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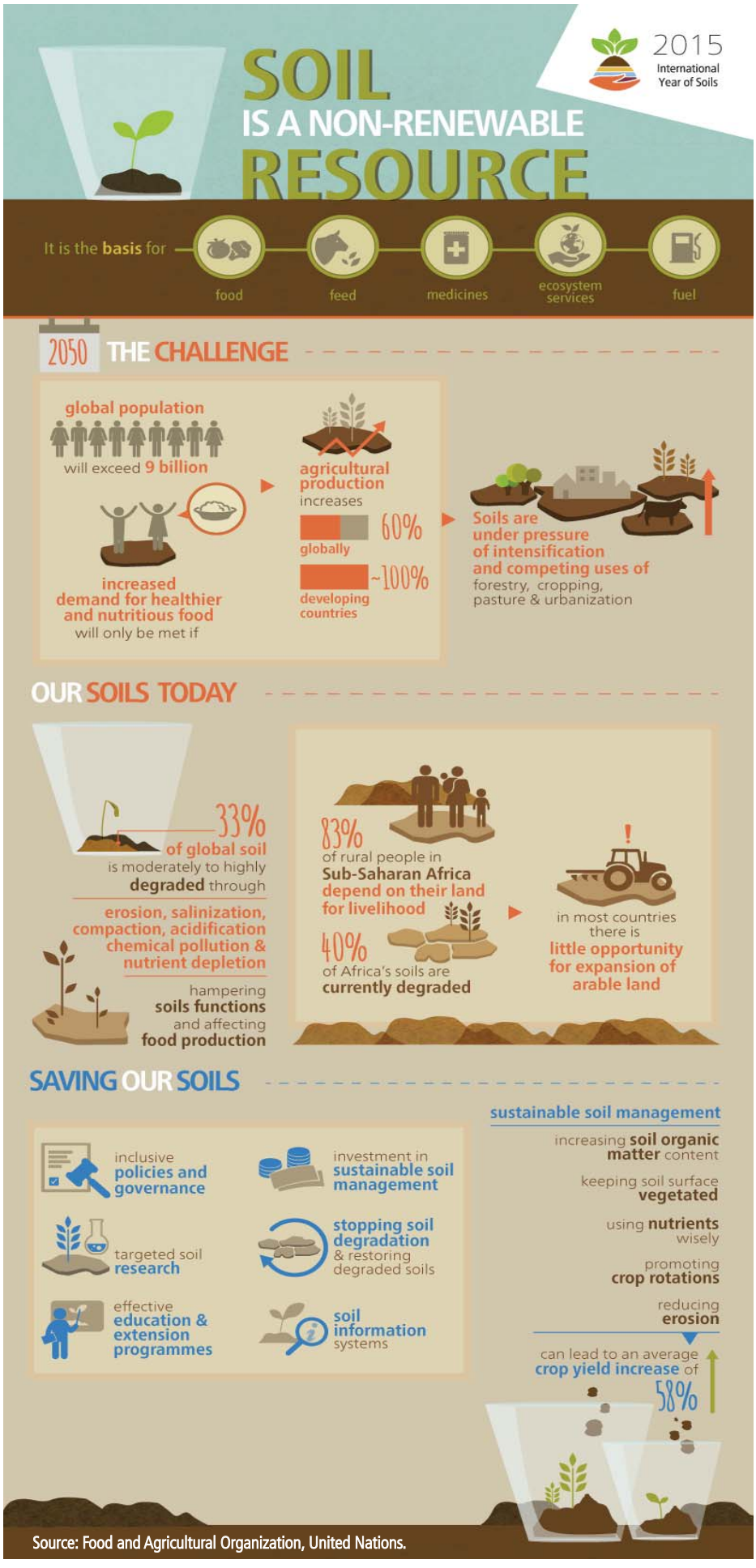
OUR SOIL MATE

INSIDE



THE GOOD EARTH

Healthy soil is the foundation of the food system. It produces healthy crops that in turn nourish people. Maintaining a healthy soil demands care and effort from farmers because farming is not benign. By definition, farming disturbs the natural soil processes including that of nutrient cycling - the release and uptake of nutrients.

Plants obtain nutrients from two natural sources: organic matter and minerals.Organic matter includes any plant or animal material that returns to the soil and goes through the decomposition process. **Organic matter is central to the functioning of many physical, chemical and biological processes in the soil.** In addition to providing nutrients and habitat to organisms living in the soil, organic matter also binds soil particles into aggregates and improves the water holding capacity of soil. Most soils contain 2-10 percent organic matter. However, even in small amounts, organic matter is very important.

Soil is a living, dynamic ecosystem. I firmly believe that by adding organic matter to the soil and improving the structure, it actually helps to increase yields. In the past, researchers and scientists have discovered various advantages to increasing or maintaining a high level of Soil Organic Matter (SOM) such as: reduced bulk density, increased aggregate stability, resistance to soil compaction, enhanced fertility, reduced nutrient leaching, resistance to soil erosion, increased biological activity and reduction of greenhouse gases.

The maintenance of soil organic matter levels and the optimization of nutrient cycling are essential to the **sustained productivity of agricultural systems.** With the optimal level of organic soil present, a number of key factors occurred in **sustained food production** such as increased plant productivity, increased fertilizer efficiency, reduced waterlogging, increased yields, reduced herbicide and pesticide use, increased biodiversity and improving soil properties that are related to soil resilience.

As the Dalai Lama once said, "The roots of all goodness lie in the soil of appreciation for goodness", we hopethat this edition of Organic Growth would be able to shed light on the critical need for organic soil; it's short and long term benefits, howfarmers can take actions to maintain, improve and rebuild their soils, especially soils that have been under cultivation for a long time and its contribution to the agriculture sector through multiple environmental and economic benefits.

Ranjit Barthakur, Chairman,
APPL Foundation

International Year of Soils: Lets Toil for our Soils!

2015
International
Year of Soils

According to United Nations (UN) data, 95% of the food we consume comes from our soil, either directly or indirectly. While advances in agricultural technology have resulted in increased food production across the globe, intensive cropping has depleted the soil in ways that will not sustain high production level for very much longer. There are approximately 805 million people facing hunger and malnutrition today. With the steady growth in population, a further increase of 60% in food production will be required to meet future needs. On the other hand, 33% of our global soil resources are currently undergoing a process of degradation due to poor agricultural practices and climatic strain. With human pressures on soils reaching critical limits, reduction and sometimes altogether elimination of essential soil functions is taking place. The question of food security, an imperative consideration for all developmental models going forward, is intrinsically tied to soil conservation. Recognizing this crucial link, José Graziano da Silva, the Director-General of the Food and Agricultural Organization (FAO) of the UN, stresses that "[w]e need healthy soils to achieve our food security and nutrition goals, to fight climate change and to ensure overall sustainable development."

Soil health refers to the physical, mineral and biological condition of the soil and its potential to sustain biological functioning, absorb water and promote plant and animal nutrition and health. Healthy soils are better able to retain function when faced with any kind of stress or disturbance, such as

On the other hand, 33% of our global soil resources are currently undergoing a process of degradation due to poor agricultural practices and climatic strain.

