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Green-Technology for Livelihood Sustainability

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ABSTRACT: Green technology applies organic farming is the form of agriculture that relies on techniques such as crop rotation, green manure, compost and biological pest control. Organic farming uses green fertilizers and green pesticides but excludes or strictly limits the use of manufactured (synthetic) fertilizers, pesticides, insecticides and fungicides. Organic agricultural methods are internationally regulated and legally enforced by many nations, based in large part on the standards set by the International Federation of Organic agri-biotech Movements (IFOAM), an international umbrella organization for organic farming organizations established in 1972.

KEYWORDS: Green technology, Organic agricultural, Vermi-composting, Agnihotra, Panchagavya

I. INTRODUCTION

Organic farming is an old age Indian traditional farming technique based on traditional knowledge & wisdom. But the modern organic farming, evolved first in the United States. In India Albert Howard 1940s, has progressed environment friendly farming. The relatively high success of organic farming in some countries is due to the high awareness of the health problem. The modern system of farming is increasingly felt & becoming unsustainable as evidenced by declining crop productivities and damage to environment. It is one of the several approaches found to meet the objectives of sustainable agriculture; it maintains an agricultural growth rate which can meet the demand of food for all living beings without draining the basic resources. Organic farming techniques are vermi-composting, agnihotra, panchagavya, inter-cropping, mulching and integration of crops, crop rotation etc. The activated organic farming technique is known as biodynamic farming. Value added organic farming is carried with regulations and certification programmes as it prohibit the use of almost all synthetic inputs, and health of the soil is retained. The benefits of conventional or modern farming are short term and in the long term they cause adverse effects. There is an urgent need for a corrective action. Adverse effects of modern agricultural practices not only on the farms but also on the health of living beings and thus on the environment have been well documented all over the world explained in fig-3.1. Their negative effects on the environment are manifested through residual toxicity, soil erosion, soil contamination, genetic erosion, water shortages, salanination, etc. Thus organic farming is one of the widely used methods, which is the best alternative to avoid the ill effects of chemical farming. Organic farming based on the absolute exclusion of fertilizers and chemicals, not only for the present, but also in the foreseeable future is promising. "Organic farming is the form of agriculture that relies on techniques such as crop rotation, green manure, compost and biological pest control. Organic farming uses fertilizers and pesticides but excludes or strictly limits the use of manufactured (synthetic) fertilizers; pesticides (which include herbicides, insecticides and fungicides) plant growth regulators such as hormones, livestock antibiotics, food additives, genetically modified organisms, human sewage sludge, and Nano materials "FOAM.

IFOAM defines the overarching goal of organic farming as: "*Organic agri-biotech is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agri-biotech combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.*"

The basic aim of organic farming is to increase long-term soil fertility, control pests and diseases without harming the environment, ensure that water stays clean and safe. Use resources which the farmer already has, so the farmer needs less money to buy inputs. Produce nutritious food, feed for animals and high quality crops to sell at a good price. It is

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important to understand the rationale that farmers follow when considering adoption of organic methods. Greater income is the reason most farmers give for converting to organic agri-biotech followed by health (personal and family), ideological, and environmental reasons. First movers tend to be either farmers using rustic or traditional methods of cultivation or the most sophisticated farmers with access to certification and marketing opportunities. Farmers that convert only because of the promise of higher prices are more likely to only participate in a perfunctory manner, not apply or adhere to the standards, and fail to receive the full benefits. Those who have a holistic understanding of organics are likely to be motivated by local benefits such as improved soils, fewer toxic chemicals, and self-reliance with inputs; these are likely to better withstand setbacks and difficult periods especially during the conversion stages and reduced premiums. Organic farming is growing about 20-22% worldwide according to the recent studies. India too has started the National Programme for Organic Production (NPOP) to promote the organic farming as modern agriculture method. The tremendous growth in consumer demand for organic products has also resulted in the specialization in growing, processing and marketing of these products. The Organic Food Production Act (OFPA) contains a wide and detailed coverage of organic farming methods and materials along with the soil fertility, application of manure, crop rotation and composting. The National Organic Standard Board (NOSB) recommended ingredients include crop residues, crop wastes from food processing operations, animal manure, other vegetable by-products, municipal solid waste compost etc.

