FOOD FOR TEA AND FOOD FOR THOUGHT

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Tea is a crop that demands heavy applications of nitrogen fertilizers, which is ideally given in the form of balanced mixtures, including phosphorus and potassium fertilizers. Such balanced mixtures furnish the requirements of the macro-nutrients (major nutrients) *viz.* N, P & K.

Crops remove plant nutrients in different proportions and each plant species requires a certain critical amount of the respective nutrient for optimal growth. Likewise, tea too places certain critical demands for nitrogen, phosphorus and potassium, for optimum crop productivity. Such critical needs must be met from what is available to the plant, in the soil.

Ordinary soils with a stand of natural vegetation receive adequate plant mulch which provide certain amounts of plant nutrients through mineralization processes and under such natural conditions the plant is forced to send roots deep down exploring and utilizing whatever available nutrients needed for its sustenance. This is what happens in a natural forest cover. For a cultivated crop such as tea, the tender shoots of which are continuously harvested, a steady supply of nutrients should be provided to meet the demands for growth as well as to enable the plant to keep producing the 'flush' that is being continuously harvested. Thus, there is a need for supplementing the required nutrients by artificial soil amendments, including the use of organic manure and/or, artificial fertilizer mixtures, in just the right amounts and proportions (balanced mixtures). Such artificial supplies of plant food undergo what is commonly referred to as 'mineralization', which is a biological process, and make available the various macro and micronutrients. The availability of such nutrients is governed by a multitude of factors that govern biological activity, including soil temperature, organic matter content and the consequent microbial activity, soil texture and tilth and the nature of the particular terrain, *etc.*

If one resorts to 'overfeeding' with artificial supplements of plant food, the plant would, with time, loose its natural explorative capacity, and would become 'ovorprotected' and confine its explorative capacity only to the top layer of soil. Under such conditions, if there is a delay in the supply of artificial supplements, or when subjected to stress, such as a period of drought, the plant would readily succumb to such stresses. One should ensure to maintain the right balance by making the plant to explore the deeper layers of the soil in search of plant food and at the same time provide for just the right amount to compensate the removal of nutrients, on account of continuous harvest of the tender vegetative portion (flush).

Varying amounts of the added plant food become 'locked' in the soil and consequently unavailable to the plant; utilized by microbes for microbial growth and activity; lost to the atmosphere through volatilization; get leached down to the deeper layers, beyond the reach of the plant; and also get converted to other forms that are non-utilizable. Thus, it is only a certain proportion of the added plant food that is ultimately assimilated, which is further determined by the capacity of uptake of the individual plant species, from what is left as "available nutrients" in the soil. For instance, if 100 kg of N is added to the soil, perhaps only about 40 kg becomes 'available' and a crop like tea may be able to utilize say 90% of this available amount, and thus what is actually taken up would then be only 36 kg of N. Hence, to supply this amount of 36 kg of N, one will have to supply 100 kg, under the given set of conditions. On the other hand, if the capacity of uptake is poor and if the plant is able to utilize only 75% of the available amount, then of the 40 kg of 'available' N, only 30 kg will be actually taken up.

A multitude of parameters thus determine what is ultimately available to the plant. When adding plant food, one should avoid unnecessary losses, beyond that which cannot in any case be prevented. In order to achieve this, one should strive towards maintaining the optimum soil temperature, microbial activity, soil texture and tilth, and should also ensure the right timing of application as well as proper placement.

Optimum soil temperature could be maintained by having a proper ground cover of the crop itself; the provision of the optimum stand of both 'green manure crops' as well as 'shade trees'. The green manure crops and shade trees contribute towards the provision of leaf litter, which further supplement that provided for by the crop itself and thus contribute towards an increase of soil mulch and consequently, the soil organic matter content. Besides improving the soil tilth and the direct provision of a certain amount of plant nutrients, the organic matter content would determine the soil population of microbes and the resulting increased microbial activity would, in turn, determine the rates of mineralization of plant nutrients, and consequently, their availability.

Whatever the nature of the fertilizer the right timing of application would ensure greater retention and availability. Timing of application is thereby very critical. The uniform and even distribution of the fertilizer is also equally critical, to maximize availability.

It is a known fact that certain seedling tea fields yield as high as 1,400 to 1,600 kg of made tea/ha, with about as low as 120 kg of N/ha. Most seedling tea bushes are deep-rooted and have the capacity of exploring the deeper layers of the soil for nutrients. Clonal fields, on the other hand, need as much as 300 kg of N/ha to generate their potential yield of about 2,800 kg to 3,000 kg made tea/ha. If in such clonal fields the input of N is dropped to, say 200 kg, yield would decline immediately to as low as around 1,800 - 2,000 kg made tea per ha. However, if the input of N is continued steadily at 200 kg of N/ha for 2 or more cycles, there is a good likelihood for the yield to move upwards slowly and perhaps reach an equilibrium point of around 2,500 kg made tea/ha. It is also a known fact that all biological systems always tend to move towards a state of equilibrium, with time. As high-yielding clonal plants have the genetic potential for high rates of metabolic activity, their demands for plant food is also high and the plant would thus make an attempt to 'go in search' of this food. The plant would thus be compelled to explore the deeper layers of the soil to obtain the desired optimum amounts of nutrients and may attain an equilibrium state by yielding around 2,500 kg made tea/ha, with an input of 200 kg of N/ha. This would naturally be more economical (1:12.5) than having to supply 300 kg N/ha, to obtain a yield of 2,800 kg (1:9.3) to 3,000 kg (1:10).

We have seen the reverse effects at the time shade trees were removed from the tea plantations in Sri Lanka. Soon after the removal of such shade trees, there was indeed an increase in yield of tea. But this increase in yield was short-lived! With time, the yield began to drop and fell to levels even below that of the earlier ones and the fields attained a state of equilibrium at such low levels.

The high cost of fertilizers, which is expected to increase even much more with time, would force us soon to think of alternatives and make us think in terms of providing just the right amount of plant food, at the optimal input level, to achieve optimal returns.

One should strive towards obtaining optimum crop productivity with the reasonable amounts of the required inputs. The cost component is thus a very essential determining factor. Cost consciousness should, however, not in any way overshadow the needs from the point of view of long-range objectives. Optimum returns can be expected only from optimal inputs - this is the law and it is the law of nature that no one can question or challenge! It is futile to expect optimal returns with minimal inputs and foolish to strive towards an unattainable 'maximum return' with maximum inputs.