



## Managing Human and Environmental Health by improving Soil Health

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Human beings are faced with serious health challenges today. The incidence of cancer is increasing at a rapid rate. Some of the studies have concluded that in about 25 to 30 years one death in every two death will be due to cancer. Cancer is seen even in infants these days. Various organ disorders like kidney failure, liver problem, heart attack etc has increased 10 times in the last 20 years. Chronic problems like Diabetics, Cholesterol etc. are very common, right from the juvenile phase.

The major reasons attributed for these health problems are : hazardous residues in the food and water we consume, life style changes leading to severe stress in life and very poor quality of the food we consume that is food without proper nutrients. These types of food also disturb the body pH leading to various complications.

Environmental health is also facing serious challenges. The outcome of the ill health is climate change. Some of the impacts of climate change are increase in temperature, failure in monsoon, severe

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drought resulting in severe landslides and floods, which we have witnessed recently in Kashmir and Uttarakhand.

Another outcome of the environmental ill health is severe and fast depletion of our natural resources like soil, water, biodiversity etc. The reasons for the environmental challenges are, green house effect due to increase in green houses gases like  $CO_2$ ,  $CH_4$  etc in the atmosphere and unscientific management of natural resources.

**Soil:** Soil is one of the most important natural resources. Fertile soil is very important for sustainable agriculture. Soil fertility is influenced by four important factors viz. soil organic matter, soil inorganic matter, soil organism and soil microbes.

**Soil Organic Matter:** It is a complex and varied mixture of organic substances. Globally around 2400 billion tons of carbon is stored in soil as organic matter. Altogether about twice as much carbon is stored in the soil than in the world's vegetation (550 billion tons) and atmosphere (750 billion tons) combined. Soil is the largest carbon sink in the world.

Every year approximately 63 billion ton of carbon is released into the atmosphere from the soil. Approx. 59 billion tons of carbon is going back into the soil from atmosphere via plant residues. The imbalance of about four billion tons of carbon along with five billion tons of carbon released by burning of fossil fuels every year is added to the atmosphere. This addition of carbon dioxide is intensifying the green house effect. Soil health is primarily dependent on the level of soil organic matter.

**Soil inorganic matter:** Sand and clay particles, macro and macro nutrients are the inorganic matters in the soil.

**Soil organisms:** Earthworms, snails, insects, grubs, termites, nematodes etc. The population of the soil organism is dependent on the soil organic matter directly and indirectly. The chemical characters of the soil also influence the population of soil organisms. Earth worms are usually called the friends of farmers and termites are pulverizers of nature. They accelerate the decay of organic matter. Some of the soil organisms control various plant disease causing organisms and these organisms help in nutrient recycling.

**Soil Microbes:** All microorganisms are present in soil. For examples fungi, bacteria, actinomycetes algae etc. The population of the soil microbes is directly dependent on soil organic matter, soil chemical and physical characters. Decomposers of



organic matter and nutrient recycling stabilize soil structure and synthesis various organic compounds which play a very important role in soil health. Some of them act as bio control agents and helps in the absorption of nutrients by plants breakdown of toxic compounds.

## Present Status of Indian Soil in terms of Organic Fertility

### (a) Healthy Soil (Forest Soil)\*

The Organic Matter level should be between 2 to 3%. Various other soil organisms are also abundantly available. Approximately 25 to 30 lakh earth worms per acre and approximately 15 to 20 tons of microbes are present per acre of soil \*(Brandy, Nyle C, 1999, N.S Subba Rao, 4th edition

### (b) Depleted Soil\*\*

The organic matter level was recorded below 0.5% in most places. Few soil organisms are available. Approximately 2 to 3 lakhs of earth worms were found per acre and approximately 3 to 5 tons of microbes were present per acre of soil. \*\*(Based on the studies conducted by Dr. Joshy V. Cheriaan and his team)

Factors leading to the above conclusion were based upon the following reasons.: With the advent of Green Revolutions hybrid seeds were used and a demand for readily available plant materials was observed which led to the increased use of chemical fertilizers. Over a period of time the addition of organic matter to soil was totally neglected.

