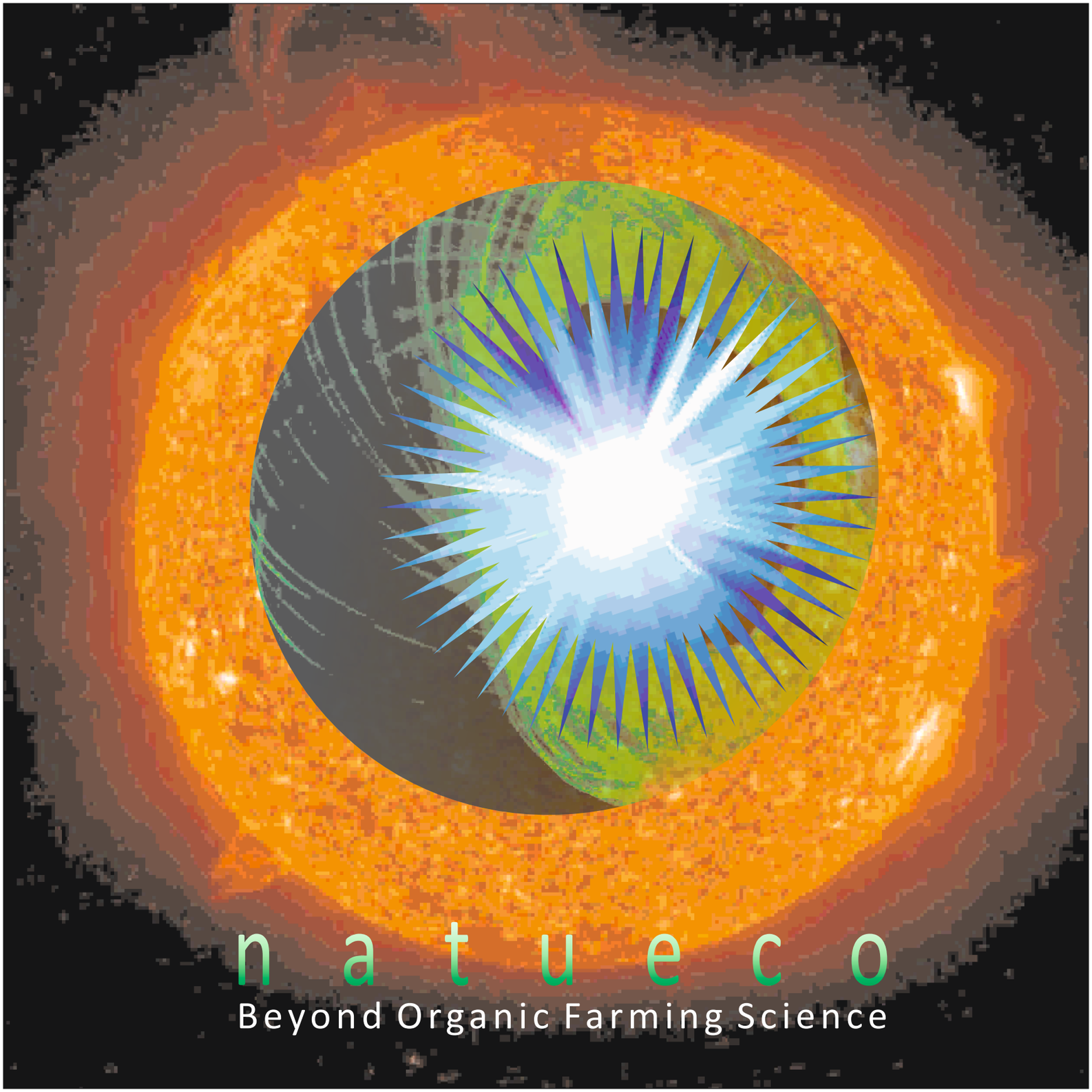
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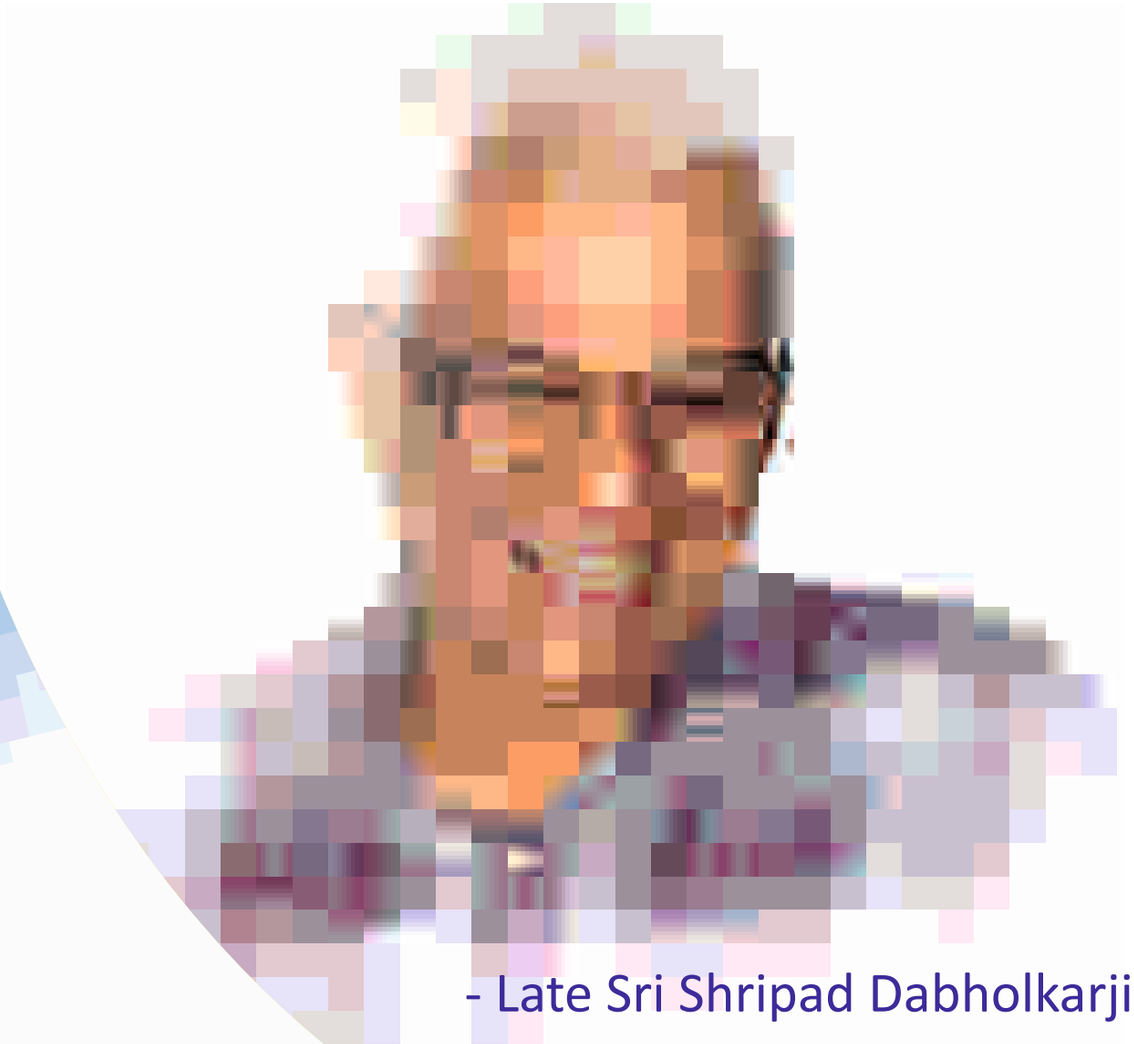

- Late Sri Shripad Dabholkarji

The Promise:

"No Wastemind,
No Wasteland,
Anywhere in the World
Plenty for All „

- Late Sri Shripad Dabholkarji

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0-1 Preamble

It is important to understand that any system we adopt for any area of society's needs, be it food, education, livelihood, public administration or law; should be completely holistic and sustainable. It should offer the highest benefits to all the stakeholders of the system. We have digressed in many ways from this concept today. Our systems today follow issue-based approaches rather than an integrated approach. The issue-based approach is discrete in Nature and hence cannot address our requirements holistically. Such approaches fail to be sustainable. Only when society wakes up and changes its approach from discretely fulfilling basic needs to more holistic ways; can we expect an evolution of the collective human spirit.

Food on the one hand is one of the most basic requirements of human beings. On the other hand, it is one of the strongest factors that determine the quality of society's health. The "quality of health of society" is determined by the health of every individual vis-à-vis his/her interpersonal relationships in a community and also the collective health of his/her surroundings. The word "health" includes physical, emotional, social, economical and ecological health! If food is the factor determining the health of society, it becomes important to pay attention to the way we grow our food.

Since centuries, we have experimented with various farming technologies to grow our food. The technologies evolved with us through experiments and a few of them settled down with us as traditional farming techniques and contemporary farming techniques.

When it comes to the holistic fulfillment of a society's health, our traditional & conventional methods of farming have fulfilled some needs .They have also caused socio-ecological imbalances in many ways. Today, contemporary farming methods have been proving themselves devastating in terms of lack of nutrition in food, chemical infusion in food, soil fertility, microbial culture in the soil and its surroundings on a broader platform! Such farming is also leading to exploitation of natural resources, fights for resources like water and electricity and debts on farmers: all further leading to great decline in society's health!

It is time for us to understand the factors contributing to this decline, learn lessons from our past and present and change our farming methods from destructive farming methods to such methods which take care of every factor listed above and contribute to our "HEALTH" as discussed in the preceding paragraphs! More suitable is a farming method which is based on the universal values of compassion, synergy & service .This is how our traditional farming ways were.

When a system does not have any exploitative agenda to perpetuate, when it is based on a vision of service and benefit to all, when a system brings man closer to Nature ,that system becomes a divine vehicle for true social progress. "Natueco" is one such system.

2.0 History

Ever since man started cultivating food, evolving from his dependence on his surroundings and hunting, agricultural practices have continuously evolved to address the growing need for agricultural produce. The ever growing demand for better productivity is generated not only due to growing demand, but also due to an increasing percentage of the population taking up non-agricultural occupations. Changing eating habits of people added further demands for better productivity. The situation got aggravated when agricultural land and produce started finding its place for satisfying other human needs (e.g; Corn for fuel, land for housing and industries, etc).

The constant search for better farming resulted in the development and promotion of different farming systems from different parts of the world. For example, Traditional farming, Natural farming, Bio-dynamic farming, Homa-farming, Organic farming, Chemical farming, Permaculture-farming, Zero budget farming and Natueco farming. Different systems focused on different issues relevant to their respective ers.

Of all these different systems, the system of Chemical farming largely dominated many parts of the world and still continues to do so. This happened mainly due to market dynamics and the quick results that can be obtained by Chemical farming. Chemical farming technology was generally considered to be a good solution to improve crops by rectifying the shortcomings in traditional farming ways .It was projected as a sustainable technology for improved results after a few years of its introduction. But even after 40 to 50 years of its use, farmers the world over are still struggling to get any sustainable achievement in agriculture through Chemical farming. They are also facing several problems affecting agricultural yields due to the increasing number of pests and diseases and decreasing soil fertility. It is now being proved that Chemical farming technology is ,in fact , not a good solution for long term application.

2.1 Agriculture in India

Before the British conquest, agriculture in India was part of a traditional way of life. It was not an economic activity. In the autonomous Indian village, agriculture was the basic life activity of the people. It's major function, (if an integrated life activity can at all be analyzed in terms of functions), was to fulfill life's basic needs. The needs of the Government, of the market, and of industry were all secondary to this function.

Agricultural practice was naturally organic, self-sustaining and strengthening of village life in many ways. An organic relationship existed between the village and its surrounding forests too. Forests supplied food to the cattle, clean air for the crops, held and recharged the aquifer of the land, supplied fuel and timber for implements and construction. Cattle played a prominent role in this agriculture. They not

only supplied the manure (transferring the fertility from forest to agriculture) to a farm, but also became the prime source of draught power. Irrigation for the entire village was largely maintained by the village community –by connecting the larger irrigation network with the local one.

Exports of agricultural produce, such as spices, cotton clothes, medicinal /aromatic produce and Sandalwood, were major items which brought silver and gold into the country. Comparatively, Indian agriculture was the best among all in this period (Dr. John Augustes Vodeker, 1893). This was the golden period of Indian Agriculture.

The first attack on this self-sustaining agriculture took place in the form of heavy burdens of tax imposed on it by Britishers. This altered the farmers' relationship with his farming land. Very soon, the tax increased to over 50%. This burdened the cultivators heavily and in turn ,had its effects on the infrastructure that farming depended on. The forest policy of the British Government came as the next major attack. In reserving the forest for industries (railways and ship-building), the farming community was denied the use of forests ,thereby breaking the organic link between forest and agriculture. Further, local irrigation was made to decline by starving it of resources. Indian farmers were forced to cultivate new crops like cotton, jute, sugarcane, tea, and indigo, which were needed as raw material for industries. This 'forced agriculture' affected the farming community adversely.

Under the impact of altered land relations imposed by the British, the constraints imposed on Indian agriculture for well over a century (through their forest policy, negative attitude towards local irrigation and due to forced agriculture etc.) it started losing much of its vitality. In spite of these adverse situations, the productivity of Indian agriculture still continued to increase even during most of the 19th century. Even with so many constraints, at the dawn of Independence, the contribution of agriculture to the national GDP was still more than 65%. But the negligent attitude of our own Government towards agriculture continued after the British rule. As a result, we witnessed a huge decline in its contribution to the national GDP. By the year 2005, this had reduced to only about 25%.

2.2 Green revolution.

In order to meet an increasing demand for food and to respond to an unbalanced demand-supply ratio post independence, chemical farm inputs like fertilizers, pesticides, fungicides, herbicides, etc. were introduced to Indian Agriculture with the objective of increasing yields. This new way of farming was termed as “the Green Revolution”! The Green Revolution package was introduced in selected pockets in a few states like Haryana, Punjab and Western UP. But its impact was felt in the entire country.

Concentration of resources in these pockets implied a total neglect of the other regions.The aggregate rate of growth of our agricultural production reduced as a result. Chemical farming led to the decline of all traditional technologies and traditional resources.

Perhaps the greatest impact has been on traditional varieties of seeds. Thousands of traditional varieties of seeds, tested and evolved over centuries by Indian farmers, started disappearing from the market and from farmer families in less than a decade. The “high yield” seeds (laboratory tested in some cases for merely a year or two) started gaining ground in Indian agriculture. This lead to all sorts of diseases and pest attacks on crops. Simultaneously , the soil started reacting to the impact of chemical infusion into it.

Chemical fertilizers and pesticides not only killed most of the micro-organisms that played the role of revitalizing the soil, but also removed valuable micro nutrients from the soil. The Soil saw a great decline in its fertility. Farmers started depending on chemical inputs to produce crops. With the decay of indigenous resources, agriculture all over the country became dependent on industrial inputs. Farmers not only lost control over agricultural operations but also could no longer produce according to their needs. They now produced primarily to pay for the inputs.

At one time, knowledge of traditional agriculture was a form of village wealth. Farmers and seed sellers were equipped with this traditional knowledge. But with the introduction of conceptually new agricultural techniques (based on the use of chemicals to produce crop) the knowledge had to come from agricultural universities and agricultural service centers. Most of the sellers of seeds, fertilizers and pesticides were (and still are) unaware of and technically unequipped for applying indigenous agricultural knowledge. To procure quality seeds, unadulterated fertilizer and pesticides remains a challenge for a common village farmer.

The residual effect of agro-chemicals in the soil led to many new forms of diseases accompanied by a decline in the nutritional value of food. Soil fertility has been continually dipping since the use of chemicals. The cumulative effect of all these factors raises a question about the sustainability of this agricultural system . Due to the introduction of several agro chemicals in the soil over a prolonged period, the organic nutrient cycles of the soil have been eliminated .The capacity of Nature's self-sustainability is disturbed. At present the world is still fighting for food security, production and sustainability. This is compelling all the Governments across the globe to consider the challenges of Chemical farming and develop solutions for them.

3.0 Few Definitions

3.1 Ecological foot print.

Some people live on very minimal means while some need a lot of things to live. The raw materials for all these “things” we need are grown in farms, forests, gardens, are found in mines, water streams etc. Then these raw materials are further processed into manufactured goods in factories which occupy a lot of space on the earth. If people use more of things, then more fields are required to produce the raw material. The area of fields needed to grow the required amount of things for an ordinary human being of any certain village or area to live, is called the ecological foot print of that person. It is measured in units of hector.

A person living in the city generally requires more things than someone living in rural areas. Therefore, a city dweller also requires more fields to grow or produce the raw material for the things she/he needs. Therefore the ecological foot print of a city dweller is larger. People in some regions of the world survive on very little. Hence their ecological foot print is generally smaller. The ecological foot prints of people living a lavish life in expensive cities of the world is higher. The lesser the field area required by a population, the more people can be fed on the same area of land. Higher the ecological footprint, the lower the number of people who can be provided with basic amenities.

3.2 Food distance (food mile)

In urban areas ,whatever we eat is generally produced in some place other than where we live. The distance between us and that place of food production is defined as food mile. Suppose you live in Madhya Pradesh and the mango you eat is collected from a tree in Andhra Pradesh, the distance between you in Madhya Pradesh and that tree in Andhra Pradesh will be the food mile. Generally, it is measured in miles. The longer the food mile, the more energy is required to supply the food to you.

This energy is acquired by using organic fuel and the increasing use of such fuel is becoming more and more harmful for the environment. The food supplied from faraway places is also generally more expensive. So, lower the food mile, the better for us and our environment as well. In simple words, the more you consume grain, fruit, vegetables, spices and other things produced in your village or your own farm, better for you as well as the environment.

4.0 Natueco Culture

The word "Natueco" combines two words together, "Natural" and " ecological"!

Natueco culture is a way of farming which is based on imitating Nature through critical scientific methods to strengthen the ecology of a farm!

Natueco has been conceived of as a holistic way to meet our farming and food requirements. It addresses serious issues of a farm like:

i. how to stay in synergy with Nature without burdening it;

ii. how to reduce dependency on external inputs to a farm; and

iii. how to work scientifically within the available resources in the surroundings of a farm, without harming its ecology and at the same time gaining the highest benefits from it.

4.1 Beyond Organic :

The features of Natueco culture distinguish it from the "Natural Farming" and/or "Organic Farming". Natueco Farming can be termed as "Beyond Organic Farming".

"In Natural or Organic farming, farming is done trusting Nature through the empirical wisdom of the ages. In Natueco Farming, on the other hand, farming is done by knowing Nature more and more and better and better through critical scientific inquiries and experiments. It is an evergrowing, novel, unique, participatory tryst between man and Nature!

Natueco culture and Critical Scientific Agriculture became synonymous words. The major features of scientific farming were also the basic features of Natueco Culture!"

~ S.A.Dabholkar

5.0 The Vision

Natueco has the vision to see every farmer prosperous and successful, to see every consumer healthy and happy and to see Mother Nature thriving in our cultivation. Natueco is scientific in approach and spiritual in its essence.

When we don't exploit Nature, when we work in harmony with natural laws, when we do not focus on yield but rather work with an intention to nurture the soil which subsequently nurtures its produce and hence our healths; farming does not remain merely a commercial activity but becomes a service to Nature and to the society.

This farming science is now being adopted and promoted by many young farmers in both rural and urban areas .They are reaping its benefits :lower consumption of resources and more value in terms of high quality yield.

One of the objectives behind the promotion of Natueco is to make people understand the difference between an activity carried out only for commercial objectives and an activity carried out with community spirit.

Any activity becomes self sustainable when people contribute their efforts, share resources, co-create a product and share rewards rather than competing with each other for exactly this cause! Our religious places(the temples, mosques, gurudwaras and churches) are all examples of how people unite under a common vision and contribute selflessly for the benefit of all.

