# Contents

# Introduction:

To understand the science of healthy and harmonious life we need the organized knowledge of the distribution pattern of different kinds of life on the earth's surface. The answer for the question why a particular kind of life is in a specific place has yielded a list of responsible factors such as rainfall, temperature, soil fertility, status etc,.

Such of these factors can be summed up and realized that the availability and quality of food is the major determinant of any life process and its pattern. The availability of food and its quality in turn depends on the different crops that could be successfully grown on the soil and according to the differences in fertility status of soil on which it is growing. Thus the ability of the soil to support life forms plays a major role in human existence. Consequently "we are what we eat" are the words of realistic scientists.

It is often said that the disease is the result of a breakdown on the part of the total individual. While proper exercise, clothing and shelter are necessary for optimal health, the most important factor-far and away- is food.

Food may be spoiled in processing, preserving…but it must in any event have been good food in the first place if it is to produce optimal health. Food of high quality can only be raised on fertile soil rich in life-supporting attributes-. This is why it is said that the health of the nation rest primarily in the hands of the farmers.

The use of pills to patch up damaged bodies in which, as soon as we conquer one disease, another will pop up, cannot be a cure. Disease can be conquered only by good food raised upon good soil, which could supply the nutrients and energy required for the structural and functional activities of the human being.

Thus we are amply understanding that the nutrition is the foundation of health. Here we should see nutrition not just as bulk of food, but in terms of both the required inorganic elements and the long and growing list of organic compounds-synthesized by microbes, plants and animals that are connected with the soil fertility, like vitamins and antioxidants. We are more and more realizing that there is an ecological pattern of human health and survival just as there is the ecology of plant survival, and animal survival according as soil is the complete nutrition for them.

Thus there is complete scientific evidence on the saying "what ever we eat comes out of the soil, therefore, sick people result from sick soil".

Hence one should view soil as a health and wealth creating force of nature.

Soil under agricultural production is an integration of many physical, chemical, biochemical and biological activities and reactions. However of these soil properties some are selected in this study, as an initial "stethoscopic" way to examine the health of the soil in the ecosystem.

A set of seven crucial parameters were identified and they are as follows.

- 1. The soil pH
- 2. Electrical conductivity
- 3. Organic Carbon
- 4. Water Holding Capacity
- 5. Available Nitrogen
- 6. Available Phosphorus
- 7. Available Potassium

Each of these has their significance, in determining the growth supporting nature of a particular soil, as a single measure and in combination with other factors.

1.The soil pH

The soil pH measures the active soil acidity or alkalinity. A pH of 6.9 or less is acidic, a pH of 7.0 are neutral. Values higher than 7.0 are alkaline. Under normal condition the most desirable pH range for mineral soil is 6.0 to 7.0. In this pH range the crops grow well and there will not be any difficulty in the availability of the essential nutrients to the plants. The pH of the soil determines the microbial population dynamics to a greater extent.

2. Electrical conductivity

Electrical conductivity is a measure of soluble salts present in the soil. Soils with high levels of electrical conductivity are called saline soils. High electrical conductivity indicates more soluble salts in the soil.

An excessive concentration of various salts may develop naturally depending on the soil, or by the result of poor irrigation, water quality, excessive use of fertilizers or through contamination from various chemicals, industrial wastes or by the way of sea water intrusion into the aquifer. High salt concentration produce water stress in crops which may cause the plant to wild and die.

Excessive soluble salts affects plant growth and inhibit seed germination. Seedlings are especially more sensitive to high salt concentration. An electrical conductivity of less than 1.0mmhos/cm is harm less, for plant growth.

3.Organic Carbon

The amount of plant and animal residue in the soil is gauged by the value of organic carbon.