Another reason for depletion of organic fertility is continuous and excessive use of chemicals for both nutrition and plant protection. These chemicals are harmful to the soil organic matter and living organisms. The soil testing conducted in almost all the labs in India gives information only about physical and chemical parameters of soil. Hardly any

lab provides information about the organic fertility status of the soil and no steps are taken to rectify the organic fertility of soil

Another major challenge modern societies are facing is accumulation of waste in all urban centers. In most of the urban centers the waste is dumped in dumping yards. In few places it is incinerated. It is estimated that in 30 to 40 years India will be world's largest Municipal Solid Waste (MSW) generating country.

The challenges due to the present unscientific management of Municipal Solid Waste are very many.

These dumping yards develop into ecological disasters by becoming breeding ground of insects, pests, reptiles, canines etc. posing serious threat also to the health of the locals. These dumps release large amount of very dangerous Green House gases for eg. Methane, N<sub>2</sub>O etc which contribute to the global warming. The leachates from these dumps contaminate the ground water source. A considerable area of land is lost due this unscientific process. These yards catch fire very often releasing huge amounts of dioxins and other noxious gases into the local environment. The un-segregated municipal waste often has heavy metal contaminants. This method requires huge capital and operational infrastructure and cost. Any break in the chain of operations will cause severe inconvenience to the urban dwellers where the garbage gets accumulated. It affects the aesthetics of the city and is a disgrace. The movement of the garbage through the urban centres cause lot of inconveniences. It is an extremely menial job which amounts to social discrimination.

These huge challenges can be converted into a great opportunity. About 50 to 60 percentage of MSW is biodegradable organic material. By proper segregation at source we can separately collect all the different materials in MSW. All the plastic can be recycled reducing our consumption of precious petroleum products and thereby reducing our foreign exchange spent on import of petroleum. The metal and glass from MSW can also be recycled. The biodegradable organic material can be converted into excellent organic manure by a very efficient coir pith based aerobic composting medium.

### Coir pith based aerobic composting medium

Coir pith composting medium is a highly efficient



solid state aerobic fermentation medium which can convert biodegradable material into high value compost without any foul odor in 23-30 days' time. It is a combination of clean processed coir pith and naturally occurring aerobic composting microbes. It is a patent pending product. Coir pith based composting medium has to be layered with biodegradable waste. The proportion of Coir pith based depends on the moisture level in the waste.

This technology is successfully followed in managing domestic waste in thousands of houses in many local bodies in Kerala along with an aerobic container. Market and commercial waste are being treated in various local bodies using this solution. Similarly the biodegradable waste of various agro industries in India are also being managed.

### Advantages of using coir pith based aerobic composting medium

A hassle free, convenient method permits us to process the organic garbage, even in a domestic environment, in a short time. There is absolutely no foul smell. A biodegradable waste which is generating foul smell when introduced into the composting medium loose the foul smell immediately. There is no leachate during the process and no flies



are seen when the moisture is maintained at an optimum level. Frequent turning of the material is not required thereby reducing the inconvenience associated with turning. This process also eliminates the hazardous process of handling domestic waste by segregating the waste 'at source' and converting the same into compost (Compost). Composting can destroy pathogens or unwanted seeds. Unwanted living plants (or weeds) can be destroyed by covering with compost. Using Compost as a growing medium reduces water requirement to one fourth of the normal recommended dosage thereby effectively saving 75% of water consumption;

Additionally, this process will result in natural development of local earthworm population in the soil by providing adequate feed and a favorable environment. This will also substantially enhance population of microbial and other soil beneficial organisms. Compost thus produced can either be used in the kitchen / household garden or can be sold in the market for price. The speed of conversion of this process is very fast and the quality of the manure generated is very good.

