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Agriculture Minister Mahindananda Aluthgamage inspects an organic chili farm.

A farmer mixes organic fertlizer.

SRI LANKA GOING 'ORGANIC' A PRACTICAL, WORKABLE APPROACH

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The Sri Lankan people have bravely faced crisis after crisis in the past five decades – beginning with the '71 insurrection to the prolonged 'Tiger' terrorism, the tsunami, the CKDu affecting the farming community, the Easter bombings and now the Corona epidemic. Amidst all of this, the people faced many other difficulties and hazards, the most formidable of all of these being the *"vasa-visa ahara"* (food containing toxic substances) due to the alleged use of (or over-use of) agrochemicals. Hence the need to produce organic agricultural products in a scientific, organised manner, which also have a huge global demand.

I. Why 'modern' agriculture uses large quantities of inorganic fertilizer

The global population currently stands at ~7.7 billion and is projected to reach 8.5 billion by 2030 and 9.7 billion in 2050. The land area suitable for growing crops is shrinking continuously because of a variety of reasons. Some of the productive lands are 'lost' to urbanization (i.e. population pressure) while some are converted to alternative non-agricultural uses (e.g. industrial purposes). On the other hand, a portion of lands available for crop production is gradually, but continuously, lost because they become unproductive and economically non-viable due to climate change (e.g. temperatures becoming too warm, rainfall becoming insufficient, etc.) and soil degradation (e.g. loss of fertile top soil due to erosion, loss of soil fertility due to continuous cropping and removal of nutrients without adequate replenishment, development soil problems such as salinity, acidity and accumulation of toxic material).

Increasing population and decreasing arable land area means that we are continuously challenged to increase crop yields per unit land area (usually called 'crop productivity') to fulfil the increasing demand for food, feed and a variety of products from agricultural crops. To produce a greater amount of yield from the same unit of land, a crop requires a greater quantity of essential nutrients provided in the form of fertilizer.

Prof. W.A.J.M. de Costa (University of Peradeniya), stated in a news media article titled "Inorganic vs organic fertilizers" that inorganic fertilizers (normally called chemical fertilizers) contain nutrients in a concentrated form (i.e. fraction of the nutrient in a unit weight of the fertilizer is high). They are produced *via* industrial processes or by refining mined minerals containing the nutrient. Three major plant nutrients, *viz.* nitrogen, phosphorus and potassium are supplied as inorganic fertilizers, either individually ('straight fertilizers') or in a mixture ('compound fertilizers').

Organic fertilizers (organic manures) are raw materials of plant, animal or human origin. When applied to the soil, they decompose and release their nutrients. In comparison to inorganic fertilizers, the fraction of nutrients in a unit weight of organic manure is much lower. Therefore, to give a crop/soil the same amount of a nutrient, a much greater quantity of organic manure than inorganic fertilizer has to be applied. All organic fertilizers are 'compound fertilizers' in the sense that they contain a mixture of nutrients though in depleted quantities.

When applied to the soil, the inorganic fertilizers release their nutrients quickly. In recent times, nano-scale materials have been used to slow down the release of nutrients from inorganic fertilizers (known as 'nano-coated slow-release fertilizers'). When applied to the soil, organic fertilizers release their nutrients slowly, because the organic raw material has to first decompose to release its nutrients. Natural decomposition occurs due to the action of naturally-occurring soil microorganisms. At present, formulations of microorganisms are used to accelerate decomposition and nutrient release from organic fertilizers.

Moreover, some of Sri Lanka's leading agricultural economists have indicated that the immediate, non-phased replacement of chemical fertilizers with organic counterparts will result in significant drops in crop yields. Some predict crop losses as much as 33 % in rice and 35% in tea, leading to export income losses as well.

From ancient times, Sri Lanka has been identified as a country that produces some of the best spices in the world, especially Ceylon cinnamon *(Cinnamomum zeylanicum),* pepper *(Piper nigrum*), nutmeg *(Myristica fragrans)* cloves *(Eugenia caryophylata),* ginger *(Zingiber officinale)* and cardamom (*Elettaria cardamomum).* Moreover, organic spice products are in great demand in the world market, particularly in the EU. However, the impact of the recent chemical fertilizer ban may have significant negative effects on over 95% or more conventionally produced spices, which are commonly available to the consumers.