Good Agricultural Practices: Potato plantation in the North Bank region of Assam where local farmers practice mulching to retain moisture in the soil and to prevent pests from attacking their fields.

too much or too little rain. These soils also recover better after confronting trying climatic conditions. The carbon content of soil is one of the key indicators of its health and is a master variable that controls numerous processes. It is the carbon content of soils that largely governs their capacity to absorb, retain and supply moisture within the soil and to sustain active plant growth. Every gram of carbon in the soil can retain up to eight grams of water. Soil carbon helps support a healthy balance of nutrients, minerals and soil microbial and fungal ecologies, improving soil fertility. It promotes the sustained production of essential food and fibre as well as the capacity of plants and animals to resist disease, insect infestation and climate stresses. Increased soil carbon levels therefore also have the means to reduce our reliance on costly fossil fuels and other farming inputs.

Hosting at least a quarter of the world's biodiversity which is crucial to the carbon cycle, the soil helps us mitigate and adapt to climate change, in addition to playing a vital role in water conservation and in building a stronger resistance to floods and droughts. Hence, the framing of strategies for water conservation or climate control, without factoring in the critical positionality of the soil would amount only to a piecemeal approach, given the interrelatedness of our natural world. Soil is the largest pool of organic carbon, which is essential for mitigating and adapting to climate change. In an era of water scarcity, soils are fundamental for its appropriate storage and distribution. Our soils must be managed in an integrated way with our water and vegetation resources.

When we stand today and take stock of our actions, especially over the past 100 years, we realize that we have cleared 75% of the Earth's forest cover, depleted over 8 billion hectares of our deep organic soils, created 4 billion hectares of manmade deserts, practiced unhealthy form of agriculture such as an excessive use of chemical fertilizers and monoculture farming, and depleted over 150% of the planet's sustainable resources.

By 2025, it is estimated that 1 billion of the world's population will be living in conditions of absolute water scarcity while over the last 18 years, shortage of food and rising prices have been at the centre stage of 60% of all human conflict. While, it can take up to 1000 years to form just 1cm soil cover! We need to pay heed to these figures. We need to recognize that the solution lies in nurturing and protecting the soil by adopting healthy practices.

Towards this end, FAO has declared the year 2015 as the International Year of Soils which is intended to serve as a platform for raising awareness on the importance of sustainable soil management as the basis for food systems, fuel and fibre production, essential ecosystem functions and better adaptation to climate change for present and future generations. Through various campaigns organized on digital media such #soil4life and a blog for soil stories, the organization is trying to engage with larger audiences and spread its vision for the future of a 'land degradation neutral world'.

The Aral Sea

In 2000, water exists in both the northern and southern parts of the sea

In 2007, the eastern lobe of the Southern Aral Sea appears to be drying

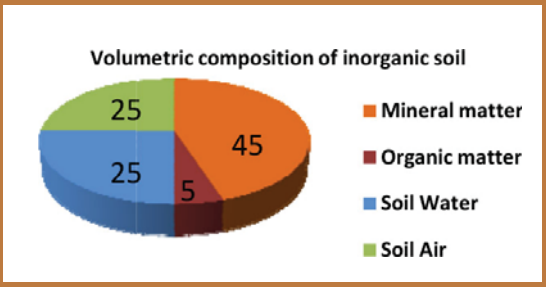
In 2014, the eastern lobe has completely dried up

Source : Down To Earth

Soil : Nature's Most Precious Gift After Water

Soil is the covering on the solid crust of the earth's land mass. By simple definition soil is **"A dynamic natural body on the surface of the earth in which plants grow, composed of mineral and organic materials and living forms."**

The soil consists of four major components i.e. mineral matter, organic matter, soil air and soil water.

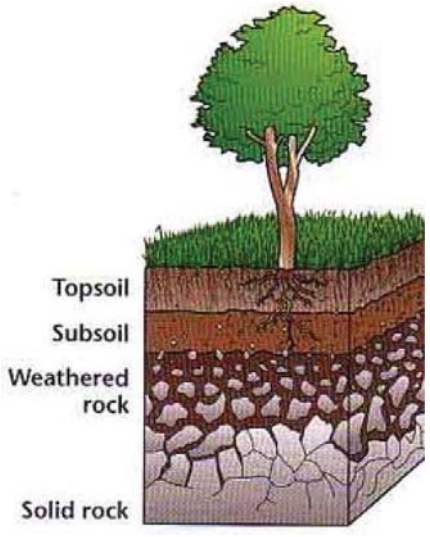


Soil as a Natural body

In soil, there involves a three phase system in which the mineral and organic matter forms the solid phase, the water containing salts & some gases in solution the liquid phase, and various gases forms the gaseous phase. Each phase contains a number of constituents which makes the whole system highly complex. On account of the changes continuously taking place in the soil, the system is never in equilibrium.

Soils on various parts of the world are as diverse as the landscape and there are different groups of soils based on different factors – viz. based on climate where these soils are formed; based on effect of local topography & drainage and based on the original parent rock materials above which the soils have been formed.

In India, soils have been divided into following major groups – Red soils, Lateritic soils, Black soils, Alluvial soils, Desert soils, Saline & Alkaline soils, Peaty & Marshy soils, Terai soils, Brown hill soils, Sub-montane soils and Mountain meadow soils.



The major types of soils found in North East region of India may be summarized as follows –

- Red soils in part of Arunachal Pradesh, Nagaland, Manipur, Mizoram and small part of Meghalaya.
- Forest & Mountain soils in Sikkim and part of Arunachal Pradesh.
- Alluvial soils in most of Assam, small part in Manipur.
- Laterite soil in southern part of Assam (Karbi Anglong & North Cachar Hill districts) and most of Meghalaya – this contiguous part is extension of the Deccan plateau.

The most typical characteristic of Assam soil are its acidity. The major parts of the soils of Assam are acidic having a pH of around 4.00 to 5.80 which is why Assam soils are favorable for Tea even in valley.

These upland acidic soils are Loam to Sandy Loam in nature. Tea grows favorably only on well drained loam to sandy loam soils with a pH of 4.50 to 5.50. However, the soils of lowland flood plains of Assam have slightly high pH of 6.0 to 6.5, are more clayey and hence are favorable for growth of wet rice. The soils of Karbi angling & Hill zone of Assam however have high pH of 6.0 to 7.5.

Soil as physical support and substrate for growth of plants:

Soil is the main physical support on which plants grow with the help of the roots.

The normal green plant can synthesize its own food, provided it gets all the elements under normal growing conditions. Majority of these mineral elements are absorbed by the roots of plants from the soil which are known as plant nutrients. Plants contain small amounts of large numbers of elements, out of which only about 17 have been found to be essential for completion of life cycle of a plant. These are called essential plant nutrients viz. Carbon, Hydrogen, Oxygen, Nitrogen, Phosphrous, Potassium, Calcium, Magnessium, Iron, Sulphur, Boron, Manganese, Copper, Zinc, Molybdenum, Chlorine and Nickel. Carbon is taken from carbon di-oxide in the air, hydrogen and oxygen is taken from water and rest all of the mineral elements are absorbed by plant roots from soil.