It is also the measure of availability of food for the microorganisms to multiply and proliferate. The reserve of essential plant nutrients is often indicated by the organic carbon. The activity of the microorganisms like bacteria, fungi and

actinomycetes depend on the organic carbon available in the soil. Enhancing and maintaining the soil organic carbon status is one of the most important goals of soil management in ecological/natural farming system. A low organic carbon is the indication of poor, lifeless, exploited, unproductive, deserted and eroded soil condition. High organic carbon denotes well managed ecologically diverse, productive, life supporting, healthy soil condition. Under the given environmental condition present in Auroville, a value of up to 0.5% is low, from 0.5% to 0.75% is medium and above 0.75% is sufficient. However higher values above 1.0% indicates well managed soil condition.

4. Water Holding Capacity

The water holding capacity of the soil indicates the ability of the soil to absorb and hold the moisture for the use of micro/meso/macro organisms living in/on it, including plants and animals. The ability of the soil to support crop growth mostly depends on the availability of water. A soil with low water holding capacity often less than 30% needs frequent rainfall or irrigation, and such soils are mostly sandy in texture. A soil with high water holding capacity often poses problems due to poor drainage and those soils are heavy clayey in texture. Water holding capacity of 50 to 70% is normal and good for the crop growth.

5. Available Nitrogen

“Plant-eatable” forms of Nitrogen is denoted as available Nitrogen. This form of Nitrogen is to a plant what petrol is to a car. The green lushly growth of a plant depends on the availability of Nitrogen.

The measure of soil available Nitrogen in turn depend on biological activity, and therefore fluctuate with the changes in conditions such as organic carbon,moisture. Use of chemicals fertilizers like urea; increase this form of Nitrogen in the soil. Excessive available Nitrogen combined with high leaching of soil due to rain/ irrigation lead to “Nitrate” poisoning in drinking water and ecosystem. A value of up to 280Kg/Ha indicates low available Nitrogen and from 280 to 450Kg /Ha is medium and above 450Kg/Ha shows high amount of available Nitrogen in the soil.

6.Available Phosphorus

“Plant-eatable” form of phosphorus is denoted as available Phosphorus. This form of Phosphorus is to a plant what wheels are to a car. The Phosphorus is essential for the proper and balanced root growth. Poor available Phosphorus makes the plant to grow poorly due to reduced root growth. Excessive soil Phosphorus combined with surface run off can cause excessive growth of plants and algae in surface waters damaging aquatic ecosystem and it is termed as “eutrophication”.

7.Available Potassium

Available Potassium is the measure of “plant eatable” form of Potassium present in the soil. This is to the plant what a steering and breaks are to a car. It regulates all the essential metabolism inside the crop plant.

This element makes the plant “stress-proof”. It imparts drought, pest and disease resistance to the plant. If the Potassium availability is high a crop plant can absorb more than what it requires for a normal growth, and this condition is called as “luxury-consumption”.

The quality of the crop produce is improved by good availability of this nutrient element in the soil. In general a value of up to118 Kg/ha is regarded as low Potassium availability, and from 118 to 280 Kg/ha as medium status and above 280 Kg/Ha as high available Potassium containing soils.

## Trace elements

A set of elements which are needed for proper crop plant growth, in small amounts, i.e. in grams/acre is known as trace elements or micronutrients. Nevertheless, they are very essential for the successful completion of the plants life cycle. Where there is a deficiency of trace elements in the soil, it may express as an observable symptoms in the crop health or as gross crop failure, indicating their essentiality.

They are needed to activate most of the enzyme systems like oxidation, reduction, hydrolysis transferences…and other vital performances. They take part in synthesis of many organic molecules and compounds like carbohydrates, protein, fats, vitamins, alkaloids…Their effect on the plant is not an addition of their separate effect, rather an integration of the possible interactions of all the ions on each other.

Many scientific experiments has proved beyond doubt that the health of humans beings and animals depends on delicately balanced interactions between the fertility of the soil, microbes and plants. Binging trace elements along natures assembly line form soil, to plant, and to animal /man is a procedure to be understood fully enough, to appreciate the effect of soil fertility status on crop plant growth and the other related ecosystem and human health.