II. Moving towards an 'organic' era

So, how can we go about making Sri Lanka a model 'organic' country? Decisions taken without any scientific basis are bound to bring disaster. With a well-prepared National Plan that includes strategies and activities, and proper implementation, it can be done in a stage by stage, time-targeted manner.

So then, how can we do this?

III. New 'organic' varieties

The "Green Revolution" plant varieties grown all over the world were the result of scientifically changing the genetic architecture of the plants to respond rapidly and efficiently to chemical fertilizers. Chemical pesticides will then get rid of any hazardous insect pests, while chemical weedicides (herbicides) will kill all types of harmful weeds. The production escalated many-fold. This is the modern, chemical world of agriculture. Without chemical inputs, these varieties will struggle and significantly decline in production in a new organic farming environment. Much scientific evidence has pointed to this downfall.

Strategy: The first solution is to scientifically produce/breed varieties that can perform substantially well, without added agrochemicals. It would take at least 5-8 years to get the first favorable results.

Activity: A new plant breeding programme will have to be initiated in every Plant Breeding Station of the country, in parallel with all other activities stated below.

IV. Compost

In organic farming, this is one of the most important alternate source of nutrients to the plants. In this case, two very important criteria have to be considered – Quantity and Quality of compost.

(i) Quantity

Compost has very little of the major nutrients N (nitrogen), P (phosphorous) and K (potassium) while having much micro-nutrients.

Strategy: Large quantities of compost need to be produced throughout the year to cater to crops that are grown in the rainy seasons of Maha and Yala as well as others such as the plantation crops (Tea, Rubber, Coconut etc.) and Spices, that require nutrients at different times of the year. How can this be done?

Activity: The proposed plan is to make use of the research institutes/ centres of the Dept. of Agriculture (also DEA) spread across the country. Each can have a division to produce compost (and biofertilizer) that is required for the specific crops of the area. For example, Vavuniya, Kilinochchi and Samanthurai Agricultural Centres can produce compost specific for Chilli and Onion cultivations in the north and east of the country. They can get further assistance and expertise from the University of Jaffna and Eastern and South-Eastern universities respectively. The Mahaillupallama Research and Development Institute can produce compost specific for crops grown in the North-Central Province with assistance from the Rajarata University. The whole country can be covered in this way.

Appropriate quantities of compost could be produced in this way for appropriate crops throughout the country in a holistic manner by linking institutes and expertise, making sure that essential raw materials are available year after year.

(ii) Quality

This is another important criterion. Different crops require different proportions of N, P and K (micronutrients have been left out for the moment due to space limitations) at different growth stages of the relevant crop. Compost made for Tea is not suitable for Rubber or for Spice crops and vice versa, just as much as feed suitable for chicken cannot be given to cattle and vice versa. Hence a quality check is mandatory. How can this be done?

The nutrient content of compost can vary from bag to bag, day-to-day, season to season, depending on the raw material used, type of composting technology adopted, duration, storage, and transport. The nutrient content will determine the quantity to be applied at different stages of a specific crop.

How can the former know this when purchasing a bag of compost that does not indicate the nutrient content in it?

V. Specific Crop requirements - some examples

Plant nutrition is the only way to optimize crop yields, where a healthy plant has the capacity to resist disease and in the case of spice crops to maintain authentic flavour and aroma of the final product.

VI. How can organic fertilizer, as an alternative, provide the above nutrients?

This has to be clearly identified for all crops.

Strategy: A single company cannot produce a mountain of compost for the whole country and then distribute it across the country 'just like that'. It is not workable, as standards must be maintained and specific crop requirements have to be met. The production has to be de-centralized.

Activity: Specific provinces can produce the compost for appropriate crops, get it analyzed and recommend as per nutrient content. Institutes such as the ITI (Industrial Technology Institute) can set the standards in consultation with the relevant crop specialists/ institutes and carry out nutrient analyses of compost in its accredited laboratories in order to provide the necessary certification. Every 'bag' (*miti*) must indicate the authentic nutrient contents. This should apply to any imported compost as well.

Some research institutes may be able to do the analyses in their own laboratories and get the certification from the ITI.

Certified Quality is of utmost importance.

Corrupt, rogue practices should not be entertained at any cost.