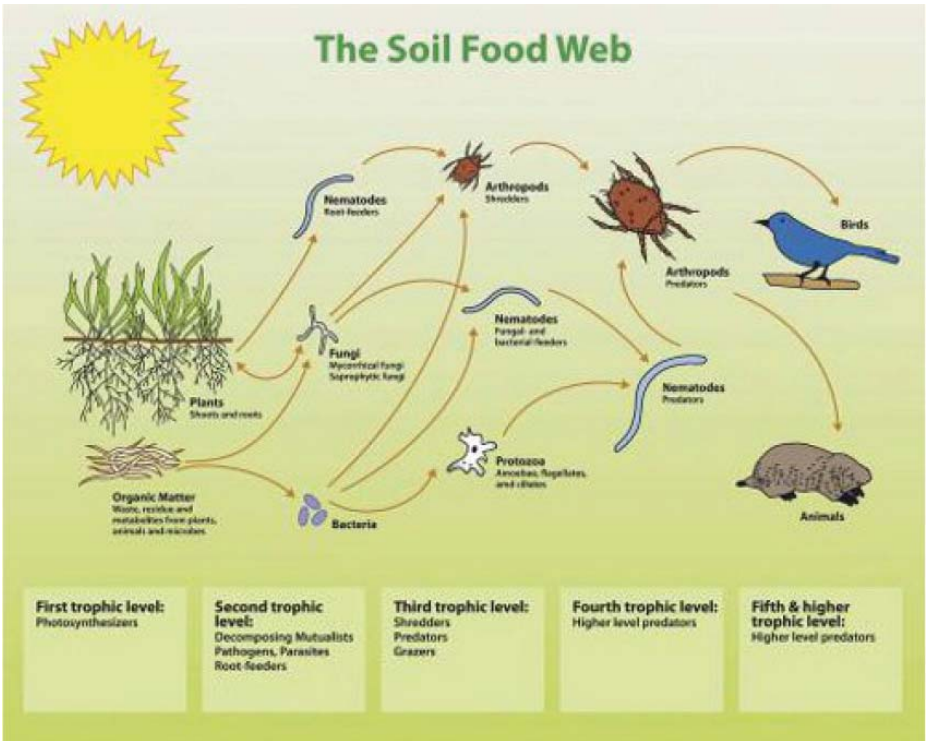
This signifies how important is soil as a source of nutrition for plant growth which in turn determines the food production for

consumption by human and animals.

Soil rich in these above mentioned minerals are called fertile soils. However, the capacity of a soil to support luxurious growth of plants over a longer duration of time in terms of years and decades may be termed as soil productivity. Soil productivity is different from soil fertility as productivity includes many other factors like soil physical conditions viz. texture, structure, density, aeration etc. as well as soil biological parameters. Hence soil productivity is of more importance to an agriculturist.

One can argue that a plant can not differentiate whether these mineral elements in the soil are coming from an organic source (decaying plant-animal matter / applied compost etc.) or from applied chemical fertilizers. It may be true, but it has been proved that long term chemical fertilizer and herbicide applications alter or cause damage to soil biology and in turn effect vital soil biochemical and structural functions. Hence, there will be always a debate between application of chemical inputs for production of food, fodder, fibre and other essential agricultural inputs on soil for ever growing human and animal population vs. doing organic or natural soil cultivation for longer term sustainability.

Soil as a habitat for living organisms:



living organisms due to the kiln-burn process and hence cannot be defined as soil.

Soil is home to a large percentage of world's biodiversity. Macro-organisms like mites, insects, millipeds, centipeds, earthworms, snails, rodents, snakes etc. live in soil. Soil also has microfauna such as protozoa and nematodes. Microorganisms like bacteria, actinomycetes, fungi and algae live in soil in huge numbers. There are several billion microorganisms in a single gram of soil and thousands of different species, some of which might not have been classified yet.

Soil biology plays a vital role in determining many soil properties. The connection between soil organisms and soil functions are incredibly complex. Soil organisms breakdown organic matter, making nutrients available for plant and other organisms. The mineral content of the soil and its structures are important for their well being, but it's the living organisms in soil that powers its cycles and provides soil's fertility and productivity. Without the activities of soil organisms, organic matter would accumulate and litter the soil surface and there would be no available food for

Soil is a living body. This is the major difference between soil and a brick. A brick is made out of soil but devoid of any

Soil erosion by water

Dumping of urban waste on landfills

Oil Spill at Seashore

Drought

Soil erosion on Tea fields at high slopes

plants, in turn no food for other consumers higher up in the food chain.

Soil at receiving end of human activities and as a dumping ground of human waste:

Soil degradation is the decline in soil quality due to its improper use, commonly for agricultural, pastoral, industrial or urban purposes. Soil degradation is a serious global environmental problem and may be complicated by climate change effects. It includes physical, chemical and biological deterioration. Some examples of soil degradation may be loss of organic matter, decline in soil fertility, decline in soil physical properties, erosion, adverse changes in salinity, acidity or alkalinity, effects of accumulated toxic chemicals, pollutants or excessive drought & flooding.

Some of the causes of soil degradation are natural but most of these are due to human activities. Increased demand for agricultural products causes conversion of forests and grazing lands to agriculture. The transition to agriculture from natural vegetation often cannot sustain the soil properties and many

of these plants, such as tea, coffee, cotton, palm oil, soybean and wheat, can actually increase soil erosion beyond the soil's ability to maintain itself. About half of the topsoil on the planet has been lost in the last one & half century. In addition to erosion, soil quality is affected by other aspects of agriculture viz. soil compaction, loss of soil structure, nutrient degradation, and soil acidity/salinity/alkalinity. These are very real and at places serious issues.

The effects of soil erosion go beyond the loss of fertile land. It has led to increased pollution and sedimentation of streams and rivers, clogging these waterways and causing declines in aquatic and other species. The degraded lands are often less able to hold onto water, which can worsen flooding. Sustainable land use can help to reduce the impacts of agriculture and livestock, preventing soil degradation and erosion and the loss of valuable land to desertification.

Care for Soil

Soil can be termed as earth's delicate skin that supports almost all life on Earth. Soils host the majority of the world's biodiversity and healthy soils are essential to securing food and fibre production and providing an adequate water supply over the long term.

Ecosystem services provided by soils are integral to the carbon and water cycles and include cultural functions. There are strong connections between climate change and soil condition. Increases in soil carbon can help to mitigate greenhouse gas emissions and enhance adaptation to climate change.

Hence steps must be taken by all concerned to reduce degradation of soil, by taking appropriate measures wherever required. Some of the steps to reduce soil degradation in agricultural use may be –

- Reduced use of chemical fertilizers and application of organic composts and bio-fertilizers as integrated nutrient management. Use of bio-fertilizers also helps in reduction of green house gas emission from soil.
- Soil application of toxins through pesticides, herbicides, solid waste dumping etc. should be reduced if not possible to be eliminated.
- Use those cultural practices for cultivation of crops which minimises soil degradation.
- Promotion of natural or organic ways of cultivating the soil, creation of a suitable toxin free soil environment for the soil biology to flourish carrying out their natural processes of keeping the soil productive for growth of healthy plants, so that the basic food chain is maintained for all living organisms in the decades & centuries to come.

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Inhana Rational Farming Technology

: A New Initiative Towards Hathikuli Sustainability

Industrial agriculture has been promoted, financed and subsidized in spite of its high negative environmental externalities. Although high-input agriculture has certainly resulted in spectacular gain in productivity, it has degraded some of the natural bases on which this system rests. The ultimate cost of this degradation are borne by the society at large be it lower productivity, soil erosion, salinization, fertilizer, pesticide contamination or genetic erosion.