Similarly, when farmers unite for the common good of individuals, their families, society; when they change their approach to farming from growing only cash crops to cultivating food for the people; our entire society would change for the better. Farming is the core activity of human society and when this core changes, every other layer will benefit from this positive change.

When the farmer learns to become truly self sufficient in terms of knowledge, resources and approach; when a farmer learns what he is doing against himself and against society, he can undo the harm that has been done in the past few decades.

The farmer has his first duty towards Mother Earth : to protect her delicate balance. His second duty is towards his family and community : to provide sustenance and health .His third activity and duty is to offer the harvest of his labor to the world, to provide food in a spirit of selfless service and not as a competitive commercial activity. Such a sense of farming makes a farmer richer in far more aspects than

through mere cash!

Farming is not about getting more yield in whichever way possible or earning more money by saving time and effort . It is about being able to grow quality produce continuously and sustainably! It then becomes an ongoing service! Service to Mother Earth and Mother Nature, even as we fulfill the needs of the community. It becomes like offering the crop as Prasad(an offering to God/Life) . Such farming leads to plenty for all .All share the same blessings of abundance without discrimination.

Many farmers are unaware of the exploitation and loss of opportunity that they are experiencing due to wrong farming practices.

When the farmers of India ,be they from the Punjab, Gujarat, Maharashtra or anywhere else in the country, will rise up and refuse to become slaves of a corrupt system; when farmers will decide to work for the highest good of their own community and the people of India, much will change in society.

Promoting Natueco is one little effort of ours in this direction of awakening farmers!

Let us together spread the awareness and benefits of adopting Natueco farming : being richer by being in harmony with Nature, seeing farming as an enriching service to the community , adopting the occupation of natural farming as a philosophy and a way of life and not merely as an activity to earn ones livelihood.

5.1 The visionary

Shri Sripad Dabholkar was the visionary behind Natueco Science! He dedicated 40 years of his life to finding out sustainable solutions for the Indian farmers' apathy which was consuming the farmer community in 1960s.

Shri Shripad Dabholkar was a mathematician turned horticulturist . He taught 'Natueco Farming' to the world as an exact science of Farming.

After leaving behind his own family and home , he had set out on a journey with a warrior's determination to offer a single solution to all the problems of the farmer community in India. He changed himself from a mathematician to a botanist, ecologist, environmentalist, horticulturist and a farmer to reinvent farming as an exact science independent of any individuals farming skills.

Natueco science to him was just one way of integrating these three aspects. His efforts to make farmers into self directed learning groups(whom he called as Prayog Pariwar) or his stress on venturism to

develop true entrepreneurial farmer or his understanding of the deep connection between consumer and the producer(which he called 'prosumership') was all intended to help an individual integrate his living or lifestyle, his earning or livelihood and his learning (defined as an ability to grow both inner as well as outer dimensions) into one seamless world resulting into not only plenty for him but eventually " plenty for all, forever".

In his book, "Plenty for All" he has explained about the Natueco Science and its exactness.

He was also an educationist or a researcher who understood how to integrate living, livelihood and learning into one homogenous canvas. He was named as "Venturananda" after his various successful community ventures into many fields of life skills and education.

Readers are recommended to read this book along with the book " Plenty for all" .

5.2 Philosophy :

Philosophy of Natueco system is to live and let live with joy, ease and grace!

Natueco is a science of life in and around Farms. Fundamentally Natueco believes that "Where there is Life, there is a flow of Energy". Therefore Natueco also indirectly deals with the flow of energy around a farm.

It's objective is to create an occupation where learning, living, livelihood, love and laughter (5Ls) is generated along with the work. Working in a Natueco farm is not only about working in a farm to produce an output but it is about living in symbiotic relationship with the farm and its surrounding.

5.3 The spirituality:

Natueco is for those who firmly believe in living a life of abundance, fearlessness, love, and believe in living non-aggressively. Paradoxically, it is also about maximizing the farm output. To understand this paradox, let's elaborate it further.

In an age where farming is considered as a source of income, Natueco brings home the point that such activity needs to be holistic and should stem from a larger vision. Mere learning and practicing a few skills can never be a substitute for this larger understanding and vision for life. Natueco farming and its practice requires one to draw connections of their life with this culture and live in sync with the other elements in their immediate environment. The love and the nurturance provided to the plants in a natural environment creates positive energy and healthy environment. For instance, healthy soil with balanced composition of elements and microbes improves not only the health of the plant but also transcends into

the life of people interacting with this environment. Thus, it is not just a science but also a culture, such that it can be understood in any local context without any barriers of language, conventional education, region, etc.

Those who want to learn the art of living, the art of being free and at the same time want to earn their livelihoods with dignity and non violence can only appreciate and make the best of this science. And those who look at their farms with only commercial motives may get disappointed with Natueco farming if they are not ready to change some of their fundamental beliefs about life.

In a nutshell, Natueco is about living a rich life with ease, grace and dignity!

In a nutshell,
Natueco is about living a rich life
with grace and dignity!

6.0 Natueco Science

Nature has developed its ecology and continues to do so since billions of years, by utilizing its own resources within their availability; without depending on any external resources and creating an abundance in its ecosystem. With its abundance, this ecosystem nurtures higher and higher complexities of life processes throughout their evolution.

Natueco Culture is a scientifically developed Farming system taking clues from this trait of the Nature, aimed towards abundance without external inputs to a farm and keeping the scope of enhancement of knowledge wide open through individual experiments and experiences!

Natueco Science is a science of harvesting maximum Sunlight available on earths per square foot of area using farming as a medium. The focus is on conservation of energy than on mere farm output by weight. It emphasizes optimal and efficient use of soil, water and labor.

Nature's food chain starts with synthesis of carbohydrates in green plants. It then runs through various macro and micro “consumers” and ultimately ends into brown mass of decomposed organic matter, before releasing its mineral elements in the air and soil. All natural aspects, which can be incorporated in accelerating the biomass production, need to be used to their optimum level to harvest maximum richness of Nature.

Thus, Natueco Farming emphasizes on `Neighborhood Resource Enrichment' by `Additive Regeneration' rather than through dependence on external and commercial inputs. It focuses on the four main areas of a plant for a good quality crop.

i) SOIL-Create a soil with best primary productivity by recycling the biomass and by establishing a proper energy chain.

ii) ROOTS-Focus on development and maintenance of white root zones of the plant for efficient absorption of nutrients.

iii) CANOPY-Focus on harvesting the sun light by proper plant canopy management for efficient photosynthesis.

iv) EXTERNAL RESOURCES-Focus on minimizing the use of external resources including water to reduce dependency on the secondary productivity of the soil.

It maximizes farm output with minimum input in energy terms. Its goal is to

maximize carbon or biomass of the soil (factors of Primary productivity).

In Natueco cultivation harvesting of Sun energy is given prime importance, coupled with nursery soil built up through use of all the plant parts. In Natueco, one needs to understand the principles on

his/her own initiatives, innovating continuously with scientific knowledge. Once this attitude is established, Natueco promises "Plenty for all".

The answers given by Natueco science to our farming and food production needs are indeed complete and beneficial. Natueco farming teaches us on how to cultivate an integrated view with the Nature & its resources while working in our farms for fulfilling our needs.

6.1 Productivity of a farm:

Productivity of a farm (also called visible productivity) is a combined effect of 'Primary Productivity' and 'Secondary Productivity' and is measured as dry mass/ per hectare.

6.1.1 Primary Productivity

Definition : Primary Productivity of a farm is the productive efficiency of land without any external input.

6.1.2 Secondary Productivity

Definition : Secondary productivity is defined as the incremental productivity of soil achieved over and above the primary productivity because of external inputs like water, fertilizers, pesticides, etc.

6.1.3 How to measure Productivity of a farm?

'Primary Productivity' is measured in terms of output efficiency (dry mass/ per hectare/KL of water consumed) while 'Visible Productivity' is measured in terms of gross output (dry mass/per hectare). Hence with more addition of external elements to the soil it is very much possible that while 'Visible Productivity' seems to be going up, the 'Primary Productivity' of the soil is going down.

Natueco Farming enhances the Primary productivity of the soil and establishes a firm correlation with use of energy and water as a resource.

6.2 Key aspects of Natueco

6.2.1 Focus on the mother and not the child

When a mother is healthy she looks after the child's need all by herself. A sick mother cannot deliver healthy babies. The same principle is applied to mother earth and the crop. Therefore, Natueco farming focuses completely on how best the mother earth can be nurtured and made strong and healthy. Natueco focuses on nurturing the soil and creating conducive environment for the best yield to manifest rather than intervening with the Nature and disturbing natural rhythm of crop cultivation.

6.2.2 Focus on strategic thinking than short cut means

Natueco farming is a growing method, a system where new improvisations are continuously sought and added for more benefit. Every practice in Natueco farming comes from strategic thinking about how best to utilize Natures' resource and potential of the crop. The short cut means can give immediate results but they make the system weak in the long run and hence threatens its sustainability.

Natueco farming does not have cutting corners! Every aspect of farming is given due importance. Every aspect is studied and analyzed in relation to other factors and the conclusions so derived are then applied to the entire farm system making it stronger with every improvisation. In thisos respect, Natueco is a closed loop system with provision of improvement built in it.

6.2.3 Focus on developing values in farming as an occupation

Natueco farming is not just a scientific farming approach but it also promotes human values like compassion, harmony & service. It highlights that it is important for farmers to have high self esteem and greater human values, that they realize the value and impact of their work on the society. Farmers like everyone else have to become learned, responsible and aware citizens. Natueco offers them a platform to practice this in their work, by adopting more sustainable means of cultivation and right vision about agriculture as an act of service.

6.2.4 Focus on uniting farmer community of India

Natueco also aspires to unite the entire farmer community of India, so that the much needed change can find momentum. Agricultural practices in India have to go through this revolution if people have to sustain their food resources without compromising on their health and without causing ecological damage. If Natueco reaches to only a few farming communities, its benefits will never reach to the larger society. Thus to have a true impact on food values, to see organic produce replacing conventional produce laden with chemicals , Natueco has to be adopted by every farming community.

6.2.5 Focus on Self Sustenance & Self Learning

Natueco farming teaches people to adopt farming as a viable, sustainable and profitable occupation. It teaches entrepreneurship and self learning creating a winning livelihood for the farmers. Natueco gives farmers the right context and knowledge to make their work a creative process which transforms their occupation into a celebration.

6.2.6 Focus on 'Prosumer' Society

In the society today the farmers and consumers are two separate entities. The gap between these

two entities results in many challenges in the food security. Natueco promotes 'prosumer' approach where consumer and producer are integrated and operate as one unit. This way the resources are better utilized and needs are better fulfilled. Farmers and Consumers are not separate here (PROducer+conSUMER= PROSUMER) they understand each other's requirements and work together to achieve food security and food abundance for all.

6.2.7 Focus on enriching Bio Diversity

Natueco removes a farmer's focus from single type of cultivation in isolation from others and makes the farmer focus on enriching bio diversity in his produce. In the Natueco approach all cultivation can be grown in synergy with each other and thus a rich ecology is developed within a farm where not only plants but birds, insects and other life forms find a very supportive environment to thrive. This bio diversity within a farm helps in creating long term sustenance and an overall enriching experience for the farmer and those whom he serves.

When the ecology of a farm is diverse, we gain more from the exchange happening between various forms of life forms. Mature sustains herself better in a balanced ecology. We do not need to put more efforts in managing the crop. This aspect of Natueco greatly benefits both farmer and Nature. This has been completely overlooked in traditional farming. Much of our bio diversity has been lost as a consequence. With Natueco, we can regain bio diversity and restore the natural balance of the land.

7.0 Major features of Natueco

To recapitulate, the major features of Natueco culture are:

1 Harvesting the Sun
2 Recycling Process
3 Establishing proper energy cycle and energy chain as food chain.

8.0 Basic Principles of Natueco :

1. The first principle of Natueco culture is the establishment of canopy index of a plant at the earliest so that the plant will be capable of taking full advantage of the Sunlight it has to harvest.

2. The second important principle is that only matured leaves of a plant are capable of optimum harvesting of Sunlight.

3. The third important principle for having optimum photosynthesis in Nature is that there should be matching storage organ growth in plants at the time when optimum photosynthesis is taking place in the matured leaves.

9.0 Understanding Plants

9.1 What do plants need to grow properly?

Plants need 104 elements. Out of which 4 primary elements, carbon, oxygen, nitrogen and hydrogen are taken from the atmosphere. The rest of the 96 elements are taken from the soil.

The ecstasy of Nature is that these 4 elements constitute 98% dry weight of the plant structure with carbon 44%, oxygen 44%, nitrogen 2 to 4 % and hydrogen 6%. Remaining 96 elements constitute only 2% of the plant. But for our nutrition, this 2% of plant plays a vital role.

9.2 How do we provide for these 96 elements to the soil?

While in conventional farming these elements are fed to the soil in the form of “micronutrients' through chemicals, in Natueco farming, these can be provided by following natural elements which are naturally and abundantly available in and around a farm. For example:

- Tender leaves
- Mature green leaves
- Flowering stage plant's leaves, branches, stem, flower and their roots
- Dried Leaves along with the decomposable parts of the plant
- Ash of the thick parts

9.3 Why do plants need water, if none of the essential elements come from it?

Water is needed to act as a medium for exchange of ions between the soil and the roots. Then it becomes a simple chemical process in which the elements from the soil make chemical combinations with the Hydrogen ions available in the water, the element in this combination is then absorbed by the plant and Hydrogen is released back in the soil through root

10.0 Let us Recapitulate

To put together all that we have elaborated in this book so far,

1. The Primary Productivity of a farm is the KEY FACTOR to determine its quality of the visible productivity (yield).
2. The soil with good primary productivity helps in harvesting optimum sunlight
3. This helps in efficient photosynthesis in a plant
4. Hence the plant gives better yield with quality nutrients available in the crop.

With these fundamental scientific requirements of a plant, Natueco teaches to create your own soil. The soil such created helps a farmer to do quality farming irrespective of the soil quality naturally available in his farm.




11.0 Natural resources available to a farm

While soil is the principal element of a farm, Natueco science has established a farms relationship with few other natural resources too which contribute to a farm directly or indirectly.

In all, the natural resources which play important role in the plants' growth as well as into a farm's development are :

AIR

WATER

SUNLIGHT

SOIL

MOONLIGHT

DEW

HUMIDITY

SOIL MICRO-ORGANISMS

OTHER PLANTS IN THE SURROUNDING

ANIMALS

STONES

MAGNETIC FORCE; DIRECTION

SLOPE

1 Air

4 main constituent elements of a plant are obtained from Air accounting for 98 % of plant's nutritional requirements.

Elements	Percentage (%)
Carbon	44
Oxygen	44

Elements	Percentage (%)
Hydrogen	6
Nitrogen	2-4

2 Water

Acts as a medium to carry minerals to plants through roots.

Acts as a solvent to dissolve minerals as plants take them in dissolved form.

Regulates temperature of a plant.

3 Soil

Serves as a medium for plant growth.

Defines primary productivity of a farm

2 % of elemental requirements of a plant comprising of 96 non-constitutional elements are supplied by soil.

Supports the microbial activity important for the plants' active growth and important for the symbiotic relationship among of the natural elements to maintain soil's fertility.

4 Sunlight

Required for photosynthesis.

Sun light absorption in a plant and the rate of Photosynthesis are directly proportional to a plants Leaf area (leaf index and canopy). Hence the amount of food produced by a plant depends on the plants own foliage which in turn depends on overall growth of a plant.

Controls the different season and hence the temperature of the surroundings.

5 Moonlight

Impacts the movement of water inside every life form.

Drawing nutrients and water from the earth depends up on the intensity of moonlight and the

phase of the moon. So Harvesting from different types of plants must follow the cycles of the moon: For example , during the new moon(Amavasya) harvest oilseeds, food grains, timber etc. as water content is minimal at this time. During the full moon(Purnima) Harvest juicy and ripened fruits, as the water content is at its peak at this time.

6 Dew

Plays an important role in rain fed farming.

Maintains soil moisture.

Regulates temperature.

7 Humidity

Directly proportional to water loss through transpiration.

(It is advised to water the plants in the evening because roots in a plant grow at night)

8 Soil Micro-organisms

Decomposition of biomass.

Converts unavailable form of elements to available form.

Manage the porosity of the soil.

Helps in developing humus.

9 Other Plants in the surrounding

Provide biomass for mulching for moisture conservation.

Provide ash when burnt.

Conserve soil and water.

Maintain soil temperature.

Increase carbon.

Provide in situ Nutrition.

Shade to earth, shelter for birds, food for humans.

Biggest source of taking nutrition from the deepest portion of the soil.

Control micro-climate of the farm.

Reduce carbon dioxide.

Provide oxygen during day time.

Source of energy for all beings.

The only source for harvesting, storing and converting sunlight it in food chain

10 Animals

Rodents: Dig the soil and increase porosity and water holding capacity.

Animals: Fastest source to extract potassium and nitrogen for the soil. Animals eat biomass and excrete within 24 hours. There excreta contains most of the nutrients required by a plant. (Urine- Nitrogen, Salt, Acids) (Dung- Potassium, Nitrogen, Micro-nutrient, Microbes).

Earthworms: Soil turner, bring minerals from well below the soil to the top soil to replenish deficiency. It enriches the soils with enzymes and bacteria which are helpful in plant growth.

Birds: Controls insect and pests on plants, bird droppings act as manure. Propagate seeds from one place to another.

11 Stones

Used as mulch.

Stone powder provides fertilizer.

12 Magnetic Force; Direction

Plantation in North-South direction of a farm ensures better harvesting of sunlight.

Plantation in North-south direction increases the energy in plant growth leading to energetic food for all living organism.

13 Slope

Farms with slope towards East ensure effective flow of water in a farm using gravitational force.

(most of the rivers in our country flow eastward)

Therefore construction of water harvesting structures in a farm are recommended towards East.

12.0 Components of a Natueco Farm

Important components of a Natueco farm are

1. Natueco Soil
2. Knowledge base
3. Seed treatment
4. Bio-diversity
5. Live fencing
6. Data base

Let us learn about them one by one.

12.1 Natueco Soil :

The two main components the Natueco soil are

Amrut Jal

Amrut Mitti

12.1.1 Amrut Jal

Amrut Jal is a solution of water, jaggery, cow dung and cow urine containing a very high number and diversity of hermetic micro-organisms. The chemical elements present in Amrut jal make the soil fertile and the micro-organisms increase the chemical and physical qualities of the soil.

Materials required to prepare Amrut Jal (the cost of the raw material is also included to give an idea of requirement as per the individual size of the farm. This costing is applicable if all the items are to be purchased. If these are available in a farm, the cost reduces further).

S.no	Material / Labor	Quantity	Rate (Rs)	Total Cost (Rs)
1	Fresh cow dung	1 liter	2.00	2.00
2	Cow Urine	1 liter	2.00	2.00
3	Water	110 liter		0.00
4	Jaggery *	50gms	40.00	2.00
5	Labor	1 hour	150	20.00
Total cost for 112 liters of Amrut Jal -			Rs.	26.00

Amrut Jal is required in the quantity of 1L per sq foot per plant.

Cost of Amrut Jal per liter would be approx. Rs.0.25

*In case Jaggery is not available, use 12 over ripe bananas or 6 guavas or 12 jack fruits or 500 ml of sugar cane juice or 12 cashew nuts fruits, whichever is available.

Importance of the key ingredients of Amrut Jal

1. **Cow Urine**

- Contains urea and other mineral salts.
- Acts as insect repellent.
- Source of Nitrogen.
- Source of acids

2. **Cow Dung**

- Culture medium containing anaerobic micro-organisms for decomposition.
- Source of nitrogen and potassium.

3. **Jaggery**

Food for the growing micro-organisms. Used for fermentation to create bacterial life.