VII. Biofertilizer

Strategy: The University of Peradeniya established the technology for preparation of biofertilizer using azolla and other such organisms, many decades ago. 'Re-ignite' the use of this technology.

Activity: Adopt this technology and expand to commercial scale. What is required is quality assurance (nutrient content) through certification and commercial production, as for compost.

VIII. Biochar fertilizer and Vermiculture

Strategy: Biochar is fine-grained charcoal obtained by burning wood and agricultural byproducts while vermiculture refers to the artificial cultivation of earthworms to convert garbage into compost. These can be used as supplements.

Activity: We have the know-how of both of these bio-technologies which can be introduced across the country to supplement the above products, on a commercial scale.

IX. Biopesticides and Bioherbicides – the forgotten poisons

It is of importance to note that much poisoning of our food comes from the extensive use of chemical pesticides and herbicides. Being a rich tropical country, pest attacks are common on every crop. So are the growth of weeds. We thus require bio-products as alternatives.

Strategy: It will be necessary to identify/ establish centers for production of specific Biopesticides and Bioherbicides.

Activity: For example, we may need a biopesticide for control of brinjal pod borer, one for rice Brown Plant Hopper and so on – targeted products. The necessary resources are available in this country to form small teams of expertise to lead the research and development activities in these areas. Traditional knowledge would provide clues to creating specific bioproducts.

The general public is more "scared" of this type of poisoning than from fertilizer.

X. First, show how it could be done - Model Farms/ Plantations

Strategy: A model organic farm/plantation must first be established in order to show how it can be done.

Activity: It is proposed that such farms be established in several Cantonments of the Armed Forces in the different provinces. The Armed Forces personnel will only plan, administer and monitor the activities. The actual farm work will be done by employing people from the neighbouring villages, especially the womenfolk and youth, thus providing employment as well as training.

The Provincial Governors and officials can provide additional support to this national effort.

XI. Focal Point and Organic Farming Clearing House

It is presumed that the Ministry of Agriculture is the Focal Point for development of organic agriculture.

Strategy: Much research has been conducted and results published on many aspects of organic agriculture carried out in Sri Lanka. Collation of this information would contribute to the rapid adoption, development and success of organic farming.

Activity: This information must be collated into a database so as to identify the expertise and possible centres to be developed. The database must also have information on both public and private involvements in organic farming and must act as the Organic Farming Clearing House mechanism to provide necessary advice when requested, as well as to plan public awareness programmes.

The Council for Agricultural Research Policy (CARP) and the National Science Foundation (NSF) must be 'roped in' to play major roles in facilitating this national programme.

XII. The Private Sector

Strategy: The private sector must be 'installed' as a partner in this national endeavour.

Activity: Establishing their own organic fertilizer units in all the provinces and also playing a role in the transport and marketing activities as well, in a typical PPP involvement.

XIII. Step by step - from GAP Certification to Zero tolerance or Dual farming system?

Strategy: Have interim options.

Activity 1. Until all of the above needs are 'installed' in a targeted period of time, we can implement the approved GAP (Good Agricultural Practices) technology and demand GAP certification for marketing.Thereafter, chemical use can be gradually decreased with time, to finally reach zero tolerance.

Activity 2. As another interim option, we can also establish a dual farming system, running parallel, where a limited number of particular crops, especially the plantation crops, including the spices can be allowed to use, just the essential quantities of chemicals, to begin with, until all necessary resources are available to gradually convert to organic culture.

XIV. Let us all pull together

One may say that it is easy to sit and prepare plans but the crux of the matter is to execute such plans. This proposed national plan is a result of discussions and planning held with many stakeholders including both public and private, which began many decades ago.

As shown above, a 'massive' plan with strategies and activities, needs to be prepared and implemented stage by stage. To achieve a model organic country label will take time, but we must start at some point without continuously talking and talking and talking about it and then taking drastic, baseless decisions.

This proposal may take 10-15 years or even more to get the final results. Many other experts such as the organic farmers themselves, economists, food scientists, soil scientists etc. will air their views, and should rightfully do so and should be heard and considered in this huge national endeavour.

The enormity of the challenges and tasks that lie ahead can be overcome by preparing a National Plan with time-targeted activities, along with monitoring. Then, the knowledgeable and the experts will join the effort. If not, this country will face yet another major calamity.

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