All proponents of sustainable agricultural development agree that efforts must be made to develop a land use system or technology that is economically viable in the short run yet not environmentally degrading in the long run. In short, the essence of sustainability is the maintenance of natural resource productivity. A new technology became necessary to solve technologically induced problems.

The cause was well understood and an un-debated global issue. But even more cause of concern was the absence of an economically viable but environmentally sound farming system. In this bleak scenario there was one man who began his search for a viable alternative for pure food production while safeguarding the fragile ecosystem from further damage. This man was Phalguni Das Biswas. Having left the realms of pharmaceutical sciences, he initiated his forays into finding effective solution for the agricultural world which was floundering from the ill effects of chemical farming practice. The journey started in 1998 with Research to understand all natural processes, moving away from the reductionist approach of conventional science to the true science of more intuitive understanding. Initially the effort was to develop the remedy for certain unresolved problems of agriculture but very soon Dr. Das Biswas understood the need for a complete Package of Practice rather than to provide the symptomatic reliefs. The study of the vast ocean of Indian wisdom and its harmonization with modern scientific thoughts and understandings gave birth to Rational Farming Technology.

It was thus named because the technology was not only rational to Plant Physiology but also to its philosophy. He founded INHANA Biosciences – science IN HArmony with NAture. Inhana Rational Farming (IRF) Technology is perhaps one of the available method which assures safest way to benefit mankind with conviction, polite aggression and results. This successfully showed that ecological and economical sustainability are the two sides of the same coin. Rather ecological sustainability surely brings economical sustainability, if a technology recognizes

Dr. P. Das Biswas, developer of IRF Organic Package of Practice with Ms Joelle Kato, Programme Manager, IFOAM, Germany during discussion regarding young tea management under FAO-CFC-TBI Project (2008 – 2013) at Maud T.E., Assam (India).

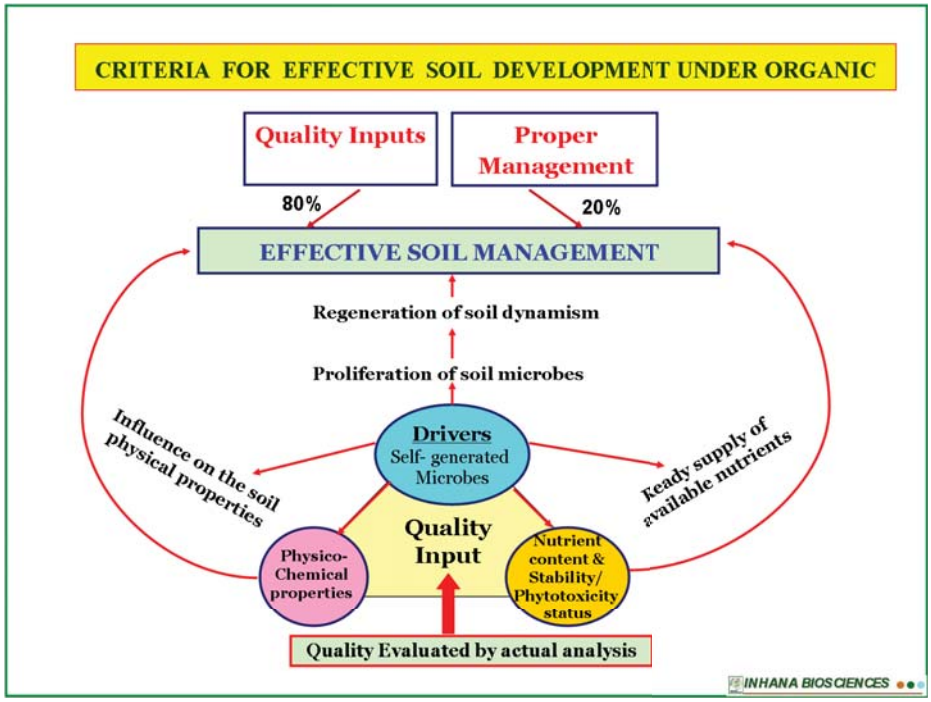
that a piece of land on which crop plants are grown is foremost an ecosystem, and not a factory - an ecosystem where all components are in interrelated and intertwined complex to retain its functionalities.

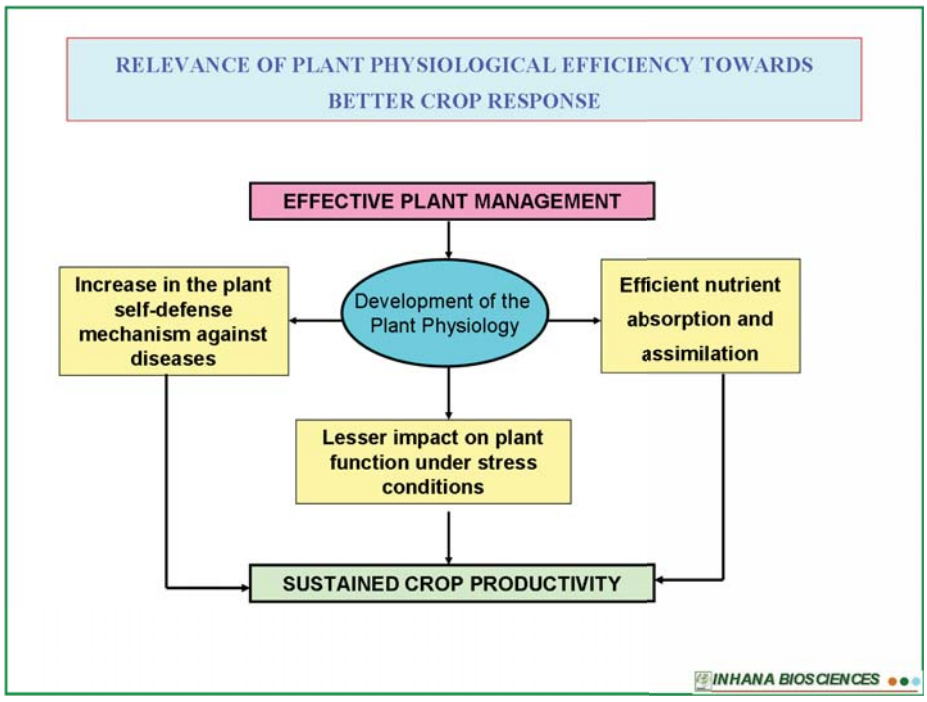
IRF Technology advocates that plants are endowed with two unique qualities i.e., sense of Self-Nourishment & sense of Self-Protection. Today, they have lost these due to application of chemical fertilizers and synthetic pesticides for more than five decades. The founder of Inhana understood that returning back these lost qualities would surely bring back the sustainability, higher resource recovery system and renewability. He found that the single most deficient factor, if provided can make the plant and soil system most efficient – and that factor is Energy. Thus Rational Farming Technology was developed under Energy Management Principle and aims towards:

(1) Energization of Soil System and (2) Energization of Plant System.

IRF utilizes various in-house solutions which are nothing but the potentized and energized botanical extracts developed under Element-Energy-Activation (E.E.A) Principle. These solutions do not add any element from outside but only provide the necessary 'ENERGIES' for activation of Plant Physiology and Host Defense Mechanism. Novcom Biodegradation Method under this technology ensures on-farm composting within just 21 days. Novcom Compost generally contains microbial population in the order of 1016 c.f.u/gm moist compost along with high nutritional status, thus rejuvenates soil in a speedy manner even under low quantitative application.