Preparation of Amrut Jal-The Process	
Step I	Make a fine paste of 1 kg cow dung with 1 L of cow urine.
Step II	Add fine paste of 50 gm of jaggery to the mixture of Cowdung and Cow urine.
Step III	Transfer the mixture to a container containing 10 L of water.
Step IV	Stir the mixture, 12 times in clockwise direction and 12 times vice versa. Cover the container
Step V	Stir as above indicated thrice a day for 3 days. The mixture is kept for 3 days as the microbial count is its maximum on 4th day and beyond this the microbial count starts
StepVI	On the 4th day, transfer the solution to a tank containing 100 L water and mix well. The solution is ready for application.

Application of Amrut Jal at the rate of 1L per square foot per plant

Year	Days interval
1st	15
2nd	30
3rd	90
4th	180

Advantages of Amrut Jal

- Contains plant growth promoting micro-organisms.
- Can be used in place of water for better plant growth.
- Helps in faster decomposition of biomass.
- Used in seed treatment.
- Promoter for feeder roots growth.
- It increases vital energy of the plant.
- It provides anaerobic microbes to make Amrut mitti

12.1.2 Amrut Mitti

Amrut Mitti is a soil prepared from biomass, Amrut Jal and earth (soil). It is a soil that contains all the essential elements that are needed by a plant for its growth and development. It consists of 50 % of biomass and 50 % of activated mineral top soil.

Timeline: It takes about 110-150 days to prepare Amrut Mitti

Area required:- 12 ft X 5 ft

Materials Required

s. no	Raw material	Quantity	Rate (Rs.)	Total (Rs.) **
1	Amrut Jal	400 L	0.25	100.00
2	Biomass (C4 plants like maize, bajra, jowar and sugarcane leaves are preferred.)	85 kg (approx)	3.00	255.00
3	Fine Soil	60 liter	0.00	0.00
4	Sand	10 kg	0.50	5.00
5	Seeds (a mix of maize, methi, coriander, gram, mung and spinach 10 gm per square foot.)	300 gms	50.00/kg	15.00
6	Labor days (including post care)	2	150.00	300.00
			Total Cost of Heap Rs.	**675.00**

**This costing is applicable if all the items are to be purchased.

Note: a. One heap of 30 cu. ft. gives 20 cu. Ft. Amrut Mitti – equivalent to 540 Litres

b. 1 Litre Amrut Mitti weighs 400 gms.

c. One heap of Amrut Mitti (20 cft) can be used for 135 sq. ft. area.

Hence 1 kg of Amrut Mitti costs Rs. 3.15 ie. 675/(540 x0.4)

Importance of key ingredients

S. no.	Items	Importance
1.	Soil	Converts minerals from unavailable form in biomass to available form.
2.	Sand	Increases porosity
3.	Biomass	Forms manure after decomposition
4.	Seeds of different plants	To supply minerals in available form and provide different cultures through the roots of each seeds' plant
5.	Amrut Jal	Facilitates fast decomposition of biomass

Procedure for making Amrut Mitti It involves three steps –

1 Heap making 3 Pruning

2 Seed sowing 4 Pruning and heap turning

Fig 1: Heap Making

Fig 2: Seed Sowing

Fig 3: Pruning

Fig 4: Pruned Plants on heap

1. **Steps of Heap making**

Step I	**Chop 100 kg dry biomass by 3-4 inches**
Step II	**Soak biomass for 24 hours in Amrut Jal**
Step III	
Step IV	**Spread thin layer of Amrut Jal soaked biomass in area of 10 ft by 3 ft**
Step V	
Step VI	**Spread another layer of biomass above the soil layer**
Repeat the process till 6th layer	
Step VII	
Repeat the process till the heap attains a height of 1 ft.	
Step VIII	
Step IX	

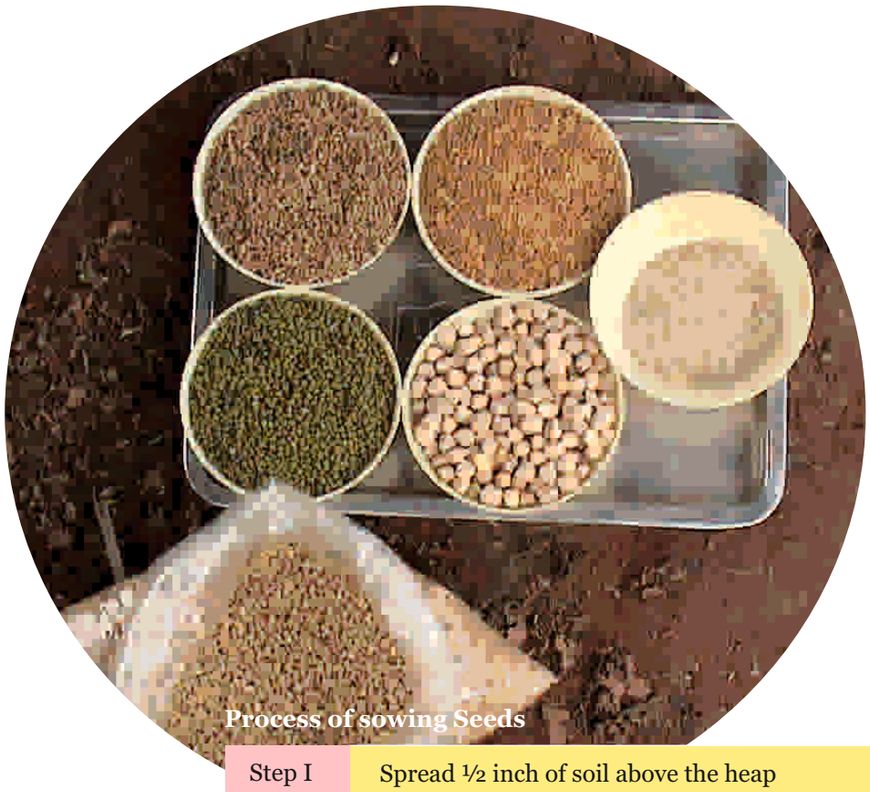
1.***While turning the heap, point should be kept in mind not to harm the microbial culture born inside the heap. Therefore the heap should be turned softly.**

Seed Sowing

Following types of seeds should be sown on the Heap according to the six rasas (shadras) of Ayurveda:

The seeds of six tastes (shad rasa) are as follows -

Sweet	Fennel seeds
Pungent	Chilies
Bitter	Fenugreek, Bitter gourd
Tangy	Ambadi, Tomatoes
Acerbic	Guarphali
Salty	Spinach



Process of sowing Seeds

Step I	Spread ½ inch of soil above the heap
Step II	Soak the 6 types of seed in Amrut Jal for 2 hours
Step III	Spread the seeds evenly and press lightly with hands
Step IV	Spread soil above it, about double the size of the seed
Step V	Sprinkle Amrut Jal to moisten the soil
Step VI	Cover the soil surface with biomass (mulch)soaked in Amrut Jal

Keep the surface moist by sprinkling Amrut Jal at regular intervals

2 Pruning and Heap Turning

Step I	Remove the mulch when the seeds germinate
Step II	On the 21st day after germination prune the plants by 25 % from the top without disturbing the stem. Leave the residue in the heap
Step III	42nd day after germination, again prune the plants by 25 % and leave the residue on the heap
Step IV	63th day after germination (flowering stage) prune the plants, keeping 0.5–1 inches from the ground and leave the residue on the heap for drying
Step V	Soak the dry residue in Amrut Jal for 4 hours
Step VI	Spread the soaked residue over the heap
	Turn the heap. Continue turning once in a week for one month
	Amrut Mitti will be ready for use after 140 to 150 days since the start of the process

Stages and purpose of pruning

Trimming 25% of the plants will allow elements found in the soft leaves such as zinc, phosphate, boron, molybdenum to mix in the Heap. Again, after 21 or 42 days trimming 25% of the rest of the grown up plants will enrich the heap with the elements found in mature leaves such as nitrogen, potassium and magnesium. On the 63rd day there will be flowers in some plants, cutting all the plants from half inch above the ground provides elements such as calcium, silica, iron and manganese. Plants roots remaining in the heap also harbor useful organic chemicals/culture.

Pruning	Days after germination	% pruning
1st	21	25
2nd	42	25
3rd	63	95

Application of Amrut Mitti: Amrut Mitti is applied at the rate of 4L per sq. ft. of canopy

What should be done to keep the Amrut Mitti fertile?

On harvesting the produce of this Amrut Mitti, the excess biomass should be mulched over it.

- After every three months, ash should be mixed in the Amrut Mitti at the rate of 30 grams / square foot.
- Amrut Mitti should always be kept covered with live cover. If there is scarcity of water, Amrut Mitti should be made in the shade and kept covered with dry grass, polythene, paper or stones, to reduce evaporation.

How to identify Amrut Mitti?

Amrut Mitti is light, soft, granular and black. Its smell is similar to that of soil after the first rain of the season. Squeezing it in your hands will not leave any mark of soil on your hands. If 1 litre of Amrut Mitti is weighed, it should weight about 400 grams.

How to examine the moisture in the heap?

Take out a handful of organic waste from about 6 inch deep inside the heap. Press it hard in your hand grip. If a few drops of water drip from it, this indicates that the level of moisture in the heap is alright. If it doesn't drip this is an indication of lack of moisture in the organic waste. If your hand gets sticky or wet as soon as you hold it in your hands then it means there is excess moisture in the heap. Due to excess moisture, micro-organisms do not get enough air and the decomposing of organic waste is slowed. Repeat this testing in different parts of the heap intermittently.

What is the process of maintaining moisture in the heap?

If organic waste like sugarcane leaves is used, usually the water poured on the heap flows over

and out of it, resulting in a deficiency in moisture inside the heap. In order to overcome this, 6 inch deep and 1 inch wide pits should be made at every 1 ft interval on the heap. By pouring water into these pits the water will seep inside the heap and moisture will be maintained.

What should be done if the heap becomes hard?

If the heap becomes hard then it should be mixed properly by turning it over. Sufficient amount of Amrut jal should be mixed in it and the heap should be spread again in its original shape and kept covered with dry grass.

What could be the reasons for Amrut Mitti falling to develop after 140 days?

There could be several reasons for this. Following are a few among them -

- The organic waste has not been chopped properly into fine pieces of 3-4 inches.
- Enough moisture has not been always maintained in the heap.
- Excess or less layers of organic waste have been laid on the heap.
- Micro-organisms have died due to not having mulch (cover) the heap.
- Living Micro-organisms have died due to obstacles in the flow of air in the heap.
- Excess of water makes the heap sticky inside. Micro-organism cannot work in these circumstances.
- Decomposing is slow due to lack of nitrogen in the heap. Need to increase Amrut Jal.
- There is an excess amount of fiber in the biomass.

What should be done to keep the Amrut Mitti fertile?

- After taking yield produced in the soil, all the left over biomass should be used as a cover on it.
- After every three months ash should be mixed in it at the rate of 30 grams in every square foot.
- It should always be kept covered with live cover. If there is lack of water, then the heap of Amrut Mitti should be kept covered with dry grass, polythene, paper or stones, so that less water evaporates.

Production from Amrut Mitti soil is as under by many farmers from different parts of the country.

s. no	Produce	Quantity
1	Rice	40 quintals/acre
2	Wheat	30 quintals/acre
3	Soya bean	20 quintals/acre
4	Ground nut	24 quintals/acre
5	Tomato	120 tons/acre
6	Sugar cane	100 tons/acre
7	Coconut	400 fruits/tree/annum
8	Grape	16 tons/acre
9	Banana	45kg/plant
10	Papaya	180 kg/tree/annum
11	Potatoes	40 tons/acre

Natueco science emphasizes understanding Nature and it's web of relationships; and then using our understanding to intervene intelligently to help Nature to enhancing it's processes for it to become more efficient and effective for a plant's growth. A true Natueco farmer must strive to understand the underlying principles behind the processes as importantly as the steps and method of each stage of Natueco farming.

12.2 Knowledge base

"Language of science should be indigenous, trouble-free and convenient to help people to understand"

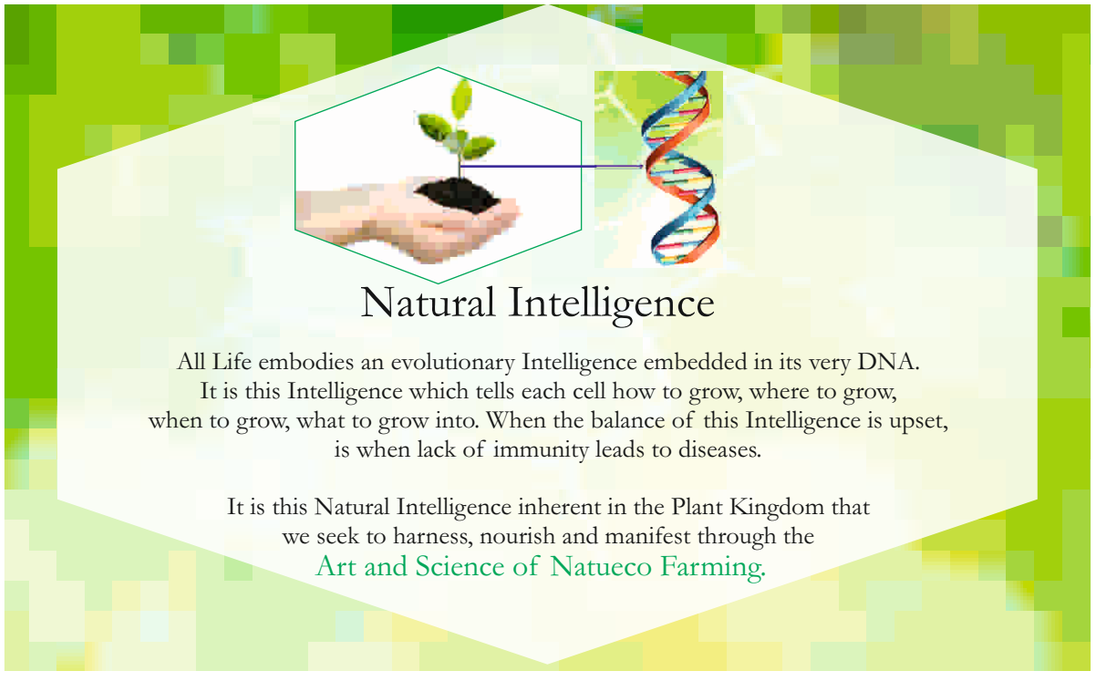
- Sri Sripad Dabholkarji.

Every Natueco farmer is encouraged to create his own Knowledge base of Natueco Science.

12.2.1 Natural Intelligence

All life embodies an evolutionary intelligence embedded in its very DNA. It is this intelligence which tells each cells how to grow, where to grow, when to grow, what to grow into. When the balance of this intelligence is disturbed, then immunity of the plant is reduced leading to diseases.

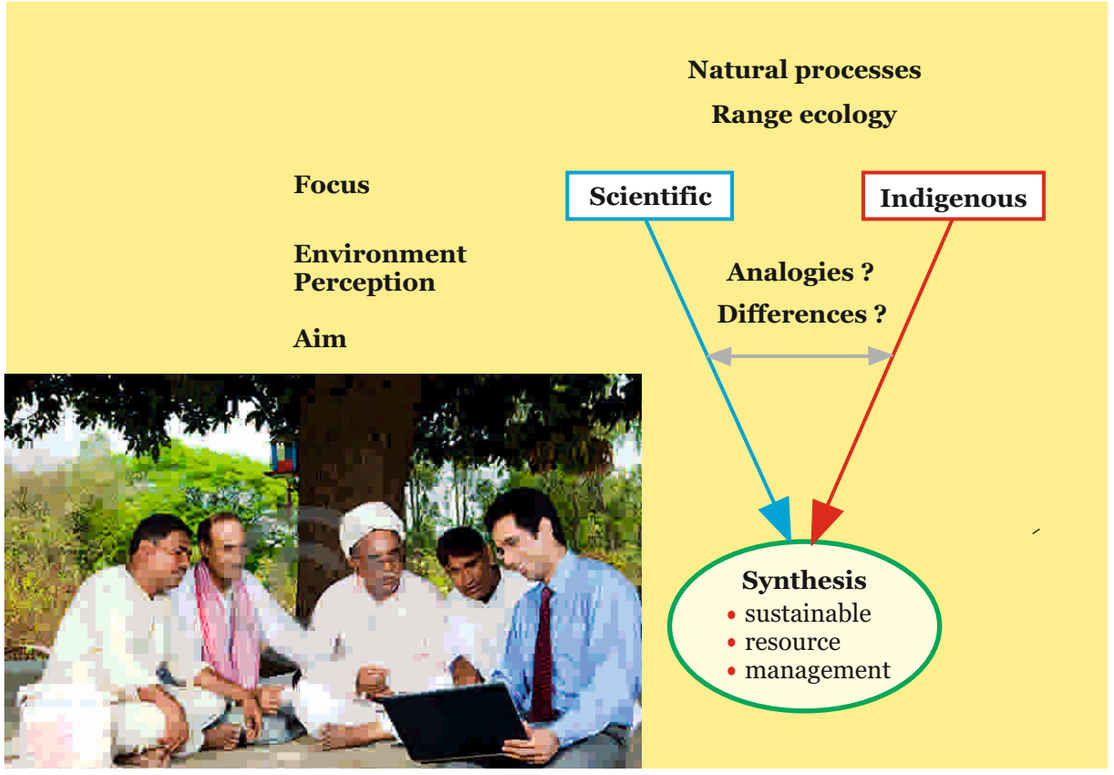
It is this Natural Intelligence inherent in the Plant Kingdom that we seek to harness, nourish and manifest through the **Art and Science of Natueco Farming.**



12.2.2 Demystification of Science

Demystification of science is generally used synonymously with traditional and local knowledge to differentiate the knowledge developed by and within distinctive indigenous communities as compared to international knowledge (sometimes incorrectly called the Western knowledge) system generated through universities, government research centers and private industry. In India few people understand the science of plants. These include students who complete their institutional study and want to become a professional and handful people who have comprehended plant science but do not adopt farming as profession. Today the bridge of Knowledge is one way, our indigenous knowledge is not transferred to universities and knowledge with universities is not transferred to demystified indigenous knowledge.

12.2.3 Demystification of Natueco Science : a depiction



Natueco Science is indegenious to the Nature and the farmer community. No expert from some school or university is required to teach this knowledge to a farmer. It is generated by individual experiences of a farmer. And such individual knowledge with the freedom to experiment is then shared across the Natueco farmers groups which are called as " Prayog Parivaar" by shri Dabholkar. The Prayog Parivaar become guides, mentors, helpers of each other and move in sync with each other and with the Nature. This way the Natueco Science gives rise to De-Schooling; arriving at the concept of knowledge by Practice, education by experiments, learning with natural instincts!

12.2.4 Natueco Farming -Energy to Energy Relationship

"Natueco
is a science of life and
life can be defined as
flow of Energy".