With these parameters in mind 215* soil samples were collected and analyzed to generate data and understand the nature and properties of soil of Auroville area and the outside village, mainly their impact on farming and ecosystem perspective, which in turn reflect on the health of those who depend mainly on the locally produced food grains and vegetables …for their lively hood. *(Comprising 101 soil samples collected from 10 places in Auroville area including farming and non-farming places, with the help of Asia Urbs project and 114 soil samples collected from outside villages around Auroville, with help

of ICEF-project being run by Mr.Jurgen of PALMIRA of Aurobrindavan, Auroville.)

Based on the data generated a comprehensive color coded summary is prepared and shown in the following page

Tables number 1 and number 2 (at the end)

From the summary one can understand that the soils of Auroville area ca be viewed as two groups

- 1.Developing soils
- 2.Depleted soils

1.Developing soils

This group is mainly from farms of Auroville like Annapurna, Maruthan, Auro orchard, Aurobrindavan and Matrimandir. Here the organic Carbon content is fairly good which indicates the life supporting nature of he soil. More over there is no excess of Nitrogen present in the soil, which may pose problem of “Nitrate” poisoning. Other than Annapurna soil, which is slightly Alkaline in reaction, rest are slightly acidic in nature.

2.Depleted soils

These soil are mainly from the places like Bharat Nivas , CSR, Dana, Samasti and Aranya. Here the soils are low in organic Carbon content, which testifies their eroded, depleted and baked quality, typical to the nature of the original soils present in the area. Their water holding capacity is poor. Potassium availability is low.

All the village soils are poor in organic carbon content, may be due to exhaustion of soil by the practice of their farming system. They are depleted and not so good supportive to life forms.

The pH of the soils form Nanakkalmedu and Kayalmedu are acidic and the rest are alkaline in nature. The availability of Nitrogen is poor and Phosphorus is high. However there is no soluble salts present to be injurious to crop growth.

## Trace elements status of Auroville soil

Analysis of trace elements in the soils of Auroville, has shown deficiency of some, as shown in the following table.

| Sl.No | Name of the place | Deficient element |
|---|---|---|
| 1 | Bharat Nivas | Zn, B |
| 2 | CSR | Zn, B, Mg |
| 3 | Dana | Zn, Mg, Fe |
| 4 | Samasti | Zn, Mg, Ca |
| 5 | Marutham | Zn, S, B |
| 6 | Auro orchard | S, B |
| 7 | Matrimandir | S |
| 8 | Aurobrindavan | S |
| 9 | Annapurna | Zn, S |
| 10 | Aranya | S, Cu |

From the table it is evident that the element Zn, S, and boron deficiency is wide spread though other elements like Fe, Mg, Ca and Cu are also deficient in some places.

From this it is understood that as mentioned earlier, of the natures supply line of nutrient for the human health from the soil to plant , plant to animals/human beings the food produced by the crops grown on a deficient soil would be deficient in such of these elements.

# Conclusion

From the present study of the soils of Auroville and outside village we could conclude the following.

Auroville soils

1. The soils of Auroville is mostly acidic in nature except Annapurna farm which is alkaline .
2. The water holding capacity of the red sandy loam soils of Auroville is medium, which implies that there could not be any problem with the drainage. The water holding capacity of the black clay soils of Annapurna farm is high.
3. Most of the Auroville farm soils are rich in organic carbon which indicates the soils are actually developing in life supporting characteristics. The non-farm sites soils are not so well developed .
4. Regarding the nutrient status of the soil the available nitrogen is low in all the places.
5. The trace elements status of Auroville soils are already explained in the previous pages.

Village Soils

1. The village soils are poor in organic carbon and this shows their over exploited condition through bad way of farming.
2. The available nitrogen status is very low and the available phosphorus status is high and this shows that the soil needs organic amendments like compost, green leaf, manure, crop rotation with legumes and crop diversification so as to improve the biological productivity of the soil.
3. Soils from Nanakkalmedu and Kayalmedu villages are acidic and from Thenkodippakkam, Keelkuthappakkam and Endiyur, are alkaline in nature.
4. The clay soils of Thenkodippakkam, Endiyur and Kayalmedur villages are having good water holding capacity and the soils from Nanankkalmedu ,Keelkuthappakkam villages are low in water holding capacity and it is sandy in texture.