The technology lays out step wise guidelines for organic cultivation from seed sowing to crop harvest, enables effective organic soil management through quality on- farm produced compost, but its primary focus remains on activation of Plant Physiology, which is the single most important criteria for successful organic crop production be it in terms of ensuring higher nutrient use/ agronomic efficiency or effective pest control through enhancement of plants' host-defense mechanism against pest/ disease or more specifically Pest Management through Plant Management.





The technology was first adopted in tea because of its uniqueness, complexity and specialty. Choosing tea for validation of the technology was to push the envelope to extreme possible limits, as it is perhaps the most difficult for organic conversion due to bush age, limited scope for soil rejuvenation, lower microflora population and higher N requirement for vegetative propagation etc. Tea plantations are also subjected to application of large volumes of fertilizers and as very little of these chemical salts are absorbed by the tea plants; the unabsorbed part causes tremendous damage to the soil system. On the other hand because of the broken and deactivated soil and plant system, pest and disease occurrence in tea plantations are perennial, acute, resistant and resurgent. The venture which was started in 2001 in 600 ha tea growing area of Assam

and thereafter in 1200 ha area has not only ensured Crop and Economic Sustenance in about 18 lakh kg but also led to approx. 12 lakh kg Carbon Neutral Foot Print Teas; which is perhaps the 1st time for an organic tea garden in India. A joint study by Dept of Ecology & Environmental Science (Assam University) and Inhana organic Research Foundation also revealed considerable development of Biodiversity components in the garden viz. soil organic carbon stock, earthworm population, soil microflora, water quality, bird diversity etc. Repetition of the success story can be witnessed in Dooars i.e., in one of the high pesticide using zone, where the technology has been accounting for 12.0 lakh kg Sustainable Organic Teas.

Commercial success of the technology has been complimented by its scientific validation under the FAO-CFC-TBI Project (at Maud T.E., Assam; 2009 to 2012) entitled 'Development, Production and Trade of Organic Tea, where it came out as the most Effective Organic Package in terms of crop performance and soil development with lowest economics; as compared to all other test organic Packages of Practice/ methods. Most importantly, the technology came out effective in all stages of tea cultivation i.e., Nursery to Mature Tea. Though IRF modestly assures sustainable organic tea cultivation, the scarcity or non-availability of biomass/organic matter became a block for large scale organic tea cultivation. At the same time, there was an increasing demand and requirement for reduction of pesticide load in Indian Tea. Equipped with the wide array of findings that came out from the research, Inhana Biosciences started an initiative towards Chemical Reduction from 2014 in about 40 lakh kg tea in Dooars and Assam which in the very first year recorded a reduction of minimum 30% compared to previous year's usage. This year about 85 lakh kg tea is under the same program, which will perhaps be 100% of Indian Sustainable Teas.

An effective technology will have universal approach and this is demonstrated by successful utilization of IRF technology for commercial production of different agricultural crops viz. cereals, pulses and vegetables (both general and exotic ones); along with its validation under various experimental projects undertaken in State/ Central Agricultural University farms, Government Farms and Research stations.

Hathikuli T.E. has been an ambitious project of APPL; from the time it went ahead for organic conversion in 2007 and has since been the frontrunner for enhancing Biodiversity of the plantation area and safeguarding that of Kaziranga National Park – the World Heritage Site. The positive impact of non-

A bird's eye view of the Hathikuli Tea Estate

chemicalization is reflective in the excellent teas produced from the garden, but still economic sustenance has been a major issue in the event of huge crop loss witnessed post conversion and still continuing. Inhana Biosciences' association with Hathikuli T.E. came in the light of leading the garden towards this much needed sustainability be it in terms of Crop or Economics, or in other way, Ecology and Economy.

Preliminary assessment by Inhana has revealed the need for focused approach towards soil and plant management in Hathikuli T.E., which in turn shall foster effective control of the pest, especially helopeltis. The foundation stone of the programme has already been laid in the form of the on-going SWOT Study or Resource Analysis of the garden, on-farm resource utilization has been stepped up as well through Novcom Composting programme, which enables conversion of any type of biodegradable matter into quality compost. Quality especially in terms of high population of self-generated microbes is the focal point of Novcom compost not only for ensuring Higher Nutrient Utilization Efficiency but more so for Speedy Resource Recovery post soil application. Plant Physiology Activation programme of the tea bushes shall perhaps be the 1st ever initiative in the garden which will serve the dual objectivities of Higher Agronomic Efficiency and Better Host-defenses of the plants against pests and diseases. Effective Resource Management and Higher Resource Utilization are the primary aim of Inhana's programme in Hathikuli T.E. and all efforts are being made in this direction.

A Pilot Scale study has been formulated which should commence very shortly with the objectivity of validating few promising packages with reorientation from the FAO-CFC-TBI Project for bringing forth 2 or 3 effective choices of organic POPs for plantations intended for organic conversion and also towards formulation of an effective pathway for Sustainable Chemical Reduction programme for the conventional gardens, which is the requirement of 99% of the Indian Tea Industry. The move towards sustainability has happened at a very significant time, particularly in the pretext of Climate Change, which is already having an impact on agriculture and food security. Hence adaptation to Climate Change and lower emission intensity per output will be necessary. Hathikuli & Inhana Biosciences aims to show a pathway for Climate Smart Agriculture.

Large scale on-farm Novcom composting in Hathikuli Tea Estate as an initiative towards effective Soil Resource Recycling for organic soil management.

Dr. P. Das Biswas

Inventor of Inhana Rational Farming Technology

– A Comprehensive Organic Package of Practice & Pioneer of Scientific Organic Tea Cultivation in India.

North-East of India - Cradle of Naturenomics™*

North East India - Context

India, particularly, the North-East, is one of the twelve-mega hot-spots of bio-diversity in the world, and hence represents one of the few remaining regions of convergence of diverse nature-based assets. The North East, being at the confluence of three major geographical realms of the world (Indian, Chinese and Indo-Malayan), is extremely rich in floral and faunal biodiversity with several endemic species. The following are examples of the bio-diversity of North East India:

- Plants and trees:
- 7,500 species of plants, including flowering plants (as many as 700 species of orchids)
- 500 species of ferns
- 500 species of mosses, etc
- Animals, mammals, birds, reptiles and fish
- 183 species of animals
- 236 species of fish
- 541 types of birds
- 160 species of mammals
- 137 species of reptiles, etc

This bio-diversity of North East India naturally lends itself to the development of a Naturenomics™ based economy.

Underlying components of the North East's bio-diversity

At the heart of the bio-diversity of the North East are its tremendous land and water resources.