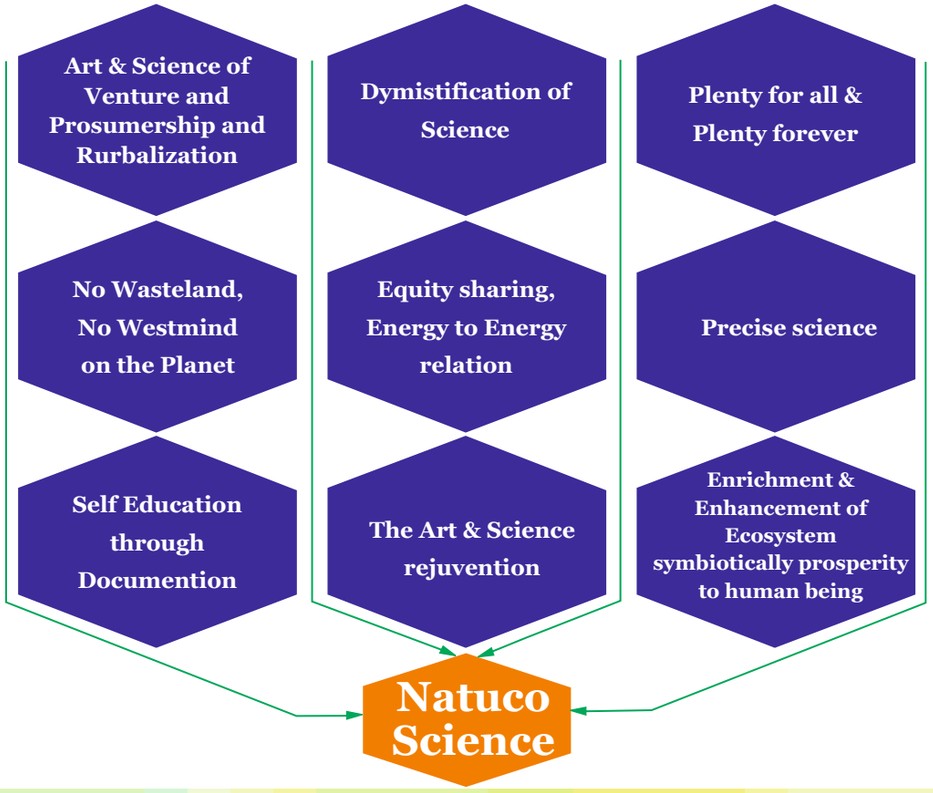
When a farmer becomes a Natueco farmer, he manages farming with energy. He creates, he nurtures and he maintains his own farm. The aspects of Brahma (creation) Vishnu (nurturance) And Mahesh (maintaining the balance) all are inculcated into the farmer indirectly which gives him abundance, joy and grace. Farming is a Dharma, a creation-when such products are consumed.

There is a strong correlation between a Natueco Farm output and the use of natural resources and use of energy in a farm.

12.2.5 Symbiotic Relationship with Nature & Ecology.

- It is the eternal truth that Nature's intelligence is the most superior among all the intelligences. So we must develop farming by mimicking Nature.
- Natueco follows the principles of eco-system networking of Nature.
- Natueco offers an alternative to commercial and heavily chemical dependant farming.
- Natueco emphasizes the harvesting of sunlight through critical application of scientific examination, experiments and methods that are rooted in neighborhood resources.
- Natueco "demystifies science" by developing a thorough understanding of plant physiology, biology, geometry of growth, physics, fertility and biochemistry.

12.2.6 Additional Principles of Natueco Science Farming



1. Harvesting sunlight

- Optimal utilization of sunlight and minimal loss
- To obtain a higher degree of photosynthesis.
- Increase the surface area of leaf/canopy to harvest more sunlight in the shorter time.

2. Stages in plant life

- Childhood: Root Development.
- Puberty: Vegetative growth.
- Youth: Branching.
- Maturity: Flowering and fruiting.
- Old age: Declined metabolic activity followed by death.

3. Medium for the growth of Root zone

- Give support and anchorage to the tap root.
- Supply nutrients to feeder roots.
- Provide moisture to plants.
- Provide good aeration to roots.

4. Food production by plants

- Increases the rate of photosynthesis.

  Plants produce 3-4 gm of dry-mass per sq.ft. of photosynthesis area a day (8-10 hrs).

Dry mass	Use
1 gm	Plant metabolism
1-2gm	Vegetative growth
1gm	Fruiting

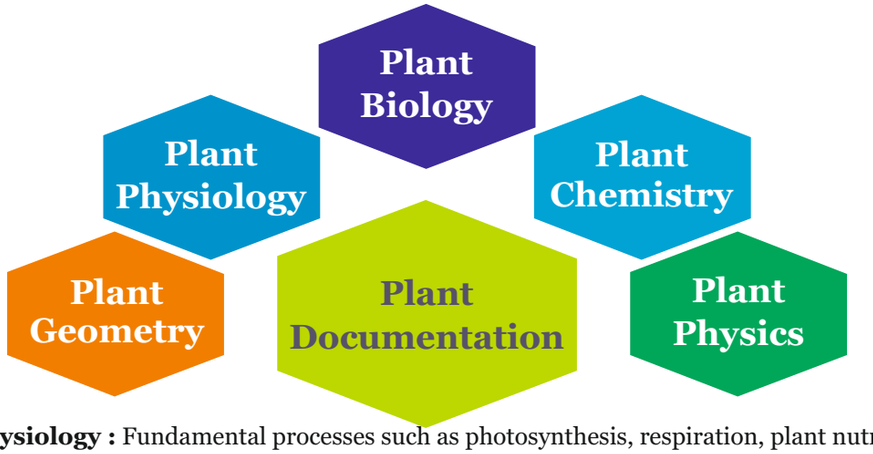
- Desired output can be obtained with knowledge of timing and place of storage of food/energy.

5. Plant biochemistry

- Understanding plant chemistry.
- Creating a micro-environment / climate which resemble a forest and understand the inter element chemical relationship.

The three areas **Natueco Science addresses to are:**

Aspects	Management
Soil	Enrichment of soil through biomass recycling
Roots	Development of feeder roots for enhanced absorption
Canopy	Proper spread of canopy for increased photosynthesis rate



6.Plant Physiology : Fundamental processes such as photosynthesis, respiration, plant nutrition, plant hormone functions, photoperiodic, physiology, seed germination.

7. Plant Geometry : Matghematics of plants vegetative growth and its multiplication along the plant growth.

8. Plant Chemistry : An example is the plant's reaction after getting Amrut jal and Amrut mitti.

9. Plant Physics : How a plant grows with respect to its surrounding.

12.2.7 10 major components of Natueco Farming

12.2.7.1 Seed Treatment

Seed Treatment is a process to ensure maximum germination and provide in situ total Nutrition for optimum growth of plants so that its produce is full of nutrition and vital energy.

Materials Required

1. Seeds to be planted.
2. Four different varieties of seeds (mixture of dicots & having less canopy and height then main seed).
3. Fresh cow dung.
4. Termite soil.
5. Ash
6. Amrut Mitti / soil of the field in which seed would be sown
7. Cow urine

Importance of above materials

(a) Volume of four different seed should be equal to that of the main seed

- These seeds are taken as they have complementary effect on main crop.
- It helps the main plant by providing nutrients to it.
- Of the 4 seeds;

Oil seeds:	Provides Nitrogen, elements and vital energy.
Coriander:	Resistant power, repellant to insect, high availability of micronutrients
Fenugreek:	Nitrogen fixation + KADURAS + Iron
Bengal gram (Chana):	Nitrogen + amino acid; weed repellant as it contains acid.
Onion:	Tikha Ras plus Sulphur + enzymes
Tomato (Khata):	Potash from leaves
Till or Muster	

(b) **Amrut Mitti / soil of the seed**

The seed will have an experience of growing in the soil in which it has to grow.

- It will become aware of the PH and the deficiency of the soil's nutrition.

(c) **Termite soil**

- It is used as binding agent, it bind the seeds, cow dung and ash.

Note : If termite soil is not available then it may be replaced by clay soil.

(d) **Cow urine**

- Contains anaerobic microbes that help plant growth.
- In presence of cow urine, the photosynthesis bacteria will develop fast.
- Cow urine has acid and act as a catalyst

(e) **Cow dung**

- Non aerobic Micro organism of cow dung helps in conveying message to soil organism and earthworms to bring the deficient mineral to top from the bottom layers (from 8 feet) .
- Attracts earthworm that provides excreta with dissolve mineral in available form near the root zone. Plants roots take this nutrition and provide it to the plant.

Process of Seed Treatment

Steps	Process
Steps I	Mix the four different seeds + 2 part of fresh cow dung + 2 part of ash + 2 part of termite soil.
Steps II	Using cow urine make paste of above material
Steps III	Make balls of 1 cm. dia of this paste and insert main seed in it.
Steps IV	These balls can be directly sown in the nursery after drying or it can be dried in sunlight and preserved to use within three years

Benefits of seed treatment

` When a seed germinates, it indicates the entrance of life force into the seed. When the seed is enclosed in soil (as in seed treatment), the microbes learn about the soil and communicate to its environment about deficiencies .This is a question of the seed's survival. This is very supportive for the plant growth.

When seeds of different species are planted together, they support each other .This helps to grow the main seed by availing relevant nutrition from the soil.

Secondly, all members of the family are involved in making seed balls and energizing the ball with their positive intentions. This enriches the process and is more beneficial to the consumers' family. While family members prepare seed balls they convey their positive intentions, feelings and emotion to the seeds . The seeds get the message of the family and behave accordingly ! They will germinate with full energy and nutrition, thereby fulfilling the nutritional need of the farmer's family and consumers .This vitally important aspect is ignored by the modern university scientist!

12.3 Biodiversity

When people consume crops grown in this way, growing and supporting each other, the World will once again begin to experience the power of Vasudev Kutumbakam (the world as one wholesome family).

Bio= Life Diversity=Variety

Biodiversity is variety of life in a given ecosystem and their essential interdependence/ interaction for sustainability as a whole. The variety of life on Earth and its biological diversity is commonly referred to as biodiversity.

The number of species of plants, animals, and microorganisms, the enormous diversity of genes in these species, the different ecosystems on the planet, such as deserts, rainforests and coral reefs are all part of a biologically diverse Earth.

12.3.1 Essence of Biodiversity:

Biodiversity in a farm indicates that flora & fauna of the farm are working with each other, helping each other in a natural and holistic way. Every one lives for helping each other in a symbiotic environment. For instance a cow eats bio waste from the farm and offers urine and dung .These helps enrichment of the soil to spawn more life in the soil .This in turn, helps flora and fauna to thrive on the farm. This is one of the examples of Nature's interdependent and mutually thriving cycles at work.

If we can relate the pattern of biodiversity to human society, joint families can be the example of it. A Joint family has biodiversity i.e. variety of relationships of different people in a family; offering love and performing duties of different inter personal relations, working for each other, benefitting each other and supporting each other. In contrast is the relationship pattern of a nuclear family.

This example depicts a comparison between a farm with biodiversity in its produce and a farm of which cultivates is mono crop. In a farm with no biodiversity, there is an deficiency of natural emotions with each other among all the natural elements of a farm. Hence the flow of energy is hindered in forming a closed loop between one of the another. Emotionless farming technique also gives rise to violence in the form as basic as destroying microbial quality of the soil and surrounding thence interrupting the cycle of the Nature. Such energy deficient farm produces crop which in turn is deficient in energy.

In our Puranas food is considered to be basic building block of life. If this block is energy deficient, the flow of energy is disturbed in its consumer too. Hence it is said that

“JAISA ANN VAISA MAN”

(mind is developed of the same universal qualities as that of the food we consume)!

12.3.2 Importance of Biodiversity:

Biodiversity boosts ecosystem productivity where each species, no matter how small, has an **important** role to play.

For example,

When a big tree falls, their dry leaves become available as food to Microbes and Earthworms in the soil. The Earthworms work round the clock for their lives but their life processes contribute to their surroundings. They eat soil and dry leaves of trees and excrete. Their excreta is rich in Nitrogen. They also bring nutrient from deep down the soil to the surface. These enriched nutrients manure the plants of short life span (Alpjeevi i.e. seasonal / annual plants) that grows in refuge of the plants of medium life span (Madhyam jeevi i.e. bi-annual plants). The life and death cycle of Alpjeevi and MadhyamJeevi plants create manure for plants of Long Life span (Deergh Jeevi i.e. perennial plants). The seasonal plants also create a constant food supply for the earthworms in the form of dry biomass after their season gets over. All these plants offer food to human beings, birds and animals and the cycle of the nature continues.

Hence the mention in our Puranas:

"JAISA AHAR VAISA VICHAR = JAISE VICHAR VAISE KARMA
= JAISE KARMA VAISA FAL"

If we allow our farms to flourish in sync with the Nature, we too become a part of this universal phenomenon and hence can generate a feeling of "VASUDHAIVE KUTUMBAKAM" (Whole world is my family).

In a farm, a larger variety of plant species indicates a greater variety of crops

Greater species diversity ensures natural sustainability for all life forms

Healthy ecosystems can better withstand and recover from a variety of disasters

Biodiversity support food security, dietary health, livelihood and sustainability.

12.3.3 How is Bio-Diversity achieved in Natueco Farming?

Bio-diversity is achieved in a Natueco farm through a concept of multi-layer, multi-tyre crop cultivation. In a limited area one can grow plants of different height (from similar habitat) in a cluster which can give diversity in produce according to our needs. This also benefits the plants to create a

symbiotic relationship with each other also reduces the water requirement of plants by capturing humidity within that area.

Two effective models of such integrated plantation are created in the Natueco farming with a bio-diversity on a limited area to benefit small farmers/ house gardens to produce the daily food requirement of a family in an effective way.

The two models are named as

(a) Ganga Ma Mandal and

(b) Ten Guntha model.

(a) **Ganga Maa Mandal**

This model was developed by a South Indian housewife. She developed the model for sustaining her family's nutritional requirement and also empowered herself through adding income to her family with minimum efforts by only utilizing the neighborhood resources to an optimum level. Bill Mollison, the agriculturist, proposed this model for domestic farming by every woman of a family to eradicate malnutrition and death of infants in underprivileged families.

Objectives

Fulfill the nutritional need of underprivileged families by optimum utilization of neighborhood resources.

Materials required

1. Land of 30 ft diameter i.e. (710 sq. ft.)
2. Seeds / seedlings
3. Amrut Mitti heaps – 8
4. Biomass for mulching – 200 kg
5. Amrut Jal @ 1 L / ft. i.e. 710L

Timeline

Ganga Maa Mandal in full bloom.

1. Within 3 months it starts producing
2. It takes about 1 -1.5 years to become fully productive.

Seven rows of Vegetables

Cucumber - 8, Bottle Gourd - 8, Luffa Gourd - 8, Amarnath - 8,
Little gourd - 8, Broad Beans - 8, Brinjal - 8

Total Redius - 30', Inner Circle - 6', Middle circle - 18', Outer Circle - 30'

- Inner Circle 6'
- Banana 4
- Papaya 4
- Turmeric 8
- maiz 16

Middle Circle 18'

1 Pudina,Basil Lemongrass
2 Fenugreek, Spinach
3 chili
4 Pigeon pea
5 tomato, Carro
6 lady's Finger Coriander
7 Onion, Garlic

Outer Circle 30'

1 Potato , Benga Gram
2 Radish Beetroot
3 Gratiola, Five leaved Chaste tree, Camphor, Scented tree
4 Malabar Nut, Ram Basil, Bishop's weed, Ginger
5 Kirayat, Aloevera, Winterchery
6 Sugarecane, Elephantfoot
7 Amarnath, Cauliflower

1½' Pathway , 1' Height Amrut Mitti Heap

Pictorial representation of Ganga Maa Mandal with crops undertaken and layout with bio-diversity.

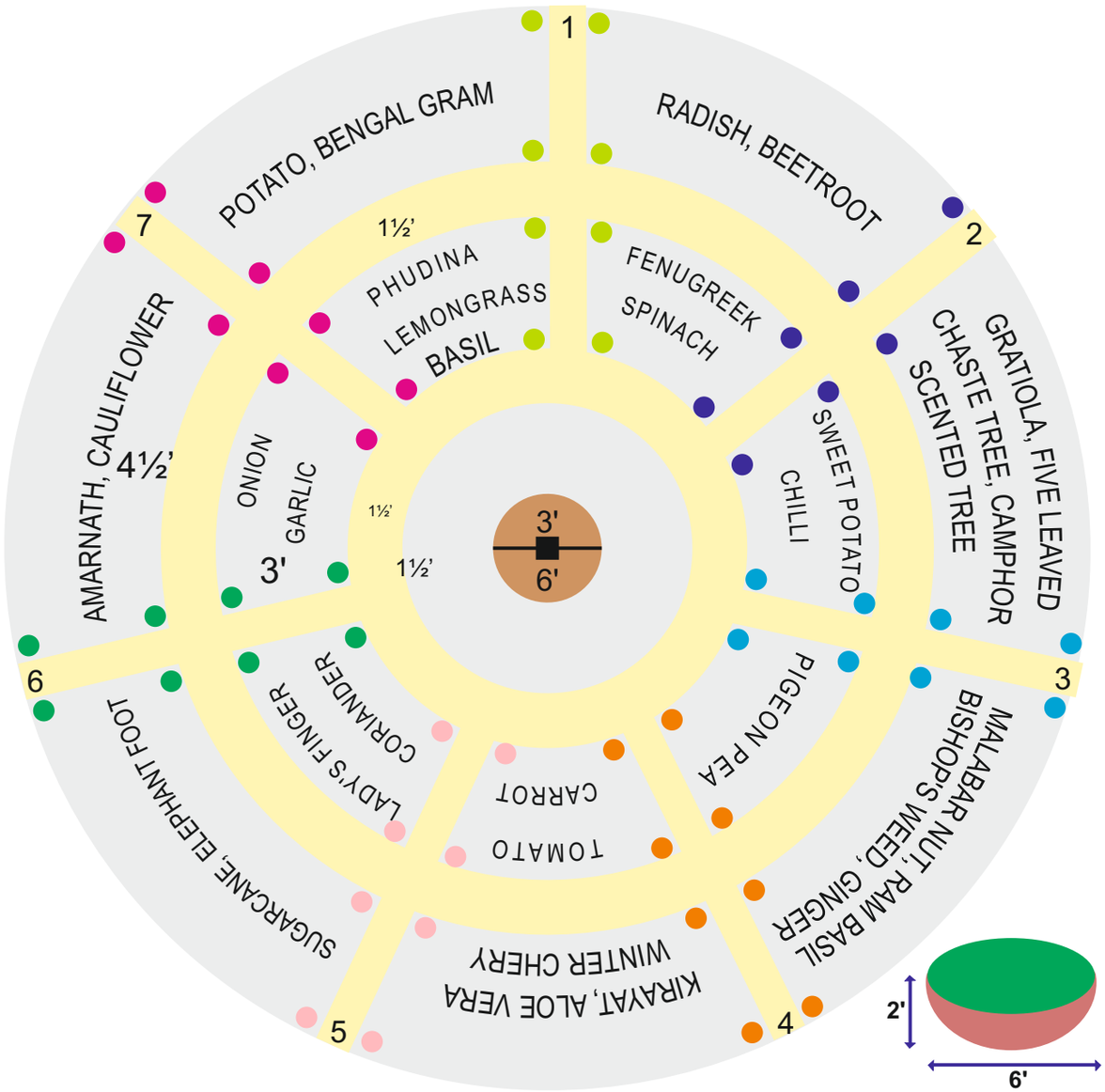



Fig : Layout of Ganga Maa Mandal

Procedure / Steps

Step I	**Clear a land of 30 ft diameter- layout as in diagram**
Step II	**Dig a disc shaped pit of 2 ft deep and 6 ft diameter-apply ash at bottom- moisten the pit with Amrit Jal**
Step III	**Fill with No.3 biomass (more fibrous) like sugar cane begesse, coconut fiber, groundnut shell, etc that has been soaked for 24 hours Amrut Jal, leaving 2 inches at top-fill the space with Amrut mitti.**
Step IV	**Fill its outer circumference with Amrut Mitti up to 1 ft and 1.5 wide.**
Step V	**Fill each part up to 1 ft and desired width, leaving the pathway**
Step VI	**Step VIPlant the seedling of plants as mentioned in the diagram**

1. **Central Circle**

S.no	Crops	Quantity	Total Production	Nutritional value
1	Banana	4	140 kg	Carbohydrates, Iron
2	Papaya	4	320 kg	Carbohydrates, salts, Vitamins
3	Turmeric	8	8 kg	Blood purifier
4	Maize	16	32 cobs	Starch

1. **Innaer Circle :** Comprises of crops for daily use

S.no	Crops	Quantity	Total Prod	Nutritional value / Benefits
PART 1				
1	Mint	-	-	Digestive disorders
2	Tulsi	-	-	Cough, cold; increase vital energy
3	Lemon grass	-	-	Herbal tea
PART 2				
1	Methi	-	1 kg / week	Vitamins, Iron and salt
2	Spinach	-	1 kg / week	Vitamins, Iron, salts and minerals
PART 3				
1	Chilli	-	3 kg /month	Vitamin A
2	Sweet Ppotato	-	1 kg /sq ft	Starch
PART 4				
1	Arhar	-	3 kg /season	Protin

