight synthetic chemical fertilizers, especially the nitrogenous fertilizers, available as ammonium sulphate or urea, have so far not been known to taint the product and affect human health, as long as these fertilizers conform to specifications and do not have any traces of other possibly harmful substances.

It is the careless farmer who depends entirely on such chemical fertilizers, without adequate supplementation of the soil with the required amount of organic matter to help sustain essential microbial and other biological activity, who suffers the consequence of soil degradation, erosion and poor fertility. The problem gets further compounded, if the farmer utilizes the so-called high-yielding varieties that are fertilizer-dependent. The continued use of excessively high concentrations of nitrogenous fertilizers is known to pollute ground water, the consumption of which could have undesirable effects.

MEETING THE DEMANDS OF AN EXPANDING GLOBAL POPULATION

There is no doubt about the real need for a careful reappraisal of our current agricultural systems and the threat these pose to the resource base. Yet, increasing the productivity on existing farmlands is the only way to meet the upward spiralling demand for agricultural commodities by an ever increasing world population. This is especially so in a situation where, agricultural land area and irrigation water are fast becoming over-exploited, degraded and restricted as a consequence of other diversified uses.

Over-exploitation of good agricultural lands and the consequent soil erosion has decreased available farmlands and significant extents of the remaining potential areas have been converted to urban development and human habitat settlements. The non-availability of suitable irrigation water supplies imposes a limitation for farming certain other available areas. Under these circumstances, when compared to the possible increases in productivity attainable with modern farming technology, the yields that could be achieved by a pure traditional farming technology will be limited and inadequate to meet the demands of a spiralling global population.

On the other hand, in order to meet the rising global demands, we will have to look out for even further improved newer technologies that will help sustain high productivity against the odds of decreasing resources and environmental degradation! There is, therefore, a real need to evolve a system of agriculture in which resource usage and environmental protection are kept in balance with the needs of increased productivity, profits and the associated incentives that are necessary for the marketing of agricultural produce.

The need of the hour is the adoption of a balanced, sound and practical agricultural technology that makes the best use of the dwindling resources, while assuring environmental stability and untainted agricultural products. A pure organic technology will be able to cater to only a very small select group of customers who are willing to pay a very high price for such speciality commodities. Such a technology cannot meet with the present demands and this can only partially replace current controlled agricultural practices.

The challenge for agricultural research is to improve agricultural technology in ways that retain the strengths of traditional agriculture, while meeting the needs of the changing times.

TEA PRODUCTION BY THE ORGANIC FARMING METHOD

Tea production as is commercially practiced, is a high input industry, demanding large-scale use of fertilizers, more particularly, nitrogenous fertilizers, together with a limited use of herbicides and other pesticides. The prices realised for tea in real terms have remained stagnant for the past several years, whilst on the other hand, costs of production have steadily escalated. Producer survival had to, therefore, necessarily depend on increasing productivity, with the consequent demand for even higher inputs.

With such a prevailing scenario in this perennial plantation tree crop, the change towards a sustainable farming system cannot be easily achieved, as much as what could possibly be achieved with annual crops, on a rotation system of cultivation. A far greater effort and high skills are necessary to bring about such a change and yet manage such systems at economic levels.

At present there seem to be about 500 to 600 tonnes of tea available in international trade, claimed to be "organically produced". On the basis of the assumption that about 2% of the internationally traded agricultural commodities are organically farmed produce, the corresponding immediate future demand for organic tea could perhaps be in the region of about 1,500 tonnes.

There is a mistaken belief amongst some that organic tea or bio-tea can be produced simply by not applying any fertilizer to the tea field and by not treating such fields with any other forms of agro-chemicals! In fact a fair quantity of the presently traded tea, claimed as organic tea, is from neglected tea plantations that had been literally abandoned. These are not organic teas at all.

When no inputs are given to a tea field and if such a field is under continued harvest, the yield that is obtained is only the "threshold yield" or the "steady state yield". This could range from about 300 to 600 kg ha⁻¹, depending on the bush population density, the jat or variety of tea and the fertility status of the soil.

Even without any agronomic inputs, the cost of harvesting, transport and processing is so high that fields allowed to remain at the "steady state" yield level would soon become uneconomic to manage. In order to elevate the yield level beyond the steady-state level, it is essential to provide inputs in the organic form. Furthermore, the continued regular harvesting of such fields, without the required biological inputs, would soon lead to further debilitation of the tea plant to a mere passenger that will eventually succumb to adverse environmental stress.