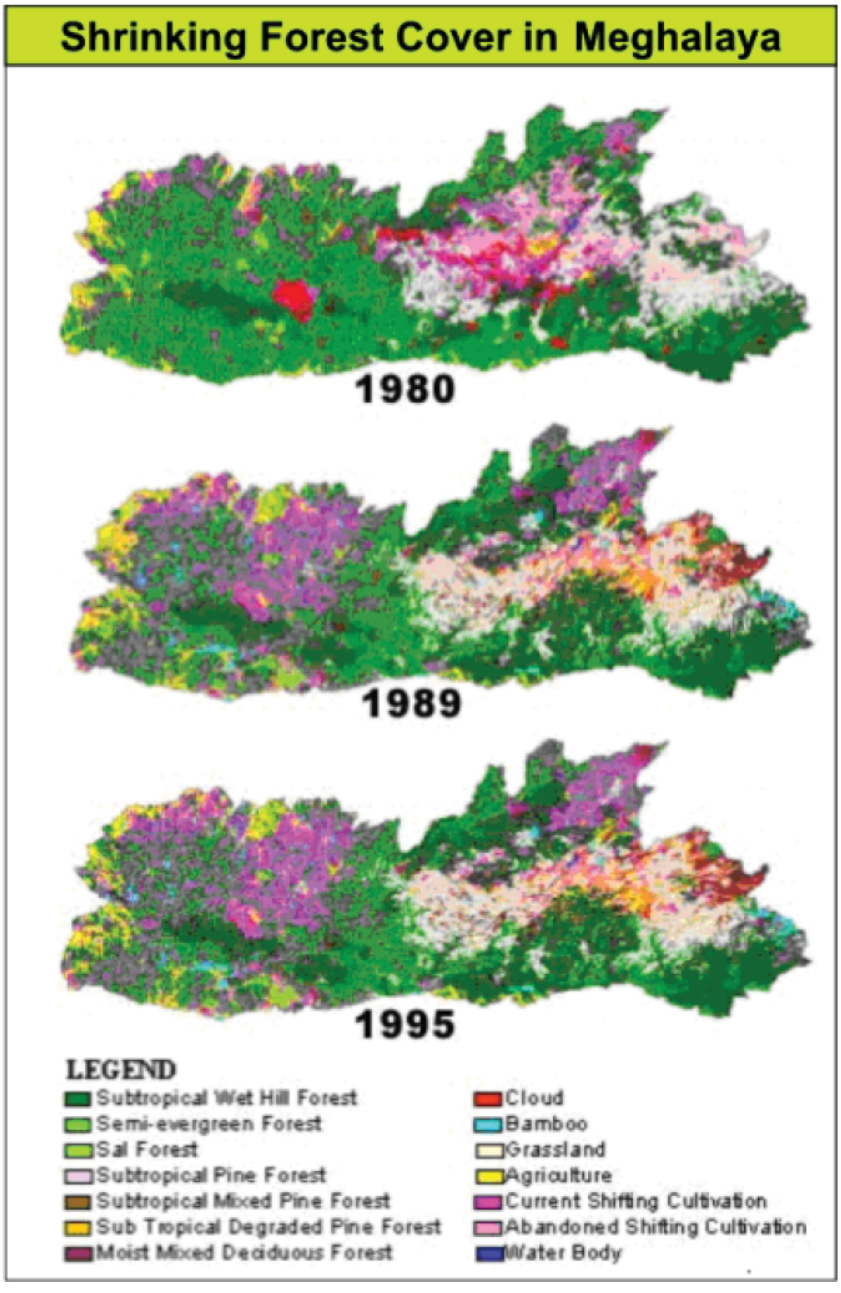
In terms of land resources, even though the North Eastern states make up for only about 8% of the total geographical area of the country, they have about 25% of the country's total forest areas (nearly 70% forest cover) supporting about 30% of the total growing stock of the forest of the country.

In terms of water resources, the North East is extremely rich in rivers, led by the mighty Brahmaputra, lakes, and other natural water bodies. In addition, this region is also one of the rainiest regions of the world, being fed with two monsoons. Rain water further enhances the existing water resources in this region. The regions extensive water resources lead to several species of water living organisms thriving in this environment.

Threats to the North East's bio-diversity

Over the last 20 years, the North East's bio-diversity has been severely challenged due to human and natural factors which have impacted its land and water resources. The key human led challenges are:

- Rapid population growth of the North Eastern states: this poses a tremendous threat to the existing forest cover and the biodiversity of the area. This rapid increase in population, in terms of both absolute and density, means that the fragile capacity of the region to absorb human presence is challenged
- Land use patterns: examples of intensive human land uses include agriculture, industrial and settlement. These land uses dramatically alter the ecological character of the land where they occur, and they tend to be permanent modifications at ecological time scales



- Large scale deforestation: this is rampant throughout the North East. The conversion of forest areas is more towards non-forest category than into other land cover types. The increase in grassland has also been due to conversion of moist deciduous forests and tropical semi evergreen forests. The increase in area of tea gardens is due to proximity of moist deciduous forest to tea garden areas
- Manmade threats: for example, unplanned and inefficient construction of dams has a significantly damaging impact on the natural surroundings resulting in flooding, relocation of population masses, and even changing courses of rivers

In addition to human-induced disturbance, the North East is also severely prone to natural disturbance. It is one of the worst affected areas of different natural calamities like flood. Taken together, the two magnify the impact on bio-diversity, affecting ecological entities from species to whole communities and ecosystems.

The implications of human and natural threats to the bio-diversity of the North East are far ranging in terms of the ecological equilibrium of the region. Some of the key implications are:

- Impact on food
- The impact on soil structure due to soil erosion directly impacts the fertility of the soil, resulting in lower productivity of the land for agricultural purposes
- Food shortage in large and fast growing population geographic pockets
- Neglect of the water resources reduces the numbers of edible water organisms such as fish
- Impact on water
- Wastage of water
- Shortage of water
- Impact on nature
- Extinction of plants, animals, birds, etc
- Dramatic changes in climate
- Damaging impact of floods, landslides, etc
- Changing courses of rivers

Land and Water Security

In order to arrest the declining bio-diversity of the North East, it is critical to secure its land and water resources. Ensuring security means creating a strategy and plan to control and manage the human and natural (wherever possible) factors which are contributing to the erosion of the land and water resources of the region, which results in the declining bio-diversity of the North East.

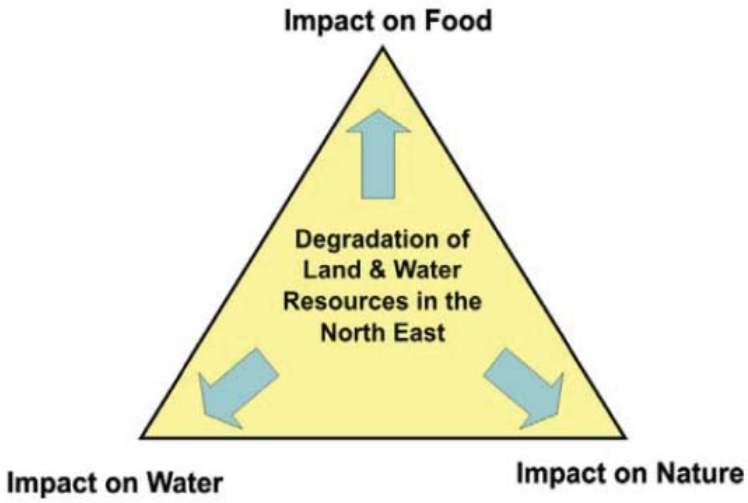
Land security would include (examples):

- Economic value addition of agricultural land: growing plants and crops with value added potential such as organic cultivation, medicinal and herbal plants, floriculture, bamboo, reinvention of tea plantations, etc
- Regeneration of agricultural land: land under agriculture has been degenerated if its essential nutrients due to constant cropping and use of chemicals. Once land yields decline, farmers move to other more fertile lands, which are most often forests. This cycle continues resulting in mass deforestation. Organic regeneration of land will return to it its natural nutrients thereby enhancing the productivity of the land
- Protection of green cover: protection of existing forests, and increasing forest cover if possible
- Maintaining the natural habitat: protecting endangered species of plants, trees, and living organisms by maintaining (and enhancing) their natural habitat
- Managing land use and migration: planned urbanization, and creating village based opportunities to reduce migration to urban areas
- Managed exploration of natural resources: planned management and minimised wastage of land based natural resources such as oil, natural gas, coal, etc

*** This is an excerpt of an article first published in Nuturenomics™ 1.0 in August, 2007.**

Prabir Banerjea,
COO Agri Business
Amalgamated Plantations Pvt. Ltd.