II. NEED FOR ORGANIC FARMING IN INDIA

India has high potential to adopt organic farming. The need for organic farming in India arises from the unsustainability of agricultural production and the damage caused to ecology through the conventional farming practices. India has developed national standard of organic farming under NPOP programme. The National Centre of Organic Farming Ghaziabad under Ministry of Agriculture is promoting organic farming as facilitator across the country and providing assistance to organic farmers and entrepreneurs. Organically cultivated soils are relatively better attuned to withstand water stress and nutrient loss; it may help to combat desertification. It is true that the increasing use of fertilizers at high rates has boosted agricultural production in the country, but it has also caused adverse impact on soil, water and environment as it causes heavy residual toxicity. Long term and continuous use of high doses of chemical fertilizers badly affects the physical, chemical and biological properties of the soil. A study at the University of Agricultural Sciences, Bangalore confirmed the deterioration of soil health because of the reduction in water holding capacity, soil pH, organic carbon content and the availability of trace elements such as zinc. In the long run, increasing nitrogenous fertilizer use leads to the accumulation of nitrates in the soil. The application of sulphatic fertilizers leaves sulphates in the soil. Rainfall and excessive use of irrigation water cause these chemicals to change the alkaline or acidic nature of the soil. The nitrates go to the rivers, wells, lakes etc. And also leak into the drainage system which goes into the drinking water contaminating the environment. It also causes depletion of the ozone layer leading to the global warming. The heavy metals present in the fertilizers and sewage sludge leach into ground water which cause pollution. Many chlorinated hydrocarbon insecticides like aldrin, dieldrin, toxaphane, chlordane, endosulfan, etc. came into the market during the second half of the last century. Simultaneously, organophosphate and carbonate compounds were employed in agriculture.

Increasing application of fertilizer also leads to increasing use of pesticides to control pests and diseases. The trend of increasing fertilizer use also compels the farmers to enhance the use of pesticides as well. For example, the use of fertilizers in increasing amounts leads to growth of weeds and in the process of weedicide use many plants growing nearby also get killed, which reduces the biodiversity. Meanwhile, the weeds also develop resistance to herbicides. Chemical fertilizers, pesticides, herbicides etc., are manufactured using the non-renewable materials like the fossil fuels. The global demand for oil and natural gas is increasing and thus the price of the inputs to agriculture is bound to rise. India's petroleum resources which presently meet only about 30-35 per cent of the consumption are under high pressure. The agriculture and allied sectors in India provide employment to 65 per cent of the workers and accounts for 30 per cent of the national income. The growth of population and the increase in income will lead to a rise in demand for food grains and also for the agricultural raw materials for industries in near future. The area under cultivation obviously cannot be increased and the present 140 million hectares will have to meet the future increases in such

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demands. There is a strong reason for even a decline in the cultivated area because of the urbanization and industrialization.

Organic Foods vs. Conventional Food

It's a sad state of affairs when more than three billion people around the world suffer from malnourishment – including in the U S– and yet most 'improvements' to increase food production is simply making our food less nourishing, rather than more so. But more and more people are getting wise to this problem and are inciting change through their shopping habits and pocketbooks.

A 2007 study published in the American Journal of Agricultural Economics found that shoppers were willing to pay more for locally grown food, and those shopping at farmers' markets were willing to spend the most for food grown close to home. Small local farms are cropping up as a result, and many of them use organic, sustainable farming practices even though they may not have been certified as such. The top reasons people cite for wanting organic, locally-grown food.

- Better food quality
- Better taste
- Freshness

And no wonder, considering the fact that studies, such as the one above, is finding that conventionally grown produce simply isn't what it used to be. Many "health" experts continue to state that there is little difference between organic and conventionally raised produce, but if they review this and other evidence, they will likely have to change their tune.

III. ORGANIC FOODS: A FAR MORE NUTRITIOUS CHOICE

The simplest way back toward health is to focus on whole, organic foods, grown or raised as nature intended. Meaning, it's grown using sustainable farming practices, and without the use of chemical additives, pesticides and fertilizers. Food grown in healthier soil, with natural fertilizers and no chemicals, simply has to be more nutritious. It is common knowledge- though knowledge that is greatly suppressed in the developing countries. A study in the Journal of Agricultural Food Chemistry 2003, for example, found that organic foods are better for fighting cancer. And in 2005, scientists found that, compared to rats that ate conventional diets, organically fed rats experienced various health benefits. Rats that ate organic or minimally fertilized diets had:

1. Improved immune system status.
2. Better sleeping habits.
3. Less weight and were slimmer than rats fed other diets.
4. Higher vitamin E content in their blood (for organically fed rats).

But perhaps one of the best studies out there on the benefits of organic versus conventionally-grown foods is the 2007, Quality Low Input Food Project- a \$25-million study into organic food -- the largest of its kind to date. The researchers grew fruit and vegetables, and raised cattle, on adjacent organic and non-organic sites, and discovered that:

1. Organic fruit and vegetables contain up to 40 percent more antioxidants.
2. Organic produce had higher levels of beneficial minerals like iron and zinc.
3. Milk from organic herds contained up to 90 percent more antioxidants.