The cessation of the use of artificial fertilizer and other agro-chemicals for a period of about two to three years is only a start towards the transition. There is the inevitable yield decline during this transition period, which decline continues until the steady-state yield is attained. The duration of the period of such decline towards the steady-state yield will naturally be dependent on the initial yield level and how soon one could establish the various green manure crops and other biomass producing ventures that are needed to sustain productivity at economic levels.

During this transition stage, the tea that is produced cannot be claimed to be an "organic produce" and will therefore have to continue to receive the common market price, that will not off-set the productivity losses sustained during this critical transition period. However, the produce from areas in such transition stage may be marketed as "transition produce".

Much of the currently traded "organic tea" is obviously from fields that are either in such a transition stage, or are from areas that are in a neglected state and where yield levels have already reached the steady-state level. Many such fields would not qualify to be correctly recognized as organically farmed systems that will meet with the required internationally accepted norms for organically farmed produce.

TOWARDS A PARTIALLY SUSTAINABLE TEA PRODUCTION SYSTEM

The continued harvesting of a tea field that is in the steady-state productivity level will soon become uneconomic and will also lead to destruction of soil fertility and the weakening of the bushes and premature death. This will only be a temporary phase of production and cannot be certified as an organic farming system. Examination of soil and leaf samples will no doubt reveal sub-optimal levels of the various elements.

Organically farmed produce have to be certified as those that are generated from fields that practice the correct principles of such cultivation, as approved by the International Federation of Organic Agriculture Movements (IFOAM). The inspecting authority should see positive evidence of activity that will generate the required inputs to help maintain optimal soil fertility status and at the same time provide the required essential nutrients.

There should be evidence of the growth of sufficient green manure crops and efforts at generating adequate quantities of compost to provide the minimum amount of organic matter per unit of cultivated area. The incorporation of farmyard manure being an essential requirement, there should be evidence for the commencement of a live-stock project as well.

Ideally, a quantity of 10 tons of compost needs to be used, per hectare of cultivated land ($1 \text{ kg sq meter}^{-1}$), at least every other year. In addition to providing green manure and compost, the nutrient demanding tea crop needs to be further supplemented with other organic nutrient sources, such as oil cakes, fish or bone meal, etc. There should be records available for auditing the availability of such stocks.

Varieties that are specifically selected for their responsiveness for high inputs of artificial fertilizer, assured moisture supplies and dense planting, are not suited for organic farming systems. These varieties are extremely susceptible to environmental stresses and to various pests and diseases. Hence, when developing an organic farming system, one should not go for the high-yielding, fertilizer demanding varieties. It is far better to depend on genetic diversity and use polyclonal or bi-clonal seedlings, or an appropriate mix of time-tested environmental resistant clones that are modest yielders.

Pests, diseases and weeds should be maintained below economic damage or competitive threshold levels. Crop diversity should be encouraged by interplanting the tea with the various approved green manure crops that will not encourage the build up of pests or diseases that can be damaging to tea. Besides interplanting in the tea, alley-cropping in the form of hedge rows at optimal spacings must be encouraged.

All vacant areas in the field should be covered over to minimize weed growth. This will require an active consolidation programme by infilling where possible or by planting beneficial grasses or any other suitable cover crops in those areas where soil conditions are not satisfactory for tea.

It is only when there is evidence for the adoption of such principles, that an inspecting authority could certify the produce as being truly "organically farmed". If we fail to establish such standards, the possibility of a growing market for such a speciality produce will soon be crippled. The producers of such costly speciality produce will have the right to expect an assured high market price that will ensure an attractive profit. Such possible high market values should not be allowed to be undermined by permitting the sale of imitations that will soon become exposed and thus damage the image of the genuine producer, as well as that of the producing country as well.

THE POSSIBLE ADVERSE PUBLICITY AGAINST STANDARD TEA

The mere fact that speciality teas that have been "organically farmed" are available in the market, could lead to incorrect publicity that conventionally farmed ordinary teas may not conform to accepted health standards! Tea produced by controlled standard agricultural methods do not have any detectable traces of harmful substances. Therefore, those selling organic teas should not engage in propaganda that could tarnish the image of ordinary teas as being less desirable for human health.

A growing market for the more expensive organically farmed produce that is meant to cater to a select market, should be treated just as any other demand for a specific speciality produce, and should not in any way lead to a price depression for the ordinarily farmed produce. The exotic high-priced speciality teas should co-exist with the ordinary produce and traded at prices that fluctuate on the simple principle of supply and demand.

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