Previously, Prabir was CEO of Globally Managed Services engaged in the areas of organic agriculture, floriculture and fresh water fisheries and has spent significant amounts of time not only in the North East but also in Rajasthan, Himachal Pradesh & Andhra Pradesh. In addition, he was actively involved in promoting eco and rural tourism home stays and activities in Assam. He is a cofounder of an NGO called Balipara Tract and Frontier Foundation



Back to the future: Conversation with Aparajita Sengupta

Aparajita Sengupta moved back to India in 2011 after having spent almost a decade in the United States, during which time she earned, Says she a PhD degree in English, fell in love with her husband, Debal, got married, learnt to drive and swim, traveled a lot, and had a daughter. This was also the time when she became convinced that she and her husband wanted to return to India and become farmers. This conviction for them began as a concern for what they consumed, and gradually invaded their sentiments regarding everything around them — society, environment, politics, the climate, and their own status as immigrants. Primarily, it was their immersion in the politics of food that convinced them to head back home to India and be part of a movement here. Below is an excerpt of a conversation that ensued with Aparajita on the future of farming.

When and why did you move back to India?

We moved back to India in 2011 from Lexinton, Kentucky. The move was more of a personal choice, I think. I didn't quite enjoy living in the States. And my family was here so I always knew that I wanted to come back. Part of it had to do with the fact that we had gotten involved with this whole movement surrounding food and farmers' markets in United States. I think that our conviction regarding what was happening in the United States was far from being right. And we could see that it was impacting the situation in India. This whole growth model that we saw being implemented in India, we sort of saw what would happen 20 years down the line. That was part of it, to share what we had seen in the States; come back and tell people about it and make them question the myth about the land of the free.

What was it that disturbed you the most about what you were witnessing in the United States?

I think it began with the food, of course. We were always dissatisfied with the food that we ate over there. We didn't like the taste; we didn't like how the food got to us. So, initially we started questioning why food did not taste good back in the States. We were constantly researching and at a point we were looking up what was going in to our food and honestly, we were shocked! We did not quite have any idea, say for example how the meat industry works over there, whether it's chicken or beef or whatever kind of meat that you're consuming. It's a horrific process how meat gets to your plate. Even the vegetables, everything tasted odd. And I was particularly put off by the fact that you could get everything year round. There was no aspect of seasonality. Weather never affected what got to your plate. Sometimes there were seasonal things that were more symbolic like pumpkins during Halloween, for example. But it did not reflect the state that nature was in.

It was bounty all year round. I did not like that. Initially it was just the taste that got us researching about what was going in to the food and then we were really shocked. You know, the amount of pesticides going in to the food, the amount of hormones going in to the milk and other dairy products, the whole idea that animals were kept in one place and given food they were not supposed to eat and then given enzymes to digest that food (and this goes on still!), the feed lots. A more recent phenomenon, I just read it up today, the plan now is to ship the chicken that is reared in the States to China, as it's cheaper to process the meat over there and then ship it back to the States. The illogic of transporting food all over the place and transportation of food itself is one industry. This transported food first of all, is toxic. Secondly, there are so many chemicals in there that have never been tested. Even when they have been tested, the chemicals have been tested individually and not for their synergistic effects. They never test how five different chemicals are reacting in your body together. You pick up a packet of chips, something which is supposed to have three ingredients – potatoes, oil and salt, maybe at the most, spices – has 18 strange-sounding ingredients listed in the package and it makes you wonder. Things never go bad. You buy a carton of milk and you put it in your fridge and you can keep on drinking it for such a long time. Those kind of things really started affecting us. So we started reading up on them and then made a mad rush to buy organic stuff at the big organic store because that's what's available. So you if don't want to consume chemical stuff, where do you go? You go to the organic store. But even in the organic store you see the same kind of bounty all year round. The organic things of course tasted better but still not as fresh or tasty as we taste stuff in India, even now. I couldn't quite see the point of an organic frozen pizza or an organic ready-to-eat dinner because once again there are 30 chemicals in that and it didn't make sense. Plus it was very expensive and we were paying 3 times more for the organic food. We were convincing ourselves that we were eating the better stuff now.

The onus is always on the consumer, right?

Well some people think that it is okay to ask more for organic food and the logic of the market follows. The demand is low while the supply is not that high so of course the prices would be high. Keeping apart the capitalist logic of price, food is your basic need. It's a basic right. It seems illogical that pure food can only be attained at a price because everybody has a right to pure food. Just because you can pay for it does not entitle you to food without chemicals. Everybody on this planet should have access to food that does not have chemicals in it. That's when we started thinking and realized there were many things wrong with big organic retail.

So what other options were there for people who wanted to consciously avoid both chemical produce and organic retail?

There were a few local co-ops that brought in local produce and at this time, when we were staying there, we saw the farmers' market movement really take off. In the beginning the market used to have very few farmers bringing very few things but by the time we were leaving the market had grown significantly. The farmers had built a covered pavilion in downtown Lexington. Initially, there was very little choice and we would buy whatever we could get but gradually, the idea started gathering momentum and people started bringing meat and eggs there; vegetables and fruits were of course available. So this was a movement taking off in front of our eyes and it was really exciting to see people actually wanting to have access to local food.

How did India figure in all of this?

So that was I think when we started thinking about India and how it was proceeding towards these departmental store types food outlets. The big brands, the fast food retail chains were all here, people were really excited about eating at these chain outlets. And it's funny how the whole class element in India came to prey on it. Everyone here considers eating these meals 'classy' while in the United States it's known as the poor person's food chain. And that's the strange thing about India, if you introduce something as the poor person's thing it doesn't take off very well. Take for instance the NANO car. For things to come in here, it must first be introduced as the rich person's privilege and then it can trickle down to rest of the community. Anyway, so everyone at home seemed really excited about these food chains and we were thinking 'Oh my goodness! Did you even know that they were feeding these chickens arsenic?' Of course, if you're going to replicate the exact type of food with the exact same condiments by means of these chains, in every corner of the world, you will no doubt have to step in to a monoculture. And the kind of quantities you're looking at, especially in a country like India, it will obviously lead to 'factory farming'. Similarly, instead of buying fish from the local fisherwoman people were

now excitedly talking about stepping in to a retail and buying things a sterile environment without the mud and slush of the local bazaar. We found all these things very disturbing for many reasons. When you buy at the retail, you have no control or idea about how much of the value percolates to the actual producer while you are definitely compromising on the quality and freshness of products. Retails also tend to promote monoculture which eventually leads to environmental degradation. If you look at the strategies of retail chains or fast food chains, then you realize that in order for these to survive, your environment, your soil, the economics of a farmer – for him to be able to make a wage that can sustain his survival – are allowed to exist only for a certain period of time. This is the eventual outcome of monoculture farming. These were some of the things we thought we wanted to start a conversation about back home, before it was already too late.