PART 5				
1	Tomato	-	3 kg /sq ft	Salts, Vitamin C
2	Carrot	-	1 kg /sq ft	Vitamin A and Iron
PART 6				
1	Coriander	-	-	Salts and minerals
PART 7				
1	Cow pea	-	1 kg /season	Protin

3 Outer Circle - mainly consists of tuber and medicinal crops

S.no	Crops	Quantity	Total Prod	Nutritional value / Benefits
PART 1				
1	Potato	-	-	Starch
1	Gram	-	-	Protin
PART 2				
1	Radish	-	1 kg /sq ft	Calcium
2	Turnip	-	-	Iron
PART 3				
1	Safed Musli	-	-	Energy
2	Brahmi	-	-	Hair & memory tonic
3	Wakhand	-	-	Headache
4	Nirgudi	-	-	Body pain
5	Kapur Tulsi	-	-	Resistance power

PART 4				
1	Adulsa	-	-	Cough digestion
2	Ram tulsi	-	-	Resistance power
3	Ajwain	-	-	Digestion
4	Satawari	-	-	Energy
5	Ginger	-	500gm/plant	Cough & Cold, spice
PART 5				
1	Kadu kadyatu	-	-	Anti-malarial
2	Aleovera	-	-	Wounds,burns,skin,ulcers
3	Panphutti	-	-	Kidney Stone
4	Aswagandha	-	-	Fitness
5	Lendipepper	-	-	Milk indigestion
6	Gunj	-	-	Throat dryness
PART 6				
1	Sugarcane	-	-	Sucrose
2	Colocasia	-	-	Starch
PART 7				
1	Onion	-	-	Spice
2	Garlic	-	-	High blood pressure

4. **Pathways -** each pathway comprises of eight vegetable plants for daily use i.e. each pathway for a day

S.no	Crops	Quantity	Total Prod	Nutritional value / Benefits
1	Cucumber	8	3kg/week	Roughages
2	Bottle Gourd	8	3kg/week	Salts,Vitamins
3	Sponge Gourd	8	3kg/week	Salts,Vitamins
4	Cow pea	8	1kg/week	Protin
5	Kundru	8	1kg/week	Salts,Vitamins
6	Bean	8	1kg/week	Protins
7	Brinjal	8	3kg/week	Protin, calcium,Vitamins

Financials

S.no	Items	Quantity	Rate (Rs.)	Total (Rs.)
1	Amrut mitti Heaps	12	675	8100
2	Biomass for mulching	100	3	300
3	Amrut Jal	6000	0.25	1500
4	Seeds	-	-	200
5	Labor days (Clearing,layout,model)	5	150	750
Total Rs.				10850

(b) TEN GUNTHA model

Ten Guntha is a term for a physical area of 10,000 sq. ft. in Western India. This is also the name given to a model of farming that can sustain the livelihood of a 5 member family catering to all the nutritional needs of the family members. It not only gives the family food security but also fulfils other requirements to lead a graceful life with Liberty and Prosperity.

Ten Guntha model is the art of sunlight networking to get optimum yield and prosperity based on Natueco Science farming. It requires 8 hours labor work a day for the first 3 years and only 2 hours a day after that. A Ten Guntha model becomes sustainable within 3 years.

Objectives

1 Fulfill the Nutrition and Calories value needed by a 5 member family for a healthy life.
2 Fulfill all other farm related requirements of a 5 member family.
3 Raise the living standards of marginal farmers to a middle class level.
4 Ensure marginal farmers live a life with equality, prosperity and freedom without being exploited.

Basics of Ten Guntha

1 Harvest the sunlight falling on the Ten Guntha.
2 Need an assured supply of water (1000 L/day).
3 Equity sharing with the Labor working in the model.
4 Use only neighborhood resources.
5 Use of latest science and manifest its outcome.

Scientific reasons for Ten Guntha.

Recommended daily intake (Dietary reference value) of a person is prescribed by WHO as : Women- 2,000 Calories/day; Men- 2,500 calories/day

Total Fat	55 g
Saturated Fatty Acid	20 g
Cholestrol	300 mg
Sodium	2300 mg
Potassium	4700 mg
Total Carbohydrate	300 mg
Fiber	25 g
Protein	50 g

How can 10 Guntha model meet this requirement?

1 Solar energy gives 1250 Kilo Cal per Sq. ft. in eight to ten hours a day.

2 Matured green leaves harvest only 1% of it, so 100 sq. ft. for one meal.

3 Apart from food, family needs firewood, cloth, oil etc. This requires 1400 ft2/person. Total 7000 ft2..

4 Shelter and water each requires 1000.ft.2.

5 Storing place and place for play 500 ft.2 for each, total 1000.

Grand total of 10,000 sq ft. or Ten Guntha

Allocation of 10 Guntha

S.no	Area (1 Guntha = 100 sq.ft.)	Crops / Use
1	1.0 Guntha	House
2	0.5 Guntha	Store room
3	0.5 Guntha	Free space
4	1.0 Guntha	Pond
5	2.0 Guntha	Paddy + Mung in Kharif - Wheat + Jowar in Rabi
6	1.0 Guntha	Pulses + Food grains
7	1.0 Guntha	Vegetables
8	0.5 Guntha	Cotton
9	0.5 Guntha	Spices + Herbs
10	1.0 Guntha	Fruit crops
11	0.5 Guntha	Oilseeds (Groundnut + Til)
12	0.5 Guntha	Fodder & Fuel

Financials

S.no	Items	Quantity	Rate (Rs.)	Total (Rs.)
1	Heaps (nos)	52	450	23,400
2	Biomass (kg) for mulching @ 200 gm / ft	2000	3	6000
3	Amrut Jal	-	-	-
	a) Soaking Biomass (L)	5200	0.25	1,300
	b) Seed Sowing @ 1 L / sq. ft	10,000	0.25	2,500
4	Labour-Clearing, layout & installation of model	12	150	1800
Total Rs.				35,000

Note: A) This excludes the cost of seeds, pond, house and store room. B) This costing is applicable if all the items are to be purchased.

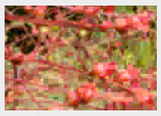
Pictorial representation of Ten Guntha with crops undertaken

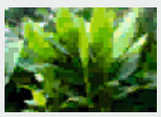
Name of Crop / Distance


Drumstick / 10'


Vitiver grass / 2'


Castor /10'


Sorrel leaves / 5'


Turmeric / 5'


Ginger / 5'


Gliricidia / 5'


Marigold / 2'


Sweet Neem / 10'

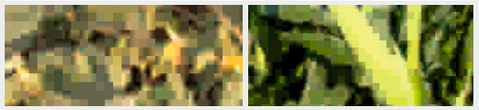
1 House 50' X 20'

1 Guntha

2 Monsoon Crops: **Kharif** - Rice + Mung, **Rabi** - Mustard + Sorghum Crop Distance 1' X 1'

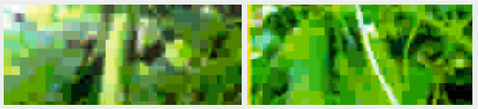
2 Guntha

3 8 line feet (1' X 1') Red Gram, Corn,Mung, orghum, Amarnath,Pearl Millet,Cluster Beans,



1 Guntha

4 **Vegetables:** Bottle Gourd, Luffa Gourd, Tomoto



Bottle Gourd and Luffa Gourd - 6' distance

1/2 Guntha

5 Cotton

4' distance

1/2 Guntha

6 **Fruits Section:** Banana, Papaya,Orange, Guava,Sweet Lime,Custard Apple

8' distance 6' distance 12' distance

5/2 Guntha

7 **Spices:** Chilli, Turmeric,Ginger

3' distance 3' distance 2' distance

1/2 Guntha

8 **Oil seeds** (1' X 1') Groundnut,Sesame

1/2 Guntha

9 free land

10 Pond

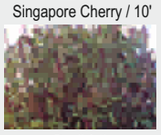
1 Guntha

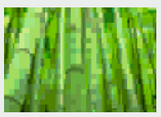
Name of Crop / Distance


Indian asparagus/ 10'


Alove Vera / 10'


Singapore Cherry / 10'


Basil / 5'


Bamboo / 10'


Kirayat / 5'


Kalanchoe plnnata /10'


Sweet Flag / 10'


Malabar Nut / 10'

Let each one on one's own strive to experiment with zest, to innovate and propagate various new ventures in every nook and corner of our planet.

- Professor S. A. Dhabolkar

12.4 Live fencing to the farm

What is live fencing?

A fence created of live plants is called “Live Fencing “

In Natueco farming, live fence plays an important role.

Purpose of Live fencing

Acts as a wind breaker.

Protection from animals.

Source of income for daily requirements.

Beautification.

Provides biomass for mulching and nutrition.

Creates micro-climate

Plants that can be planted in Live Fencing are as follows.

S. No.	Crops	Spacing (ft.)	12	Ginger	5
1	Drumstick	10	13	Marigold	2
2	Gliricidia	5	14	Rose	5
3	Jatropha	5	15	Tulsi	5
4	Methi Neem Curry Patta	10	16	Lemongrass	5
5	Tomato	4	17	Arhar	5
6	Bamboo	10	18	Ambadi	5
7	Vetiver Grass	2	19	Gunj	10
8	Bottle Gourd	10	20	Wakhand	10
9	Castor	10	21	Panphuti	10
10	Kadu Kadyatu	5	22	Adusa	10
11	Turmeric	5	23	Aleovera	10

12.5 Database

Self Education through Documentation (De-schooling)

"Incredible brain can take from rags to riches, from loneliness to popularity and from depression to happiness and joy – if it is used properly. If you do the right things in right way, you will get whatever results you desire." -Unknown.

Documentation is essential for success. Usually farmers do not document their farm input vis-à-vis farm output. This trend stops them from learning from mistakes and hence stops them from evolving.

Farmers can self-educate themselves through proper documentation. It helps to avoid/repetition of mistakes and data helps to take corrective actions. Natueco Science says when farmer understand plant physics, plant physiology, plant chemistry, plant geometry and plant biology - he/she understand language of plants. When plants get their requirements as per their need, plants grow well and yield better produce.

Documentation of plants growth vis-à-vis the farms input, farms output vis-à-vis farm input, yield per plant, relation of canopy size with its yield etc helps a farmer learn from his own farm. Also the farmer can shrare his experience with Prayog Parivar to create a bigger database.

Suggested Format for Data collection for Grains/ Root crop/Vegetables

s.no	Crop	Area (M)	L. Prep. Cost	Seeds sowing			Fertilizer		Irrigation		Misc. Cost	Harvest		Input Cost (A)	Produce		Prod/ seed	Margin
				Date	qty	Cost	qty	Cost	Date	Cost		Date	Cost		qty	Value (B)		
1																		
2																		
3																		
4																		
5																		
Total																		

13.0 Prosperity with Equity

Today the Equity sharing in agriculture has reduced to a practice of few land owners giving their farm land on contract to farmers for a season and get returns in the form of certain percentage of the production.

Dr. Dabholkar ji had said that the Prosperity can only self-sustain itself if it is inclusive and equitable in nature. An equitable farm reduces poverty and inequality by ensuring a systematic re-distribution of the economic benefits of development.

Dabholkar ji suggested every farmer to bear a child's curiosity towards his/her farm. Each one of us as a child is gifted by nature. We grow up with learning through W/H questions on every observation of ours. The same curiosity should be re-inculcated in a farmer. As a child's constant prattle on 'Why', 'How', 'How much', 'Why not this way' etc gets him/her well acquainted with the things, a farmer too should get acquainted with his/her farm and its surrounding through continued curiosity. The spirit of sharing the equity, sharing knowledge, sharing database generates from this curiosity

But if an inequality exists in the farming culture in a group, the curiosity about a particular culture poses the risk to its existence.

Natueco says agriculture is not only a cultivation of flora and fauna but it also a cultivation of prosperous culture. Sharing of knowledge, labor, resource etc. Individual farm contribute to the Nation's prosperity too.

14.0 Advantages of Natueco Farming

Natueco Cultivation:

1. Is a non violent way of growing food:with minimum tilling and digging.
2. Requires no external additives or pesticides are required
3. Is a method in which the soil nourishes itself while growing food:the method imitates the natural process of top soil creation.
4. Is less laborious (after 3 years) unlike conventional farming.
5. Maximizes yield, produces healthier plants which, in turn, makes them less susceptible to pests and disease.
6. Maximizes nutrition to the family by diverse and multi-crop pattern of cultivation
7. Is Less water intensive:is rain fed and needs as much as we (humans) consume for personal use.
8. Dramatically reduces our 'eco-footprint' and 'food-miles':hence good for environment
9. Is aligned with Nature's 3 cycles- of matter, energy and life.
10. Increases biomass through perfect management of Sun, soil, plant and man.
11. Is a dignified way to help an individual shift from total dependence on external inputs to self-dependence.
12. Has embedded shock absorption against ecological and pest disasters- due to multi-cropping and crop diversity
13. Is a combination of age old natural farming and modern scientific intervention
14. Is highly integrative: reduces sense of duality.
15. Emphasizes primary productivity.
16. Fulfils 5 “L” concept comprising of living, livelihood, learning, love and laughter.
17. Ensures no loss in production from the very first crop.
18 Encourages active microbial population and yet there is no disease throughout the season.
19. Reduces dependency on farm inputs from external sources.
20 In built and in-situ process with all resources available from the neighborhood.
21. Leads to the enrichment and enhancement of soil quality.
22. Is mutually beneficial for producer and consumer.
23. Uses minimum tilling , thus increasing the organic carbon in soil.
24. Decreases the entropy of ecosystem, and
25. Uses a diversified / multi-tier farming approach.

15.0 Natueco vis-à-vis conventional farming in terms of " farm productivity"

With conventional methods of farming our efforts have been to increase the 'Visible Productivity' of a farm. Therefore the " Green revolution" was introduced. The fundamental approach of green revolution was to enhance the visible productivity of a farm by its 'Secondary Productivity' which in itself is a sensible thing to do. But over a long period of time we only considered the visible productivity of a farm as its measure, hence rigorously followed enhancing its secondary productivity and neglected and gradually forgot about the farm's primary productivity.

We derived a false sense of pride from the visible productivity of the farm without realizing the apathy of soil's primary productivity!

In the beginning with such conventional farming, the 'Visible Productivity' can be easily increased by external inputs. However, over a long period of time it impairs farm's 'Primary Productivity' and gradually we start seeing a decline in the 'Visible Productivity' even though external inputs are the same.

Natueco Sciences focuses completely on the Primary productivity of a farm and concentrates around enriching the soil in its carbon value. In other words, it is a way to increase the dry mass output per hectare per kilolitre of water consumed.

In the beginning of understanding, this seems to be a very subtle factor but is an extremely important point because the Sun's energy can only be harvested optimally if the dry mass output is maximized.

If land is harvested at its most optimal levels of 'Primary Productivity', it WILL give maximum yield per hectare FOR EVER with the least input cost! Thus such farming becomes viable financially.

With increase in the primary productivity, dependence on the external resources reduces gradually; helps the farmer to create a knowledge base and data base of experience, create his/ her own seed bank and hence such farming becomes sustainable for a longer period of time.

The markets of the supplements for conventional farming unfortunately do not offer anything to enhance the Primary Productivity of a farm.

15.1 Difference between Natueco Farming and Natural Farming

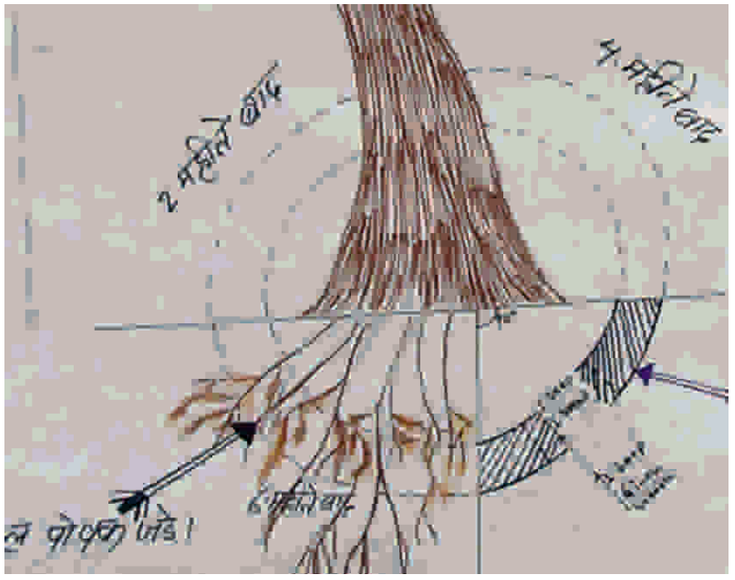
Natueco Farming	Natural Farming
This is a new concept of Farming	This is the traditional concept of Farming
Farming is done through understanding nature more and more	Farming is done through trusting nature as it is
It is nature friendly	It is nature glorifying
It promises Plenty for all	It hopes to establish sustainable development only
It asks for resource right for each family of five. Eg. a - Ten Guntha (100 M square) Sunlight b- daily 1000 liters of water as usable waste water c- Latest of Science in a demystified way.	It is worried of resource crunch in nature. It fails to understand how abundant wealth can be generated for the benefit of all through enrichment and enhancement of neighborhood resources.
It has a new vision of infinite resource potentials in nature through increasing the universal human creativity to harvest these.	It is very sensitive to disturb the present equilibrium of the system
Depends on critical understanding of greening and recycling of bio mass from within to enrich the structure and fertility of soil in a calculated way.	Depends on traditional practices of organic farming in an empirical way where mostly, organic waste are brought from outside.
It promises record assured yields trough knowing plants actual fertility needs, plants geometry of growth, plants cycles of growth, plant physiology, new techniracy of canopy management and soil and water management with least external inputs and for optimum harvesting of Sun light	It provides no basic insight into various nature's processes in programming any crop production.
It has developed the new concept of agriculture where abundance for every one where of everything is possible.	It s confused between the difference between the riches and abundance and fels increasing human needs is anti nature.
It visualizes that in near future; there will be energy markets only. All consumer goods will be from neighborhood home farming systems.	It has no better alternative to fight against the present commercial market and money market systems.
The present paper economy system will have to give way to new energy equivalence eco-economic system of nature	The myth of present paper money system is as yet not exposed by natural farming system.
Promises to build up new enriched eco systems	Natural farming promises only sustainable living as in ancient times.

(Derived from “Plenty for All”)

16.0 Other Important Processes in Natueco Farming

16.1 Root treatment

Root treatment is a process to rejuvenate the feeder roots to enhance growth of the canopy. The process is applicable for medium and long term plants.



Objective

- To develop better root system (Feeder Root Zone).
- To get better vegetative growth of the plants and optimum quantity of vegetables or fruits.
- Ensure food for plant at right place and in right quantity.
- To increase the life of the plant.

Process

- To locate feeder root zone, start digging from outer periphery of the canopy on the ground towards the tree, 6 inches breadth and 1 foot deep .
- Once the feeder root zone is located while digging, dig a trench of 1x1 foot for 1/4th of periphery of the canopy on any one side.
- Cut the feeder roots which are exposed in theis trench. Moisten the pit with Amrut Jal and Apply ash on the cut feeder roots as antiseptic to the roots.
- Fill the pit with Amrut Mitti and again moisten the surface of the trench.

Mulch the trench with biomass (No. 3*) dipped in Amrut Jal.
After two months, carry out the same process on the opposite side of the treated quarter of the plant periphery; after four months treat the left or right side of the plant periphery in the same fashion. After six months, treat the remaining quarter of the periphery. After an year this process can be carried out 1 foot inside the previously treated periphery towards the canopy. But this time the the entire inner periphery can be done at once, instead of doing it in quarters. On the place where root treatment takes place, the shadow loving crops can be grown.