### **Advantages of the manure when applied to the soil**

The manure is capable of improving all the physical properties of soil including air water balance and protects the soil from sunlight and rain drops when available as a mulch. It provides various macro and micronutrients to the plants and enhances microbial population and microbial activity like Nitrogen fixation, solubilizing of various nutrients, production of humic substances etc. This manure can also enhance the buffering and water holding capacity and also water infiltration

Moderation of soil temperature both in day and night is maintained and also helps in reducing

evaporation loss from soil. Less surface runoff is observed and soil erosion is restricted, less flooding by increased retention of water in soil.. It can also improve the soil structure so that it holds more nutrients and there by the soil becomes more fertile.

By repeated application of organic matter to the soil, the soil regains its health. When there is enough organic matter the microbial population will increase and the earthworm population and all other beneficial organisms in soil will proliferate. The organic matter when breaks down completely will release a lot of macro and micro nutrients. The organic matter also helps in building up the humus content of the soil.

All the above factors make the soil healthy. A healthy soil will support a healthy plant. A healthy plant is less susceptible to disease and pest problem. The harmful usage of chemicals have come down drastically. The minor incidence of pest and disease can also be controlled by bio inputs. The food and water we consume will have less harmful chemical residues. A plant growing in healthy soil will also produce fruits and vegetables which are rich in nutrients. A healthy soil will also help the plant face the challenges of climate change more efficiently. Thus the end user viz. the people and animals consuming these food and water will be healthy.

From an environmental angle the increase in organic matter in soil will ensure a healthy sustainable soil for generations.

The water availability will be better because the soil has much better water holding capacity. Because the soil is healthy it can support much larger life inside and above the soil thereby increasing the biodiversity. A healthy plant will fix more carbon dioxide throughout the year thereby reducing the pressure of carbon dioxide in the atmosphere which is responsible for the green house effect. Therefore



by correcting soil health we can manage both human and Environmental health.

### SUDHLABH's composting digester

The composting set up comprises of a ventilated digester and composting medium, provided by Sudhlabh. This composting medium is a patent pending specially formulated coco peat based product developed and supplied by Dr.Joshy V Cherian.

The wet waste and composting medium in

dry compacted form should be taken in a ratio of 1:1/8. Further the medium is hydrated, mixed with wet waste and deposited in the ventilated digester (dimensions provided at the end of the document). The final compost generated can be recycled by mixing it with fresh composting medium in 1:1 ratio.

### Challenges

Criteria for setting up the digester were that it should be spread across the complex, it should have good air circulation so that the smell can be wafted away in the wind, good sunlight for better moisture management. It must be placed at least 10 feet away from home and 3 feet away from the compound wall so that the residents don't feel that they are near a composting area. It should have good drainage to clean the area thoroughly every day, strong concrete base so that 3000 kg unit doesn't sink in, good roof to avoid rain water, space to remove compost. It should also have work around space to clean and should not affect aesthetic value of the building.

The waste was mixed in a room and put into each digester. The digesters are filled one after the other which ensures enough time(40 to 45 days) before it is opened for compost harvesting.

## A Municipal Waste Management Initiative

Kunnamkulam is a municipal town situated in Thrissur District of Kerala in India, spread across an area of 34.18 sq.km. The Municipality has an area of 34.18 sq.km and has 37 wards. The total population as per 2011 census is 54,071.

### Challenges

Kerala state banned all landfill because of the frequent protests by the people living near the landfills. Based on the state government policy, the Kunnamkulam Municipality decided to compost the wet waste generated in the commercial space in the municipal area. The municipality strictly enforced segregation of waste and they constructed a building of 5000



sq.ft and installed a shredding machine. One ladies self help group was formed to compost the waste procured and delivered by the municipality.

The ladies self-help group

composted the wet waste by mixing and shredding it with aerobic composting medium, a coco peat based specially formulated product developed and supplied by Omega EcoTech

Products India Pvt Ltd through IRTC (Integrated Rural Technology Centre). The shredded mixed waste is formed into windrow piles. The piles are periodically turned, mixed and bulked after two weeks. A month old compost is mixed with fresh waste and recycled. After the compost is fully mature it is sieved packed and sold as compost to nearby farmers.