The results were so impressive they stated that eating organic foods can even help to increase the nutrient intake of people who don't eat the recommended five servings of fruits and vegetables a day. As illustrated in this research study, the four-year, European-Union-funded study also found marked differences between dry matter, mineral, vitamin, protein, and amino acid concentrations between organic and conventional crops.

And Don't Forget About the Chemical Toxins!

In addition to simply being depleted of many essential nutrients for all the reasons mentioned in the article above conventionally grown food is also typically tainted with a multitude of chemical residues, including chemical fertilizers, insecticides, and herbicides. These chemical concoctions can cause a wide variety of health problems, including:

1. Neurotoxicity.
2. Disruption of your endocrine system.

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3. Cancer.
4. Immune system suppression.
5. Male infertility and miscarriages in women.

IV. TRADITIONAL, LOCAL FARMING ON THE RISE

Unfortunately, whereas organic foods were once truly raised naturally, on small farms with great integrity, big business has now stepped in and tainted many of the principles upon which the organic label was founded. You are, in fact, being ripped off by much of the organic food you are buying, so buyers beware.

However, increasing numbers of people are now reverting back to the ways of our ancestors, choosing to purchase food directly from local farmers, who generally apply organic farming practices and cooking it using slow, traditional methods. Proof of this trend can be seen in the rise of small farms. After declining for more than a century, the number of U.S. small farms has increased 20 percent in the past six years. But there is still a long way to go. In India organic food represents less than 2 percent of the food economy, and local food makes up well under 1 percent. There is some debate on the issue of which is better: organic or locally-grown. Ideally you'll want both. But keep in mind that even if your local farmer is not certified as organic, by speaking with them and establishing a rapport you will truly know how your food is raised and grown.

Many small farmers grow their crops according to organic standards, yet are unable to afford the certification process to legally call them so. But in the end, it's not really the certification itself – which big food manufacturers can afford – that matters, but whether or not your food has been grown in a manner that is compatible with nature and will sustain your good health.

V. ORGANIC CERTIFICATIONS

Access to certification, cost involved therein and a time lag of three years (conversion stage) often constrain farmers especially small land holders in India from adopting organic farming. Organic produce needs certification to ensure that all synthetic inputs are prohibited and soil building approaches are followed TOS (2009). Certification authenticates organic produce for consumers and validate price margin of the product in the market. The certification process aims at converting the growing area to comply with requirements of standard within a period of 3 years. For this reason, farmers who adopt organic management need to wait for up to three years under certification procedures that requires purging of chemical residues. Certification for organic farming is required so that consumer can trust on the quality of product. To fulfill this requirement there are various certifying agencies like Organic Crop Improvement Association (OCIA), IFOAM, ECOCERT, BCS, SKAL, KRAV, IMO, FVO, QAI, OREGON and NASAA have strong international presence and have even developed the ability to assist worldwide marketing of organic products by promoting organic agri-biotech as an environment friendly and sustainable method. In India, the Director General of Foreign Trade, New Delhi, permits the export of organic produce provided that these are produced, processed and packed under a valid organic certificate issued by a certification agency accredited by an accreditation agency designated by the Government of India. The Government of India has recognized Tamil Nadu Organic Certification Department, Agricultural and Processed Food Products Export Development Authority (APEDA), Spice Board, Ministry of Commerce and Industry, Coffee Board and Tea Board for the purpose. However, lack of knowledge, rationale capital and access to certification discourage small farm holders in developing countries including India. To overcome these constraints the government of India is providing extension services, training and institutional demonstration, fiscal incentives to encourage organic farm sector to strengthen nation's economy and sustainability (IFOAM 2002).

The Responsible Body and Certification

Certification decisions are not only limited to initial approval of operators, but also approval of products, changes in production, disciplinary measures etc. The Inspection and Certification Agencies shall ensure that each decision on certification is taken by person(s) different from those who carried out the inspection or assessment.

The agency responsible for certification decisions shall reflect a diversity of stakeholders, without any single interest predominating. Where certification decisions are delegated to a small committee or officers, the Inspection and

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Certification Agencies shall demonstrate reporting and review functions that enable the agency responsible for certification to exercise ultimate control and responsibility for such decisions.

Guidelines for Organic Certification

1. General Requirement for Certification.
2. Application for Certification.
3. Review of Application.
4. Scheduling of Inspection.
5. Verification during Inspection.
6. Group Certification Standards.
7. Continuation of Certification.
8. Group Certification Standards

General Requirement

This system applies to farmer groups, co-operatives, producer groups, contract production and small scale processing unit. The producer group shall have similar production system and within the same geographical proximity. Farmers holding four hectares and above can be part of group but has to be inspected individually. The total area of such farm shall be less than 50% of total area of group. Processor and exporters may be a part of the same group but they shall be inspected annually by agency.