* No.3 biomass, which has the capacity to absorb 50% water of its own weight.
* In the rainy season this process of root treatment can be done at 15 days interval between each quarter of the periphery.

16.2 Pruning

Pruning is a post plantation management technique conducted to reduce the maturity time of a plant. It's purpose is also for canopy management to get more productive vegetative growth to increase the production from the plant in terms of quantity and quality. Pruning also helps to prolong the duration of the yield

16.2.1 Benefits of Pruning

Increases the productivity of the plant.
Maintains health and quality of plant and fruits.
Removes the dead, non productive and diseased branches.
Gives specific shape and height to the plants/trees.
Helps in regeneration of old plant.
Develops secondary and treasury branches earlier to have fruits on time.
Manages production with respect to market demand

16.2.2 Equipments / Materials Required for Pruning

1. Secateurs 2. Saw 3. Cow dung 4. Cow urine 5. Ash

16.2.3 Methods of pruning of selected plants

1 Bottle Gourd

Fig: Before pruning

Fig: After pruning

Follows this chart after date of seed germination
Various pruning stages in Bottle gourd

S. no.	Pruning	Time after germination	Height/No. of nodes	Pruning at nodes from top
1	At 21day nodes/ leaves emerge(childhood)	34 days	13 nodes	At 5th node
2	Secondary branch at 13 node	50 days	13 nodes	At 5th node
3	Tertiary branch at 13 node	59 days	6 nodes	At 5th node

Provide ash in 30th days 10gms to maintain the nutrition taken by the plants to the soil.

2.Tomato and Brinjal

S.No.	Stage of pruning	Prune at
1	At flowering stage	Just above the flowering node

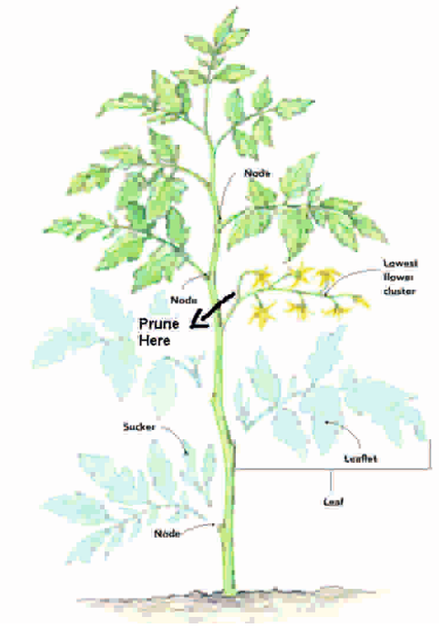


Fig: Pruning in tomato

3. Pruning of Chilli

S.No.	Stage of pruning	Prune at
1	45 days after germination	30% from the top
2	After harvesting	70% from the top

4. Mango Plant

Fig: Pruned mango tree

(a) The time of the pruning a mango tree is always after harvesting. 70% pruning is done for rejuvenation of old mango plant. After pruning, the tree would give more fruits than the previous year. And will continue giving more yield for at least 2 years. (Subjected to root treatment: please see the science of Root Treatment).

(b) Pruning should be done 30% from the top in order to maintain the shape and increase the capacity to harvest cosmic energy.

(c) First identify main stem- which is the longest. It is pruned at a height till which we want.

(d) Pruning is done just after 3 nodes if new branch are not developing, cut 2 nodes from the top. This helps to accelerate the new multi branches from the pruned part.

(e) If there are 4 branches (3 healthy and 1 weak), cut the weak one, if 3 weak and 1 healthy then cut the healthy one.

(f) Cut the surrounding branches at 9 inches distance towards outer circle, prune below the height of center point.

(g) Again 9 inches from the above is pruned at a height less than the previous.

(h) The branches which are less than 450 are pruned where two or more branches are seen, more than 900 also to be pruned.

5 Pomegranate

When the plant attains height of 3 feet, cut 1 foot from the top.

Allow the 4 new branches to attain the length of 3 feet, prune them 1 foot from the end.

After 3 years harvest, prune the plant 70% and develop new branches. Root treatment at this stage is very useful.

Water shoot and branching emerging from the ground other than the stem should be pruned

6 Drumstick

1st pruning when the plant attains a height of 3 feet from the ground and color change in the top stem. The branch should be cut to allow new branch from well storage stem.

When the new branches grow more than 3 feet length, cut 1 foot from the end.

After harvesting the fruits, prune the tree keeping the height from the land 3feet.

16.3 Humidity Chamber

A Humidity Chamber is a structure made of plastic sheets, bamboo, bricks and Amrut Mitti to facilitate growth of plants. As the polythene is transparent, sunlight enters the Chamber. It heats up due to incoming solar radiation and carbon dioxide released by the plants. Along with this, internal moisture turns into vapor during day time and falls back as dew when the external temperature reduces during the

night. This reduces the requirement of water. The warmed structures and plants inside the humidity chamber re-radiate some of their thermal energy in the infrared spectrum, to which plastic is partly opaque, so that this energy is also trapped inside the chamber. The primary heating mechanism of a humidity chamber is convection. This principle is the basis of the autovent automatic cooling system. Although heat loss occurs due to thermal conduction through the plastic and other building materials, net energy increases inside the chamber.

This entire process results in activating the plants in the chamber.

16.3.1 Uses of Humidity Chamber

1. A Humidity chamber is a nursery which can be made with very little water and space (10 foot long, 4 foot wide, 4 foot height).
2. It is a nursery in which a seedling can be kept under excessively humid conditions supplied with fresh air.
3. It is a moisture chamber where there is very little transpiration from the leaves and hence foliage growth increases.
4. It controls key factors like temperature, light, water and atmosphere required for a plant.
5. Humidity chamber can be used to overcome the poor growing conditions- such as poor light levels, seasons, or soil infertility- thereby improving food production in marginal environments throughout the year.
6. It can be used to grow saplings faster. Aromatic plants and those plants that favor shade, such as coriander, mint etc. Saplings (plants fit to sow) can be grown from the seeds in a humidity chamber.

16.3.2 Need of Humidity Chamber

- Helpful in feeder roots growth and development of canopy of the plant.
- To grow leafy vegetables throughout the year.
- Able to grow plants/seeds in off seasons.
- Slips and branches/wildings which do not have seeds can also be grown in nursery.

Materials and cost to build a Humidity chamber

S.no	Items	Quantity	Rate (Rs.)	Total (Rs.)
1	200 Gauge black polythene	4 x11 ft.	20/kg	60.00
2	Bricks	80	3 each	240.00
3	150 gauge White polythene	14 x 8 ft.	30/kg	90.00
4	Amrut Mitti	80 lt. (32kg)	0.75/lt.	60.00
5	Sand	32 kg		10.00
6	Amrut Jal	50 lt.	0.25/lt.	12.50
7	Bamboo strips	1	10 each	10.00
	Labor	day	150/day	150.00
Total Rs.				632.50

How to build a moisture pavilion?

Fig.1

Fig.2

Fig.3

Fig.4

Steps by step procedure

Step I	**Place the 10 foot long and 4 foot wide black polythene of 200 gauges on the leveled ground to prevent absorbing water from the soil, due to this moisture will be maintained.**
Step II	**Use the bricks to line the boundary around the polythene to stop Amrut Mtti from draining out.**
Step III	**Fill the structure by 50% of sand and 50% of Amrut Mitti**
Step IV	**Saturate this with Amrut Jal.**
Step V	**Fix both ends of the bamboo strips of at five places of the chamber**
Step VI	**To bind these sticks strongly, 10 foot long bamboo, split in the middle is placed and tied to each other in five places- one in the middle and two on either side.**
Step VII	**12 foot by 8 foot transparent polythene of 150 gauge is laid on this structure of bamboo sticks. The pavilion is sealed by placing bricks along its border**

16.3. 5 Precautions to be taken while building and using the Humidity Chamber

Build in a place where the polythene won't be damaged.

Build in a place with less exposure to sunlight. Polythene melts faster in bright sun and plant dies due to increase in internal heat inside the chamber. A chamber of shed net can also be made over that.

Keep the two ends open for an hour each day for air ventilation on very hot days.

17.0 Conclusion

Natueco Farming is a component of a larger and deeper thought-process. It is essential for a Natueco farmer to create a deeper understanding and to practice it. In fact, Natueco Science is a holistic science concerned with science of farming integrated with other sciences, aiming at a final integration of living, livelihood and learning. In the book "plenty for all" written by Shri Dabholkarji, one can read about the Science of Direct-Learning, (experiential and de-schooled); about the Science of Venture and "Prosumership"(concerned with the relationships and societal spheres) and about the Science of Energy Economics and eco-economics vs monetary economics.

Natueco Science is about Life, it is a wholesome science which wants to include rather than exclude, which wants to integrate all the sciences rather than compartmentalize; it aims at generating a dynamic understanding that everyone can enrich through his / her own direct-learning. Natueco Science is thus concerned with Oneness.

When we farm with love and concern for all forms of Life, our experience becomes deeper, we open our hearts to understandings that normally evade us in daily life. We observe, we understand our relationship with Nature, our beings, surroundings etc. Natueco farming is thus envisioned to produce not only material but also spiritual abundance.

Love and concern are key concepts in Natueco Farming, without these there is no Natueco as such. Farming with consciousness is essential to bring about the transformation of the Self. With consciousness our work becomes a sacred activity and with consciousness we have the power to transform ourselves, and eventually our communities and the world we live in. If we act collectively with consciousness, we can find solution for today's problems, we can reduce the selfishness, the greediness and violence. More than this, **global warming** is known to be irreversible, but the Truth is that by working consciously and collectively we can reverse its ill effects without any doubt.

The Natueco farming system is a farming practice which involves effective and efficient use of the available resources within the farm vicinity to enhance and enrich the ecosystem without exploiting it, thus making a farmer prosperous with equality and liberty.

Natueco Farming Science is a (healthy) way of farming through scientific methods by using less space, less water and natural resources from surrounding areas in accordance with changes in the environment. Its aim is the protection of environment and the prosperity of the farmer families. This method is developed by combining old and new natural methods and scientific methods of agriculture. It has resulted in more and better yield at lesser cost.

The message of Natueco is -**Farm yourself; your own transformation can only lead to a world transformation.**

Natueco science stresses on understanding Nature and it's web of relationships. Then, using our understanding to intervene intelligently to help Nature by making it's processes more efficient and effective. A true Natueco farmer must strive to understand the underlying principles behind the processes.

Our world is facing unprecedented challenges ranging from poverty to Global warming. Natueco farming can provide prosperity, joy and livelihood even to the poorest.

Soil is the most critical factor in farming and Amrut Mitti and Amrut jal has been scientifically tested for superiority. This improved soil content will not only increase yield (quantity) but also improve quality. Even in case when the quantitative improvement is stagnated, one can be sure of qualitative improvement (increased nutritional value) in the produce. Increased nutritional value will not only support good health of our society but also reduce food demand as we will be fulfilled with lesser food intake.

While all these benefits are outcome of Natueco farming, it is very important to re-state that farming should not merely be an act of money making. Only then true benefits of farming will come about. If profit is the sole yardstick of farmers, Natueco farming will not attract him beyond a point.

Soil, plants, microbes, birds, animals all help us in growing food, without knowing it as a “great work”. They just do what is natural for them and give their service as “offering” to Nature. They all co-exist happily. In spite of our immense brain power, human beings do not do things as “offering” but rather for selfish motives. Human beings have been gifted with capacity to reduce the entropy in Nature but we have done exactly the opposite. We must learn from Nature, mimic Nature and live in co-existence with all living and non-living entities of universe.

In this book we have tried to share various concepts, ideas and processes related with Natueco farming. The account in this book is not by any sense close to completeness. Farming is as vast as life. It'll take volumes to cover the science and processes of farming, there is endless depth to it. In a farm, life is

abundant, so many worlds exist. A true farmer must be a continuous learner because there's no end to learning. This book is just the beginning, as we spend more time with Nature, it'll unfold it's mystery and poses many new questions. This is why Natueco looks at farming as a lifestyle for evolution of human consciousness.

Natueco farming does offer an opportunity, an invitation to start living a life of health, happiness and non-exploitation.

Only when we understand the deeper sense of life and nature, can we really make right use of various processes of Natueco farming which is nothing but mimicry of Nature. It's unfortunate that

18.0 The way forward

farming has reduced only to a non-glamorous way of making money. Farming is a way of life, which can help in realizing the true purpose of human life which is like knowing who we are and living joyously.

Natueco Farming - the challenge

The success of the Natueco Farming depends solely on the interest and dedication of the farmer to work with awareness and consciousness for his betterment in the society.

Natueco is growing to become an inspiration for the coming generations of farmers. Natueco is taking its mission forward by reaching out to many farming communities, by also offering urban people support and resources on farming for their own day to day needs. Farming should be seen in a new light of awareness about our needs and Nature's working, and Natueco is doing that with its every growing community and its relentless work.

18.1 The role of individuals & society

The focus of Natueco is on transforming the mindset of people from consumers to co creators, working towards creating food abundance for all. If people understand and apply Natueco farming techniques to their farms, the food requirements can be fulfilled for all along with nutrition and economic sustenance. Every individual can be the part of this movement by adopting Natueco farming wherever one can, by learning about Natueco science, by promoting Natueco and by participating in our farming activities.

You can lead Natueco movement in your village or city and help your community to get rid of resource heavy farming and chemical laden food. If one can inspire others by one's own efforts no matter how big or small, we would love to join hands with every such person who wishes to contribute and work in this direction.

It will be a service to humanity and to nature to adopt Natueco farming. We all are called in to be a part of this service which is the call of the hour!

18.2 Context

Natueco culture compels us to ask some very fundamental questions to ourselves; even if they appear irrelevant or unrelated in the beginning but as we begin to understand the whole picture, we will start realizing the image.

Who are we? What is the purpose of Human life? Are we and how are we related to rest of the nature? What is our natural food? Is agriculture natural way of farming at all? How did agriculture start? What kind of conduct will bring peace and happiness in us and our environment?

There are no definite answers but all that we human do, including farming, must lead us to a way of life that addresses or supports the search of the fundamental questions.

18.3 Ask question to yourself before you adopt Natueco in your farms.

If you find any of the reasons listed below are one of the answers to your question, you have the right mindset to adopt Natueco farming!

21 reasons why I want to be Natueco Farmer?

1. It is a non violent way of growing food-No tilling and digging.
2. No external additives or pesticides are required
3. The soil nourishes itself while growing food-the method imitates natural process of top soil creation.
4. Becomes Less laborious after 3 years of starting, unlike conventional farming
5. Maximizes yield per plant. This happens with improved health of a plant which in turn makes it less susceptible to pests and disease
6. Maximizes dry matter/sq ft of available land. Makes business sense. More for less.
7. Maximizes nutrition per family by diverse and multi-crop pattern of cultivation
8. Least water intensive-just rain fed and as much as we consume for personal use
9. Overcomes an important constraint-a need to have good quality of top soil on existing land. i.e. The results of the Natueco are independent of the soil type (produces same results in clayey soil as well as sandy soil).
10. Dramatically reduces our 'eco-footprint' and 'food-miles'-reducing carbon footprints.
11. Is perfectly aligned with nature's 3 cycles- of matter, energy and life.

12. Increases biomass thru perfect management of Sun, soil, plant and man.
13. The only occupation to set a man truly 'free'-free from being a slave of an employer
14. The only dignified way to help an individual shift from dependence on external inputs(like job, government help, infrastructure etc) to liberation and 'Swaraj' in real sense
15. Provides shock absorption against ecological and pest disasters because of multi-cropping and crop diversity
16. The best combination of age old natural farming and modern scientific intervention
17. Not an esoteric or theoretical concept and leads to wholesome and spiritual experience
18. Possible to develop new ventures and non-exploitative entrepreneurship abilities
19. Generates a natural healing climate where automatically harmony and love evolves and greed or selfishness dissolves.
20. Highly integrative-reduces sense of duality. It is a highly spiritual practice.
21. Helps the farmer unlearn old mono-culture ideas and traditions which no longer are useful. A perfect way to de-school ourselves.

Message of Book Cover and Natueco Logo

Black

When the God was thinking to create the universe, He was in His “Shunya kaal” of meditation. The whole universe came from black hole with blast.

Orange red

Highlight the source of energy from that all are harvesting and enjoying the life with the co-existence.

Green

After trillion years came of universe God created the nature on earth to make worth living of flora and fauna. Human was introduce to reduce the entropy, but he did reveres, and we are suffering now with GLOBAL warming.

From Prakruti, it took many year to develop Sanskruti and now we are suffering from Vikruti which is just part of last 50 years only.

Blue and white

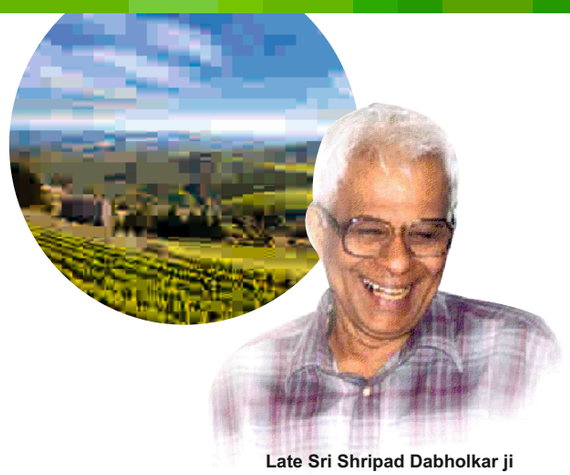
Symbol of light-Spark along with darkness indicates the enlightens through the NATUECO science to have the answer of reducing the Entropy is to go back to nature i.e. only be with Divine energy get Consciously evolved and become CHAITYA MANAV. All work which will be done with collective consciousness then only we will come back from present situation of caous.

If we go deeper everything is by master design not by defaults. The cover page design became by default but it was also plan of ultimate power.

natueco
Farming Science

The logo of Natueco is indicates the Journey of life, Energy, Collective Consciousness and Demystification. God made everything in demystified manner. Everything is related and depends to each other after making of water nature created 1 inch soil by vegetation in 500 years. Basis of science nature created buffer zone of flora meanwhile fauna also developed our culture. Everything was cohesive on each other and till now continues to exist, flora requires intervention of human for their better survival because flora cannot manage everything for their sustain then nature gave a science Natueco to human to grow their culture, culture of non violence, culture of get live and let live, culture of live together and finally culture of Cohesive. Natueco gave the science of mimic of nature to make fertile soil in 150 days called Amrut Mitti, instead of 500 years.

The rising sun in logo indicates of rise of cohesive culture in nature. By using the energy of sun flora converts food and fruit to human and human convert biomass into Amrut Mitti for flora. This is the prosperous cohesive culture of nature and Natueco science. This is the Panchmahabhut, Inner Journey, Prosperity and Collective Consciousness. Natueco is nothing but existence of all with joy having concept of five “L” i.e. Living, Lively hood, Learning, Love and Laughter,



Late Sri Shripad Dabholkar ji

"Most people know Shripad Dhabolkar as a progressive farmer who taught 'Natueco Farming' to the world. Some know him as a mathematician or scientist who would explain farming as an exact science and not an art.

However, very few people have understood him as an educationist or a researcher who understood how to integrate living, livelihood and learning into one homogenous canvas. Natueco science to him was just one way of integrating these three aspects. His efforts to make farmers into self directed learning groups(whom he called as Prayog Pariwar) or his stress on venturism to develop true entrepreneurial farmer or his understanding of the deep connection between consumer and the producer(which he called 'prosumership') was all intended to help an individual integrate his living or lifestyle, his earning or livelihood and his learning (defined as an ability to grow both inner as well as outer dimensions) into one seamless world resulting into not only plenty for him but eventually plenty for all forever".