**Result**

There is no landfill in Kunnamkulam municipality. All the wet waste generated in the commercial space is fully composted into good quality compost. The local farming community is using the compost for more sustainable farming. This has become a show case model for various municipalities and private entrepreneurships and many such initiatives are on the way. The municipality has also taken steps to compost the domestic waste in individual houses.

**Waste Management in Apartments- a Case Study**

Bangalore city is an important commercial city in South India and known as the silicon valley of India. The city is generating 5000 tons of waste daily. This waste was collected in a mixed format and dumped in nearby villages. Because of severe pollution and health hazards in the dump areas the local villagers protested and with the intervention of court the dumping was banned. Therefore the city administrators had to find ways to address the huge waste. The city was forced to regulate the waste management.

The Bangalore city corporation classified the large



apartments as bulk generators of waste and mandated them to segregate and manage waste by themselves. In order to initiate waste segregation, the Bangalore city corporation introduced “2 BINS AND 1 BAG” model in 2013.

The ideation, planning and implementation of a decentralized waste management model in Purva Fairmont apartment at Bangalore which is comprised of 324 houses is furnished below.

**Approach**

The residents of Purva Fairmont formed a committee and educated the residents about the needs and ways of segregation. Further they explored solutions to manage different categories of waste segregated such as Wet/Organic waste, Dry waste, Reject waste, e-waste etc. Out of these, wet waste management seemed to be the most challenging. After collaborating with vendors and apartment volunteers, the committee studied the pros and cons of existing composting machines and techniques. They concluded with the following requirements for an effective wet waste management method which is sustainable composting model well suited for apartment complex. Affordability of the composting setup and ease of composting for the workers were

taken into consideration. It was also decided that the compost generated should be of good quality.

Thereafter in 2013, the committee representatives met Mr. Vasuki from SudhLabh. They also visited SudhLabh’s first trial run composting digester which was managed by a community of 80 odd apartments mostly of senior citizens. The major advantages of this model were its simple structure and set up, ease of composting and less effort by workers, easy maintenance, lesser construction and machine cost compared to existing facilities etc.

Capacity building and training was simpler. Electricity was independent and there is no complex machinery required. It was easy to correct the mistakes and change the process according to the conditions. There was lesser operational cost compared to existing machines with minimum smell and worms with minimum amount of the carbon source against the feedstock. We can recycle the compost generated by mixing it with fresh composting medium and above all, this process generates good quality compost. This inspired the committee to set up Shudhlab’s digester in their apartment. Result

By the end of 2016, the apartment had fully functional five digesters which yielded good quality compost. Purva Fairmont processed 250kgs of Wet Organic waste and produced approximately 80 to 150 kgs of compost once in 2 days. After

initial struggles, the residents turned to be very cooperative with the process. Few residents still complain but they are made comfortable and accommodative by continuous engagement. This composting process is good for the environment, this case gives

an analysis of the contribution made by an apartment to preserve our mother Earth. Many more got inspired with this facility at Purva Fairmont apartment in HSR sector and have adopted the same. ■

## Company Profile

Omega Ecotech Products India Private Limited came into existence in the year 1999 at Coimbatore, Tamil Nadu (India). The company is engaged in manufacturing, supplying and exporting a comprehensive gamut of Bio Fertilizers, Bio Fungicides, Bio Pesticides, Composts, Growth Promoters and Aerobic Composting media. The company is promoted by a team of Environmental and Agricultural scientists with rich experience in Biotechnology, Horticulture, Waste Land Development, Solid Waste Management and Organic Agriculture. The vision is to promote sustainable agriculture by producing compost by farmers and even in households using the composting media Bioclean.

## BIOCLEAN

Bioclean is a highly efficient solid state aerobic fermentation media which can convert biodegradable material into high value compost without any foul odor in 23-30 days time.

It is a combination of clean processed coir pith and naturally occurring aerobic composting microbes. It is a patent pending product. Bioclean has to be layered with biodegradable waste. The proportion of bioclean depends on the moisture level in the waste. This technology is successfully used in managing domestic waste in thousands of houses in many local bodies in Kerala along with an aerobic container.

For more details, visit: [www.omegaeotech.in](http://www.omegaeotech.in) ■

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