Constitution of Group

Group shall have a legal status or structured organization. The group shall maintain a documented Internal Control System (ICS). The responsibilities of the group shall be delegated to individual members/committee for carrying out specific activities. The group shall develop an internal quality system manual comprising of implementation of internal control system and assessment of risk.

Internal Standards for Group Certification

Internal standards shall be prepared in local language under the framework of NPOP standards. The internal standards shall include definition of production unit, method of dealing with part conversion, parallel production, period of conversion, and production norms for entire production unit, harvest and post-harvest procedures. The IQS shall include buying procedure, trading procedure and processing procedure for the group.

Granting of Certification

The agency shall issue Scope Certificate or Certificate of Registration, Transaction Certificate and Product Certificate to the eligible operators. The issue of certificate shall be based on the decision taken by the certification committee.

Organic Certification Brand

“India Organic” will be granted on the basis of compliance with the National Standards for Organic Production (NSOP). genuineness as well as the origin of the product, this trademark is owned by the Government of India Only such exporters, manufacturers and processors whose products are duly certified by the accredited inspection and certification agencies, will be granted the license to use of the logo which would be governed by a set of regulations. In Fig-3.8: Major International Organic Certification Brands are compiled.

VI. CONCEPT OF ORGANIC LOGO

Symbolizing the rhythm of cosmic and earth forces represented by the blue and brown waves of force and energy, ‘India Organic’ logo celebrates the essence of nature. These forces work in harmony upon the earth’s environment and this rhythm is reinforced and supported by the green plant growth.

The colors used have a special significance in the logo concept. The cosmic force in blue symbolizes universal purity. Richness of soil, nourished with natural ingredients in organic farming, is symbolized by the earth forces in golden brown. The plant in green uses the color of nature and natural products untouched by chemicals. The blue background is symbolic of earth’s environment that is congenial for life to thrive in and is also free of pollution and harmful chemicals. India Organic etched over the surface authenticates the carrier as “Organic” and also establishes

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Vol. 5, Issue 3, March 2016

the Indian connection for all the carriers of the mark. Beautifully synthesizing all the elements of our environment, the logo also communicates total adherence to the National Organic Standards. In India a government “PGS-India” and a private “PGS Organic Council” by Joelle Katto Andrighetto IFOAM, is popular. With the launch of the governmental program to support PGS, India is now the only country in the world with a private (NGO-lead) PGS system and a government-lead PGS program running in parallel. In India, PGS actually began with the involvement of both government and NGO representative. It was in 2006, with the support of an FAO project, that consultations were held with the Ministry of Agriculture, farmers, NGOs and state government officials, to work on the development of a specific PGS model suitable for India. After a national workshop, pilot programs were launched in different parts of the country, under the leadership of various NGOs. Later on, these NGOs consolidated their efforts into one national PGS network, coordinated by the “PGS Organic India Council”. In 2010, the National Center for Organic Farming (NCOF), a government institution part of the Ministry of Agriculture, began consultations for the development of a national PGS program. This program was launched in April 2011, under the name “Participatory Guarantee System (PGS-India)”. The “PGS-India Organic” logo was developed in relation to this program. Meanwhile, the NGO-lead “PGS Organic India Council” was working on its legal registration, which was completed also in April 2011. Due to the existence of the new government-lead PGS program, the “PGS Organic India Council” had to change its name and logo. The word ‘India’ had to be dropped from the original name and the association is now called “PGS Organic Council”.

VII. BENEFITS OF ORGANIC FARMING

Organic farming requires more labor input than the conventional farming system. Thus, India which has a very large amount of labor unemployment and under employment will find organic farming an attraction. Moreover, the problem of periodical unemployment will also get mitigated because of the diversification of the crops with their different planting and harvesting schedules resulting in the requirement of a relatively high labor input. Several indirect benefits from organic farming are available to both the farmers and consumers. While the consumers get healthy foods with better palatability, taste and nutritive values¹.

VIII. SUSTAINABLE AGRICULTURE

1. Increasing agriculture production.
2. Food self-sufficiency.
3. Environmental protection.
4. Conservation of natural resources.
5. Rural development.
6. Livelihood Security.
7. Green Growth & eco-security.

Thus organic farming today’s need and tomorrow’s future.

Benefits of organic fertilizer

Organic fertilizers have been known to improve the biodiversity (soil life) and long-term productivity of soil and may prove a large depository for excess carbon dioxide. Organic nutrients increase the abundance of soil organisms by providing organic matter and micronutrients for organisms such as fungal mycorrhiza, (which aid plants in absorbing nutrients), and can drastically reduce external inputs of pesticides, energy and fertilizer, at the cost of decreased yield.

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Vol. 5, Issue 3, March 2016

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