In 1942 he was university student preparing for science graduation. During the 1942 quit India freedom made him feel strongly, and in a very passionate to sin a build up an individual academic career. In that period Dabholkar ji used to walk among the people in the countryside and also lived with them and tried to cultivate a small organization called "Shastra Siddhi Sadhnalay" meaning "let us share and serve science so that science can serve us with its blessings".

With this vague vision he undertook various graduate level studies. Physics, Chemistry and athematics were course subject but he particularly liked and studied were Agricultural sciences,Biology and specially Botany. With this subject he also interested in Physiology and studied different social sciences: Sociology, Political science, Economics, Philosophy and Anthropology too. And also Studied, practiced and helped own selves in Yoga and Medicine.

Dabholkarji came from a middle class family, had seven brothers and five sisters living together, father was a well known High court lawyer and mother was very cultured and considerate Indian woman. Since his young age Dabholkar ji believed more in his own experiences and expressions, rather than academic way of building his character.

In 1942 he was a university student preparing for science graduation. The 1942 quit India freedom movement made him feel strongly to build his individual academic career. In that period Dabholkarji used to walk among the people in the countryside and also lived with them and tried to cultivate a small organization called “Shastra Siddhi Sadhanalay” with an aim “let us share and serve science so that science can serve us with its blessings”.

With this vague vision he undertook various graduate level studies. Physics, Chemistry and Mathematics were course subject but he was always interested in Agricultural sciences, Biology and especially Botany. With this subject he also got interested in Physiology of plants and studied different social sciences: Sociology, Political science, Economics, Philosophy and Anthropology.

By the time our nation was a free sovereign Dabholkar ji got post graduation in Mathematics. After completion PG he had a great opportunity to start “Open Self Study Courses” in different subjects. This endeavor of different open courses was operated by Dabholkar ji single handedly. It soon became very popular. With this early success, his passion for exposing own self to different life situation increased. During this period he used to take long holidays and go to unknown places where he lived the life of a tramp and moved on foot like a “Sanyasi” among the people of villages with a different mother tongue and environment.

All these form of varied experiences and experiments enriched his life. He began to realize that knowledge abounds everywhere in such a varied form that it is difficult to consolidate it in any system. After some time he rapidly began to lose interest in his own activities in the open courses. He closed entire open activity system. It took one full year to close these activities because of various types of personal, social, structural, administrative, economical, and emotional involvements which had to be dissolved in a detached manner.

In 1958 he was a free-lancer again, free to move and get involved in any field of life. He joined “Mouni Vidyapeeth”. After spending three to four years here, he felt very familiar with the complex mode of educational activities and got actively engaged in various types of extension and teaching activities.

However, he began to get disillusioned about the thesis of bringing a change in our complex rural

life through various institutional activities and training. He formed an opinion that in whatever way the institution may work, the structured curriculum of the system kills all the germs of creativity and originality. During this thinking he initiated some activities and experiments in the institute.

Dabholkar ji had love for experimenting with plants since early childhood. He was successful in growing prize pumpkin in a small earthen pot of about one and a half liter capacity, that the neighbor used to call him "Pumpkin Doctor". His desire for experimenting with the plant kingdom continued with the rural surrounding of institute and in campus with living quarters and a small open space around each home.

This small space became an experiment ground for studies in Agriculture, Horticulture, Sericulture, poultry, Goat and Rabbit rearing, soil fertility building, new techniques in wasteland development, and so forth. All these experiments were aimed at a farmer who is living a life below poverty line in the country and is living at a level of disinvestment, and who has no other resources than his own free labour and the dry waste-land that he has at his disposal. During these experiments, Dabholkar ji realized that so called packages of agriculture practices, professed agriculture extension agencies, were out of place in such a dire conditions. The whole process needed a new approach towards the application of scientific principles and techniques with minimum or no external resources available.

Dabholkar ji then started work on new approach in which exciting results began to be visible from the very first year of experiments. In a very small area of nearly one thousand square feet, he was able to grow a variety of fruit plants. He grew good bunches of grapes on one cubic feet soil, 30 lemons in 20 liters of soil, pineapples, guava, pomegranate, papaya, Drumstick, Custard apple on terrace in polythene bags and even mango. Along with this, he grew a variety of vegetables too. The whole place which used to be a barren waste-land, became like a forest of fruit plants, all healthy, all productive and all taking their nourishments from the symbiotic built- in-aggregate from the garden waste. To this space, he also added poultry, goat, rabbit, and sericulture. This small garden became a sensation to everyone in the locality and to anyone who came for training or a study course in the institute. About thirty people used to visit the work every day to discuss and understand the approach; and used to leave their address, in a hope to join the courses on the subject if started at this place.

The then popular Marathi magazine called " Kirloskar" offered to publish Dabholkarji's experiments to bring these ventures to the common man. In January 1966 first issue was published and it created sensation among the people. This magazine had the highest circulation among the Marathi intellectuals and middle class readers, and among many farmers and active village workers. The article

received a tremendous response! it was a novel situation to deal with, 10,000 letters were received on first issue. In November 1966, in the Diwali special issue, Dabholkar ji wrote an article explaining a new design to organize a network of information on his ventures; he called this network " Swasharya Vikas Mandal", meaning "self -help and self- reliance". This was created to build new creative constructive possibilities in the ventures by working in one's own real life situations. The Nature of such a knowledge communication network became clear only after its actual trial in the field. Each person was expected to have communication at least twice in every month and was expected to give a ready procedure to others to conduct those trials.

After the success of this network, Dabholkar ji started a new network of learning exchanges. Five hundred participants came forward to work on the new network. They were of different age groups, of both sexes, of different professional and social standings. There was no syllabus, no regular printed matters to send. They worked in one of the several venture groups like grape cultivation, poultry rearing, vegetable production, wasteland development and so forth. For this purpose Dabholkar ji introduced participants having common interests to one another. This cross communication relay created a further feeling of belonging and togetherness in the entire group. The network thus began to function by mutual correspondence and feed-back, and then began to express as a unit by sharing and caring for the common experimental involvements in the group.

To make this system active and dynamic, a telephone exchange-like-directory method was introduced. By looking at a particular code number of the network activity one could contact the desired set of addresses.

For example: They found that any code number of 7 or 8 digits will be enough to maintain a free ready reference with all for any type of desired learning exchange.

Eg : in the grape cell activity there were various levels of real life situations that could be classified in ten groups.

1.With verdana space to grapes

2. With kitchen garden and meager resources

3. With small farm but no resources

4. with a good farm but adverse climate etc.

All these numbers could further be suffixed to make them more systematic. The digit in the units place was relating to a real life situation. Thus number 24 meant 2 for kitchen gardening and 4 for

availability of less water (for two months in a year). The suffix 4 helped to denote how the group 2 is further qualified. The meaning of each of these digits would be given on a separate page elsewhere in the directory.

The next digit in the tens place would denote credit unit situation, say (2)64 is the number, no. 6 in this place speaks (from corresponding reference list) of non availability of fertilizers in the locality then a credit to get over that difficulty would arise when he would be venturing in the cell.

Now the umber (2)64 could be easily read as the ventures where the provision of fertilizer could be made to the participants of kitchen gardeners who in their locality had to face water problem in summer.

Thus this post box cum directory number could make the choice system work as a telephone exchange system helping one another to build up direct communication in the form of any institutional communication in a cell. Moreover as this was a voluntary collaboration, no problem of paying or charging fees also arised.

Dabholkar ji called this entire activity a “Cell activity” and the whole system of network was called as “Prayog Pariwar”. The old name 'Swasharya Vikas Mandal” was now replaced with this new name. The word “Prayog” signifies experiments and the word “Pariwar” signifies sense of belongingness and togetherness till the successes is achieved.

ICRISAT

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12 May 2008

Mr Dipak Suchde, CEO - Malpaani Trust
Krishi Tirth, Village Bajwada,
Post Nemawar, Pin 455339
Taluka Khategaon, District Dewas, MP

Subject: *Some comments on analysis report of the soil samples collected from Krishi Tirth, Malpani Trust, Bajwada in Sept 2007*

Dear Mr Suchde,

The attached file has four data tables, one each having soil chemical, soil biological and soil microbiological properties and fourth on micro-nutrients. This report pertains to the soil samples collected on 19 Sept 2007. Analysis was done within 60 days after sampling. Widely used methods were followed for the different types of parameters. Data on the different parameters are in the attached data tables. Comments/highlights on the analysis report/data obtained on the different parameters are given below:

It may be noted that the unplanted area of about one acre of your farm was used as reference or control and is stated as 'Original soil' in the three data tables.

Soil chemical parameters, Table 1: (a) fertility of the original soil was lower than the area under cultivation, (b) fertility was maximum below (15 cm) the heap indicating that roots from plants sown on heaps will tend to go deep in the soil to explore/take up the nutrients, (c) organic carbon percent (OC%) below heap was at least 3 times more than that in the heap itself, indicating that smaller carbonaceous molecules of degrading biomass move down from heaps with water (rain or irrigation).

Micronutrients analyses, Table 2: Only five of the ten micro-nutrients, reported in published literature as deficient in farmers' fields were analyzed. Salient comments follow: (a) quantities of available form of at least three nutrients [boron (B), sulfur (S) and zinc (Zn)] was deficient in all the samples except those from below heaps as per Sahrawat et al. 2007 [Current Science 93(10):1428-1432]. (b) it indicates that the heap method has potential to convert total concentration of all these elements, which was similar in all the four treatment, into soluble form. (c) quantities of 'total' or unavailable form of all the elements was similar across treatments except sulfur indicating addition of sulfur with the items such as 'Amrit pani' etc. being applied, and this needs to be studied. (d) it was apparent that the heap method of cultivation has ability to continuously converting insoluble form of nutrients to soluble form (note: heap remains moist due to continuous application of water) and therefore seems to allow high microbial activity. Overall, the heap method potentially obviates the need of dependence on market purchased elements, provided the local soil has sufficient quantities.

Soil biology parameters, Table 3: (a) as indicated by microbial biomass carbon and nitrogen the soil below heaps had most microbial activity/population followed by that in the original soil while the activity in the decomposing biomass in heaps was next highest, (b) activity of microorganisms as indicated by 'dehydrogenase' enzyme was also maximum in the sample collected below the heaps, followed by that in the heap itself, and lowest activity was noted in unplanted area between heaps which was covered with dry biomass. the noted high activity in the original soil is perhaps due to good growth of grass that would have allowed a good level of microbial activity in its root rhizosphere and needs further consideration.

Soil microbiological parameters, Table 4: (a) Population of bacteria inside heaps and below heaps was significantly more than the other treatments (range from 6.64 to 6.80 $\log_{10}$ per g of soil), (b) population of actinomycetes and fungi was similar across the four treatments and ranged from 5.30 to 5.67 ($\log_{10}$ per g of soil) in case of actinomycetes and from 4.00 to 4.51 ($\log_{10}$ per g of soil) in case of fungi; (c) maximum population of the plant growth promoters and organic acid producers was inside heaps where lot of roots were noted during sampling and lowest in the soil below the heaps where chemical fertility was the highest; (d) population of *Psuedomonas* (indicators of ability of soil to manage diseases) and P-solubilizers could not be counted due to methodology problems; (e) N_2-fixing bactena (colonies that were looking like *Azotobacter*) was similar across the four treatments

On crops seen at your farm: Like at your previous farm at the Yusuf Meherally Centre (YMC) Tara, Panvel district of Maharashtra, I was surprised by the very good growth of plants of a large number of species (at least 50) in a small area of much less than one acre (1 hectare = 2.42 acres). Surprizingly, the growth was stated to be of less than five months, almost the period when I saw similar good growth of plants at YMC when visited in April 2005. There were all signs of high productivity per unit area at the Krishi Tirth. When dug out, most plants had abundant roots and were white ie. highly active, at both the farms. The visit to your farm at the Krishi Tirth, Bajwada in Sept 2007 was another good opportunity for me to learn and confirm my belief in your technology. However, the challenge remains on how to scale-up this kind of crop production protocol. But I see this need of 'scale-up' as a collective duty of the society in general and of the agricultural research institutions, in particular. I strongly recommend agricultural scientists and policy makers to visit your farm to believe the indicated level of productivity that has all potential of feeding families of small-holder farmers owning about one acre area and having access to one thousand liter water per day per ten Gunta (1 acre = 40 Gunta). It was the obvious good growth of different crops that prompted us to spend resources and collect the attached data. Interested scientists may like to verify it. I believe that if promoted strategically your technology can potentially feed not only poor of this country but of most developing countries.

Challenge for you: *Keep records of productivity of all crops per unit area of your model farm and compare it with that of any one or few neighbor farmers who are largely monocrop farmers*

Yours Sincerely,

12.5.08

OP Rupela
Principal Scientist (Microbiology)

पूर्वी क्षेत्र के लिए भारतीय कृषि अनुसंधान परिषद् का अनुसंधान परिसर, अनुसंधान केन्द्र, राँची
पलान्डू, राँची–834010 (झारखण्ड)

ICAR Research Complex for Eastern Region Research Centre, Ranchi
P.O. Rajaulathu, Plandu, Ranchi- 834 010 (Jharkhand)

From : Dr. S. K. Naik
Sr.Scientist (Soil Science)

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Soil analysis report

· The 'Amrit manure"(Amrut Mitti) is having neutral pH and organic carbon content of 8.45g in 100 g of manure. Further it is rich in both total and available nitrogen, phosphorus and potassium content. The calcium and magnesium content is also found higher value in the manure. All the micronutrients are above sufficiency level in the manure.

· The soils of farmer's field having higher pH and is coming under alkali soil with low organic carbon content. The soils are low in Nitrogen and Phosphorus while medium in Potassium. The calcium and magnesium content is found higher value in the farmer's soil. The Zn content was found in low level while others micronutrients are in sufficiency level.

· The soils of bajwada farm are having higher pH with high in organic carbon content. The soils are low in Nitrogen, medium in Phosphorus while rich in Potassium. The calcium and magnesium content is found higher value in the farm soil. All the micronutrients are above sufficiency level in the farm soil.

Comments:

The challenge is to enrich our soils with organic carbon and all the nutrients by practising Natueco-farming and is possible to increase the food production with no dependency on synthetic fertilizers. The enriching of carbon in soils of Bajwada has begun and this technique of Natueco-farming needs to be popularized in all types of soils of India.

Table-1: Macronutrient content in Amrit manure,(Amrut Mitt) Farmer's soil and Farm soil of Baiwada, MP

Soil sample	N		P		K		Ca		Mg		pH	Org C (g/100g)
	Total (mg/kg)	Avl. (mg/kg)	Total (mg/kg)	Avl. (mg/kg)	Total (mg/kg)	Avl. (mg/kg)	Total (mg/kg)	Avl. (mg/kg)	Total (mg/kg)	Avl. (mg/kg)		
Top of heap (Amrit manure)	6710	165.67	748.25	20.2	3200	441.67	14000	4860	10560	1352	7.11	8.45
Below heap (Amrit manure)	1730	94.73	466.25	9.5	3750	365.00	12300	3430	9540	1240	8.17	0.84
Farmer's soil	1230	58.80	375.00	Trace	3300	240.00	15500	5170	4800	534	8.44	0.38
Farm soil (Bajwada)	1910	71.40	661.50	6.7	3150	368.33	8200	2530	4920	610	8.03	1.16

Table-2: Micronutrient content Amrit manure (Amrut Mitti), Farmer's soil and Orchard soil of Baiwada, MP

Soil sample	Fe		Mn		Cu		Zn	
	Total (mg/kg)	Avl. (mg/kg)	Total (mg/kg)	Avl. (mg/kg)	Total (mg/kg)	Avl. (mg/kg)	Total (mg/kg)	Avl. (mg/kg)
Top of heap (Amrit manure)	6290	10.12	648.25	14.26	42.40	0.89	73.20	4.84
Below heap (Amrit manure)	6615	9.73	639.70	5.60	54.25	1.96	69.55	1.16
Farmer's soil	6632	5.82	573.50	3.19	56.25	1.40	67.25	0.53
Farm soil (Bajwada)	6234	15.64	434.95	4.42	43.35	1.76	69.15	1.84

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Ashwamedh
Engineers & Consultants C.S.L.
Laboratory Services Division

ANALYSIS REPORT

Sample / Report No.	F/09/12/80	**Date**	22/09/2012
Name and Address of Customer	**Mr. Jitendra M. Kutmutia** "Nisarg" Prem Farm, At. Post Sayne, Tal :- Malegaon, Dist :- Nashik		
Sample Collected by	Customer	**Sample Description/Type**	Bottle Gourd
Sample Identification/ Batch No.	-	**Date of Receipt of Sample**	18/09/2012
Sample Quantity/ Packing	1 kg x 1 no. plastic bag	**Date of Start of Analysis**	19/09/2012
Order Reference	Verbal Discussion	**Date of Completion of Analysis**	21/09/2012

Sr. No.	Parameters	Results	Units	Method Reference
1.	Protein	7.81	g/100g	IS 7219: 1973, Reaffirmed 2010
2.	Calcium (as Ca)	15.2	mg/100g	AOAC,18 th Ed.,2005, Rev. 3,2010, Method no.984.27
3.	Magnesium (as Mg)	5.18	mg/100g	AOAC,18 th Ed.,2005, Rev. 3,2010, Method no.984.27
4.	Iron (as Fe)	0.936	mg/100g	AOAC,18 th Ed.,2005, Rev. 3,2010, Method no.984.27
5.	Vitamin B_{12}	3	mg/100g	WI/SAP-HPLC/5/6

----------End----------

FOR ASHWAMEDH ENGINEERS AND CONSULTANTS CO-OP.SOC.LTD.
Laboratory Services Division

Shubhada P. Joshi
Deputy Technical Manager (Chemical)
VERIFIED BY

Aparna S. Pharande
Chief Executive Officer
AUTHORISED SIGNATORY

Note:
1. The result listed refer only to the tested sample(s) and applicable parameter(s).
2. This report is not to be reproduced except in full, without written approval of the laboratory.

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Laboratory Services Division

ANALYSIS REPORT

Sample / Report No.	F/10/12/12	**Date**	15/10/2012
Name and Address of Customer	**"Nisarg" Prem Farm** At. Post Sayne, Tal :- Malegaon, Dist :- Nashik		
Sample Collected by	Customer	**Sample Description/Type**	Bottle Gourd
Sample Identification/ Batch No.	Market Sample	**Date of Receipt of Sample**	03/10/2012
Sample Quantity/ Packing	500 g x 1 no. plastic bag	**Date of Start of Analysis**	03/10/2012
Order Reference	Verbal Discussion	**Date of Completion of Analysis**	14/10/2012

Sr. No.	Parameters	Results	Units	Method Reference
1.	Protein	1.44	g/100g	IS 7219: 1973, Reaffirmed 2010
2.	Calcium (as Ca)	11.6	mg/100g	AOAC,18 th Ed.,2005, Rev. 3,2010, Method no.984.27
3.	Vitamin B_{12}	BDL (DL:1)	mg/100g	WI/SAP-HPLC/5/6

BDL : Below Detection Limit.
DL : Detection Limit.

----------**End**----------

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FSSAI recognized Food Testing Laboratory listed under registration number 28

Sustainable high soil fertility without chemical fertilizers, a challenge for agriculture scientists

OP Rupela et al.*

Background:

This farm is in village Bajwada, district Dewas, Madhya Pradesh; owned by Malpaani Trust and managed by Mr Dipak Suchde, CEO of the trust (deepaksuchde@gmail.com, mobile: 9329570960). As I understand, Mr Suchde is also an important member of 'Prayog Parivar' – a non-institutional network of knowledge communication initiated by Prof. Shripad A. Dabholkar. The network involves several practicing farmers. More information on the network should be available at www.prayogpariwar.net. A book "Plenty for All" written by Prof. Dabholkar, published in 1998 (Mehta Publishing House, 1216, Sadashiv Peth, Pune; mehpubl@vsnl.com) tells us of a different outlook to farming and should be read by all students of agriculture.

I know the group from April 2005 when I participated in a workshop by the group, organized to commemorate first death anniversary of Prof. Dabholkar. Surprisingly, quite a few farmers associated with the group were awarded by some states/organizations for harvesting highest yields for different crops, including sugarcane and grapes. Some of their views/concepts (in the book and/or on the website) may appear unscientific, but the fact that their farmers were harvesting high yields forced me to spend more time/interest in this direction.

The group has developed several innovative protocols of crop production. The most fascinating for a microbiologist like me was 'the method of composting' which they called process of making 'Masala Matti' – Mr Dipak Suchde now calls it "Amrit Matti". Some samples of this compost had up to 100 million plant-growth promoting bacteria (siderophore producers) in every gram of the compost - highest ever measured in any compost in our lab.

Mr Suchde believes that about 10 Gunta (one hectare = 2.42 acres, one acre = 40 Gunta) land is enough for not only feeding a family of four, but also providing other items of livelihood through selling the excess produce.

Visit to crops at the Yusuf Meherally Centre (YMC) Tara, Panvel district of Maharashtra, where Mr Suchde used to work when I met him first, was an eye opener. The small area of 10 Gunta had over 100

crop species (mix of annuals like Papaya and perennials) and reminded me of several publications of Miguel A. Altieri (Professor of Entomology, University of Florida, 215 Mulford Hall Berkeley, California 94720; agroeco3@nature. berkeley.edu) where he argues in favor of designing agroecosystems mimicking the structure and function of natural ecosystems if we have to have sustainable high yields. Here at the YMC I was witnessing a working model of what perhaps Altieri was theorizing in his publications. The Alfisol soil at YMC did not seem fertile and had lot of pebbles. I was told that the crop was only 3-months plus. Still there were all signs of high productivity per unit area. It seemed much was happening in the heaps of "Amrit Matti" and needed explorations.

* Co-authers will soon be contacted because of their intellectual contributions in educating me on aspects relevant to 'soil chemistry' and several sessions of discussions in the past one decade on interactions between microorganisms and soil chemistry. All the soil samples were analysed in the Soil Chemistry Laboratory at ICRISAT, headed by Dr KL Sahrawat, for NPK and OC%.

The key characteristics of this technology of growing crops, which the group calls 'Natueco Farming', were (a) plants growing on small 'heaps of Amrit Matti' covered with mulch, (b) the heaps were always kept moist (watering with rose cans at the rate of 1000L water per day per 10 Gunta), (c) spacing was wide, (d) not only the heaps, even the rest of the area was covered with grass mulch, (e) weeds were allowed to grow until flowering and were seen as a resource (again this reminded me of the work by Altieri), (f) need-based sowing and harvesting of crops – overall it looked a constructed forest.

In Sept 2007, I visited at the Krushi Teerth, this time to spend five days. This was a new place of work for Mr Suchde. I was told that the Malpani Trust acquired these lands only recently and the 10-Gunta experiment was started only in June 2007 and thus the crops I was looking at were only about 3 months old. And again there were signs of high productivity per unit area as noted at the YMC. When dug out, most plants (including upland rice) had abundant roots and were white ie. highly active, as was true at the YMC. Note: Yield data from the Krushi Teerth.

On Studies/Data:

The signs of high productivity and other factors indicated above made me to take detailed soil sampling and we analyzed all possible parameters for which facility was available at ICRISAT. Results of the analyses along with comments are in the attached four data tables. The data indicate a system of crop husbandry that uses locally available natural resource, knowledge and labor to convert a soil with 'low' to 'high' available form of crop nutrients.

Overall:

Unfortunately, in the absence of any comparative treatment we cannot say that the yield with the Natueco Farming was or will be higher than conventional system of agriculture. But there were no signs of nutrient deficiency, diseases and insect-pests worth worrying. The fact that this method does not need agrochemicals, make it environment and farmers friendly, another 'low-cost biological option' that can help farmers. The method is worth exploring further and seems to have surprises for we scientists (plant pathologists, entomologists, soil fertility experts, agronomists, soil physics, crop physiologists, environmental economists, and ---?).

OP Rupela, Principal Scientist (Microbiology), ICRISAT, Patancheru, 502324, o.rupela@cgiar.org

Note : items highlighted yellow need confirmation

Table 1. Available P, total P, kjhel N, exchanglable K (ppm) and % organic carbon in the soil samples collected from Krishi Tirth, Bajwada, Dewas (MP).

Treatment	Available P (ppm), % of total	Total P (ppm), % of total	Kjehldahl (organic form) N (ppm)	Exchangable (available) K (ppm)	%OC (ppm)	pH
Original Soil	17.1 (4.4)	392	174	284	0.66	7.75
Between Heaps	20.5 (5.7)	362	198	315	0.74	7.59
Planted Heap	33.1 (8.1)	410	194	424	0.72	7.91
Below heap	247.7 (49.5)	500	798	770	2.61	7.89
Mean	79.6	416	341	448.25	1.1825	7.79
SE+	17.7***	58.4NS	77.8**	87.0*	0.264***	0.036***

***=Differences** across treatments are statistically significant at probability level (P) 0.05 **=Differences across treatments are statistically significant at P 0. 01; ***= Differences across treatments are statistically significant at P 0.001, NS= Differences across treatments are statistically non significant

Soil sampled on 19.09.07

Original soil = soil sample from unplanted area on the farm

Between Heaps = Planting concept on the farm is grow horticultural crops on heaps and heaps are widely apart, soil sampling in this treatment was done between heaps.

Planted Heap = Sampling in this treatment was done at the heap, besides a growing plant on top of a heap

Below Heap = Sampling in this treatment was done after removing all the soil and plant roots from soil surface. Sampling was done from area just below the soil surface but below the heap.

Replications: each of the four treatments had three replications, and there were about three spots within a given replications.

On the different parameters that were measured:

A plant needs over 30 different elements for its growth/formation of leaves, stem fruits etc. all body parts. But we generally measure only selected few and largely nitrogen (N), phosphorus (P) and potash (K). All the 30 about elements occur in a soil largely in two forms – 'available' and 'non-available' form. Wherever it is stated as 'Total' it means it is total of available plus non-available form. The available form of a nutrient can be readily taken-up by a plant through its roots while the other form has to be processed by microorganisms, which are in maximum numbers on surface of roots and convert them into available form, through enzyme activities or production of organic acids. The process of conversion will generally be slow and would depend on type and numbers of different microorganisms. An element provided as a 'fertilizer' is essentially in available form and therefore when applied to soil, we generally notice a rapid response of plants, in terms of increased green color of foliage and/or growth/yield. pH tells us whether a soil is close to normal or a problematic soil. For a very good soil, pH should be around 7, and values more than 8 (salinity/alkalinity) and less than 6 (acidity) indicate problem. Note: All these elements come from mother rock from which a soil has formed. Formation of soil is very long process. Few centimeters layer of soil might have taken thousands of years to get formed.

Organic carbon (OC) is a biological and not a chemical parameter. Unlike the other biological parameters, this can be measured readily by a chemistry laboratory and is therefore generally lumped with the chemical parameters. OC% is like a bank of nutrients in soil and may contain all the nutrients needed for plant growth. More the value, bigger will be the bank balance. But like other elements in soil, much of these elements are also in unavailable form for a plant, but relatively easily degradable to become available for use by plants. These can be made available to plants by microbial activity and carbon in this component serves as food for the microorganisms.

As stated above, a plant needs over 30 different elements for its growth and good yield and these should be in balanced form. The three elements nitrogen (N), phosphorus (P) and potash (K) are called major elements because these are required in relatively large quantities compared to the others. Ten other elements [B (boron), Ca (calcium), Mg (magnesium), S (sulphur), Fe (iron), Mn (manganese) , Mo (molybdenum), Cu (copper), Zn (zinc) and Cl (chloride)] are regarded as vital elements for plant growth along with the P and K. These ten are widely known as micro-elements because these are needed in micro quantities - parts per million (ppm). Like the major elements these also occur in 'available' and 'non-available' form. As stated above, an agricultural field would highly likely have all the over 30 elements needed for crop growth, but they would largely be in 'unavailable' form. But interestingly, much of the soil analyses done by scientific community is only for the 'available' form and not for the total amount of any given element in the soil. Also, it is worth noting that all the recommendations of a given fertilizer by the extension agencies or by fertilizer dealers is based on the available quantity of an element.

Note: For good crop growth, other 18 elements are also needed, but in very miniscule quantities and these are regarded as 'Trace Elements'.

Comments on data table 2: Only five of the ten micro-nutrients, widely noted as deficient in farmers' fields in semi-arid tropics [see paper by Sahrawat et al. 2007; Current Science 93(10):1428-1432], were analyzed. Salient comments follow: (a) quantities of available form of nutrients (B, S, Fe, Mo and Zn) were invariably significantly more below the heap than that at other sampling spots of the same field; (b) total concentration of all these elements was similar across sampling spots except for 'total S' indicating addition of 'S' with the items such as 'Amrit pani etc. being applied, and this needs to be studied; (c) the noted small differences across sampling spots in the total concentration of three elements -- B, Fe and Z were statistically non-significant. It was apparent that the heap method of cultivation has ability to continuously converting insoluble form of nutrients to soluble form (note: heap remains moist due to continuous application of water) and therefore potentially obviates the need of dependence on market purchased elements. Discussion with soil scientists indicated that most soils would have total form of most elements.

Table 3. Biomass carbon, biomass nitrogen and dehydrogenase activity in the soil samples collected from Krishi Tirth, Bajwada, Dewas (MP)

TreatmentMicrobial Biomass C (mg kg-1 soil) Microbial Biomass N (mg kg-1 soil)Dehydrogenase activity (µg TPF g-124 h-1)Original Soil3763758Between Heap2743338Planted Heap2083463Below heap4266698

Mean3214264SE+79.8NS19.3NS26.9NS

NS= Differences across treatments are statistically non-significant

On the different parameters measured:

Microbial biomass carbon: this parameter tells us about the carbon held in body of microorganisms, and is an indirect measure of total population of microorganisms, irrespective of their culturability. Note: microbiologists can only culture (in laboratory conditions) about 10% of microbial life in a given niche – a generalization. But this does not mean that the un-culture-able microorganisms are not functioning in nature. It only means that we do not fully understand their importance/value.

Microbial biomass nitrogen: this parameter tells us about the nitrogen held in the body of microorganisms, an indirect parameter of total population of microorganisms, irrespective of their culturability.

Dehydrogenase activity: like the above two parameters, this also reflects all microbial life in a given niche, irrespective of culturability limitations. This reflection is recorded through activity of this enzyme having over 10 sub-types by oxidizing several different substrates of the several biochemical processes operating inside a living microorganism.

Table 4: Population (log10 g-1 dry soil) and diversity (no. of colonies of different types) of different microorganisms in the soil samples collected from Krishi Tirth, Bajwada, Dewas (MP)

TreatmentTotal bacteria pop.Total bacteria diversityActinomycetes pop.Actinomycetes diversityFungal pop.Fungal diversityPlant growth promoters (Ab)Pseudomonas pop.,suppress diseases (Ab)P-solubilizers pop. (Ab)Org. Acid producers pop. (Ab)N2-fixers, AZO like pop

(Ab).Original6.6455.6784.0264.94<4.0<3.03.334.33Between

heaps6.8075.3064.3464.77<4.0<3.03.674.09Planted

heap7.2075.6754.5135.57<4.0<3.05.334.28Below heap6.86115.5874.1863.85<4.0<3.04.004.16

Mean6.8785.5564.2654.79<4.0<3.04.084.22SE+0.099*0.6***0.103NS0.9NS0.152NS1.4NS0.482NS<

4.0a<3.0a1.244NS0.135NSa=Population of Pseudomonas spp. and P-solubilizers could not be assessed due to presence of large numbers of other bacteria.*= Differences across treatments are statistically significant at probability level (P) 0.05 **=Differences across treatments are statistically significant at P 0. 01 ***= Differences across treatments are statistically significant at P 0.001 NS= Differences across treatments are statistically non significant

On the different parameters measured:

Total population of bacteria, actinomycetes and fungi: this parameter tells us about the population of these types of microorganisms that can grow on selected recipes (different for different microorganisms) where microbiologists believe that majority microorganisms will grow. It may, however, be noted that microbiologists can culture about 10% of total population of microorganisms in any niche, due to limitations of methods of culturing. Note: all populations are log numbers and have to be taken accordingly. For example, log 3 means 1000 and log 6 means 10 lakh.

Diversity of bacteria, actinomycetes, and fungi : this tells us the different types (due to size, color, texture etc. of the microbial colony) of microorganisms noted on the growth medium (recipes) used for

population count (above parameter). Thus it does not account for the total microbial diversity in a given niche.

Agriculturally beneficial bacteria (Ab): All the five parameters (last five columns) indicated by (Ab) [the last five columns of this table] are the five different functional group of bacteria with functions as indicated with their names.

Comments on data table 4: (a) Population of bacteria inside heaps and below heaps was significantly more than the other treatments (range from 6.64 to 6.80 log10 per g of soil); (b) population of actinomycetes and fungi was similar across the four treatments and ranged from 5.30 to 5.67 (log10 per g of soil) in case of actinomycetes and from 4.00 to 4.51 (log10 per g of soil) in case of fungi; (c) maximum population of the plant growth promoters and organic acid producers was inside heaps where lot of roots were noted during sampling and lowest in the soil below the heaps where chemical fertility was the highest; (d) population of Psuedomonas (indicators of ability of soil to manage diseases) and P-solubilizers could not be counted due to methodology problems; (e) N2-fixing bacteria (colonies that were looking like Azotobacter) was similar across the four treatments.

Poornima Savargaonkar

Who Am I ?

(It is big question for every human being, and one needs many lives to get the answer to this question. But I will answer this question in the purview of the need here)

My name is Poornima Savargaonkar. I am a telecommunication Engineer by academic education. I served as Scientist / Engineer in Indian Space Research Organisation (ISRO) Ahmedabad for 13 years. I left my this job 10 years back and am now pursuing life on all other dimensions. I am a sports person, a poetess, a learner and a gardener at heart.

Why am I in NATUECO?

Being a learner by choice, I love learning new things; and gardening being my hobby close to heart, I keep learning new methods of urban gardening. My search for a simple, natural, and chemical free gardening brought me to Bajwada to learn another natural method of gardening/ farming. The aroma and vibrance of the nature at the farm; the sheen of knowledge and experience on Shri Deepak Suchade's face assured me of great returns from my this journey. Through the workshop on NATUECO for 5 days, I felt as if I am on a spiritual journey in synergy with the universal energy. Being a Scientist by profession, I questioned every aspect of NATUECO during all the five days. I kept seeking answers to my questions with abundant evidences at the farm. I was amazed with the relationship of mathematics and a plants life as an exact predictable science! After returning home, I strted practising NATUECO on my small roof top in whatever little way I could and experienced the power of the method! I was convinced that My family can eat home grown chemical free food, grown with all the compassion of nature !

What inspired me to help writting / editing the book on NATUECO?

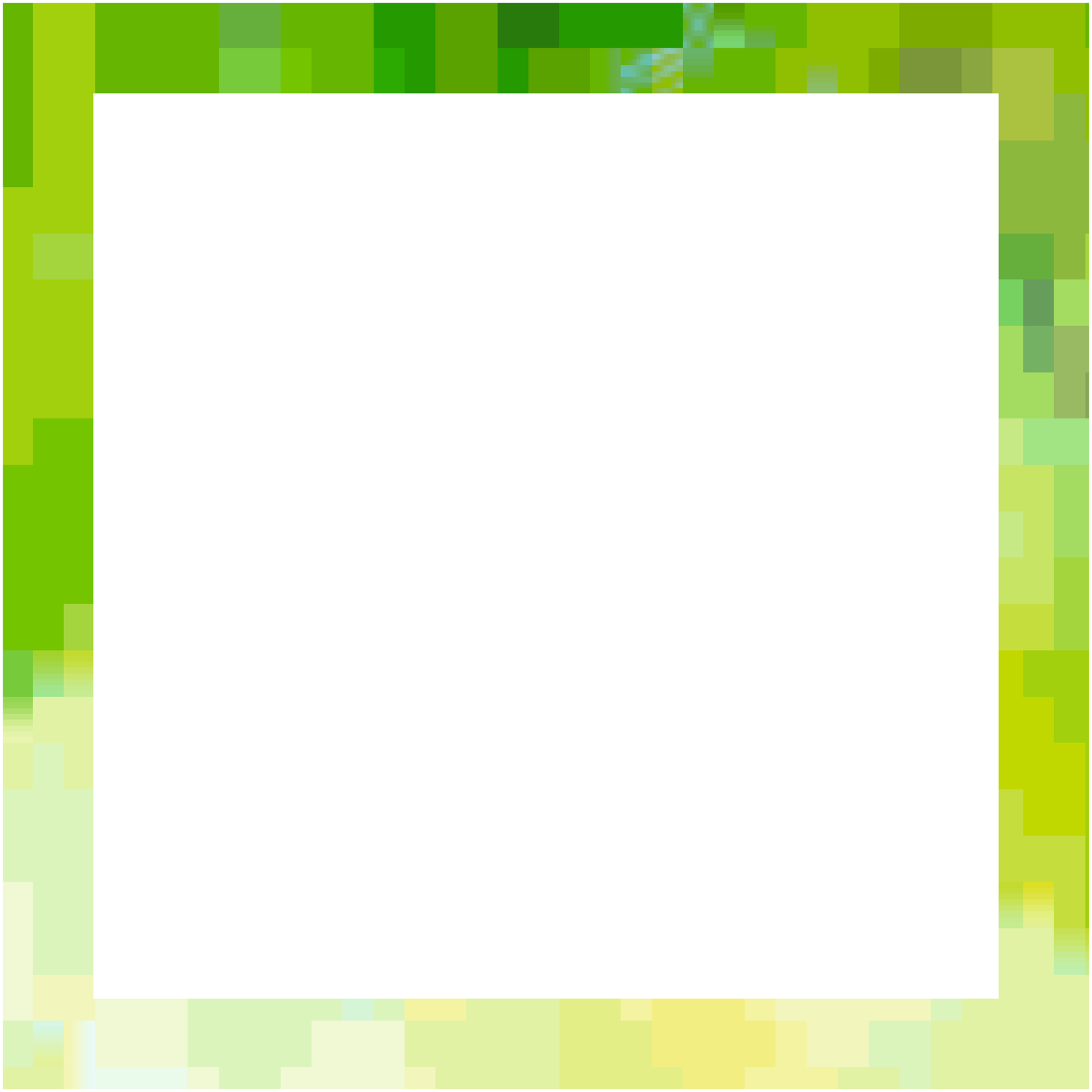
In my various fights against the synthetic urban life in its every aspect including food in North India since past 10 years, I have been following various indegenous/ natural/ spiritual ways of life. I realised during my journey of NATUECO that all my ways of life culminate into it! With the message of Shri Suchade to farm with compassion towards every element of nature and to consume the food such produced; with the mathematical exactness of farming through such methods put forward by Shri Dabholkarji, my patriotic side urged me to join the mission to take NATUECO to every farmer of my country.

Being an electronic engineer, the only scope I had to join this mission was to give out my scribbling skills and expertise in writing scientific documents in their 100%. While language can not express the feelings and depth of knowledge, I have tried my best to give my contributions to the knowledge of the writers of this book

Ajay Bhavsar

I am a man who strongly believe on God, this ancient received by my parents when I was in my childhood. I am a average student in my academic life, did Masters in Social sector. I strongly follower of **"Shri Bhagwad Gita"** from my childhood when I met with or can say felt graciousness of **Lord Krishna**. A lot of times I have been felt he is with me and show me a light in dark pathway of life. More often I thought why I am here, what is the motto of my life and sudden some incidence or human comes in my life and show a luminosity of pathway of life, Perhaps which sent by **Krishna**.

When I was struggled in my life I met with **Shri Deepak Suchde** and learnt a lesson of life from him with Natueco. I inspired a dialogue "Natueco science not just a farming it's a way of life" encouraged me to written the book.



For more information on Natueco

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