This is something you have mentioned a few times, about monoculture being detrimental for the environment and the farmer in the long run. Could you elaborate on how monocropping is detrimental to the soil itself?

I'll give you an example. One rice crop was grown in the fields across the road from here. The rice crop was harvested a few months ago and in a matter of another month, they started preparing for another crop of rice. By the time this is harvested, they'll plant another crop of rice. Its common sense, if you keep planting the same crop over and over again in the same place, your soil will die out. You are taking out the same nutrients from the soil. Plus you're putting in tons of chemical pesticides and fertilizers, of which a very small fraction gets absorbed by the plants. The rest is being washed away by the rain water in to our water bodies and creating dead zones. And whatever the natural microbial populations were of this land are dying out.

So, how do we ensure soil health while engaging in agricultural practices? Does organic farming aid that process?

I don't really use the term organic farming because it also shares the same philosophy as chemical farming that you put something in to the ground and in return for that you get something. But if you're looking for the most nutrient rich soil on the planet then you would have to go in to the forest, where the ground is always covered, there are a lot of trees and the cycle of regeneration and decomposition goes on. That is where soil retains its natural fertility to the fullest. If a seed drops on the ground, nobody has to go in to the forest to tend to it. Even in the darkest of corners, seeds sprout and this happens because the soil is packed with nutrients. So the idea is to mimic nature to the extent possible. This is known as permaculture. The future of farming does not lie in the growing of annual crops anymore. The point in history where everything changed was when what we understand as 'agriculture' emerged. We started cutting down trees for things that would grow annually. All the winter and summer vegetables that we cultivate are annual. We plant them once and harvest them once and then we need to do the whole cycle all over again. So if you ask me about organic farming that simply replaces the chemicals with chemical-free inputs, I say even that does not have a future. Where are those inputs going to come from? How are we going to live in an increasingly chemical world and find things that are not chemical and pure? Even if you're thinking of dumping truck loads of manure on your land, where has that manure come from? How has it been transported? What was the cow eating? How can you make sure that there are no chemicals in that manure? How do you account for the fossil fuels that get spent in the process adding these 'organic' inputs? So the future of farming lies with the regeneration of forests. It lies with the regeneration of perennials. The future lies in food forests. If you plant a single banana it gives you a plant. It does not ask for fertilizers, it does not ask for pesticides. It just gives you fruit. So the ideal model for farming, at the moment, should include the growing of a food forest as well where you can get your fruits from. You can also do annuals but a heavy concentration on annual crops can once again destroy the balance of nature.

Ecosystems do not thrive in spaces where you clear out forests and grow annual crops. If you look at all the discussions happening around the future of farming globally, agri-forests or food forests are a large part of it. They are all working with the idea of trees that can give us food. What we eat, our habits, our practices, everything is going to come in to question when we talk about the future of farming.

What are the practices you are currently engaged in that will take you closer to that vision of mimicking nature and restoring its natural balance?

So we bought land with our savings, 10 kms away from Shantiniketan and the idea that we're working on is first of all, to grow all our food, whatever we eat. We thought that if we are to talk to farmers about organic farming there has to be a model where we can set something up as an example. It's the easiest way to say anything. I can show them that I'm buying very little, I'm growing all my food so my expenses come down and I'm participating in the economics of money as little as I can. If I have a simple, natural building, if I use very little electricity then that can become the model for the future where you're not really dependent on the market that much. Your excess can go to the market and you can somehow add value to it and sell it for profit but your livelihood would be based on this piece of land that you are living in. And if you are practicing chemical-free farming you are not spending much money on inputs. What we practice is really natural farming which does not even require truck loads of manure. We are using whatever organic matter is on the farm and putting it back in. We will probably be keeping a few animals on the farm in the future. You can lecture farmers. You can have numerous organic farming conventions in air conditioned halls and have farmers come over and spend 3 days over there. But that whole thing has been done. I myself have attended and lectured at such conventions but I grew tired of that. It's all about the talking while there may be a lot lacking on the actual work front. So I decided to do it myself and demonstrate through example that this is how you farm and you can get by quite well if you do this. And we're absolutely sure of this, if farming is done intelligently then all this about farmers being in debt will cease to be a problem. Farmers have been shown all the wrong directions so far. Living in the village and working with farmers for a few years now, I have come to realize, culture trumps everything in India. If everybody is doing something, a person will continue follow the same practices, even at the cost of their own financial well being. 'Everybody is doing it' is something that you have to accept. So everybody participates in the economics of rice, potatoes and mustard – the 3 main monocrops of India. The village folk have so much of knowledge about the different kind of greens that can be grown in these areas but it is no longer even possible to cultivate these crops as the seeds are not available any longer. There are so many different kinds of vegetables that are nutritious and easy to grow. Those which do not require any kind of input but we have moved away from the path of biodiversity, variety and seasonality into system that encourages monocrops.

Organic News

World Scenario

1. **Organic farming continues to rise across the globe**

http://www.csmonitor.com/World/Progress-Watch/2015/0217/Organic-farming-continues-to-rise-across-the-globe

- 2 million of the world's 1.5 billion farmers are now producing organically, with nearly 80 percent based in developing countries.
- India boasts the most certified organic producers, followed by Uganda and Mexico.
- Currently 164 nations have certified organic farms, powering an industry worth $63.9 billion.

2. **Govt incentivizes growth of organic farming sector**

http://www.arabnews.com/saudi-arabia/news/707026?quicktabs_stat2=0

- Khalid M. Al-Fuhaid, deputy minister of agriculture, third right, cuts the ribbon at the opening of Agriculture Festival at Khuraish Road Lulu Hypermarket in Riyadh
- Saudi Arabia has expressed its support to farmers in promoting organic farming, and to phase out production of all water intensive crops that are depleting the country's scarce water supplies.
- The total number of organic farms in the Kingdom exceeds 130 today.

3. **Demand for organic milk causes shortage**

http://www.mnn.com/food/beverages/blogs/demand-for-organic-milk-causes-shortage

- It may cost twice as much as conventional milk, but demand for organic milk keeps rising.
- In 2014, sales of organic milk rose 9.5 percent, Bloomberg reports. Consumers paid 8.4 percent more for that milk than they did the year before.
- People are buying so much organic milk now that some stores are seeing a shortage. Wisconsin, a state that produces a lot of milk, had a 10-day shortage last month.

4. **New crop production guide aimed at helping farmers tap organic markets**

http://www.farmanddairy.com/news/new-crop-production-guide-aimed-helping-farmers-tap-organic-markets/243946.html

- If you are an organic crop producer in the Northeast, or a farmer interested in transitioning to organic, there is a new resource available to help provide the research-based information you need to be successful.

5. **Wal-Mart searching for footing in organics**

http://www.foodbusinessnews.net/articles/news_home/Business_News/2015/03/Wal-Mart_searching_for_footing.aspx?ID=%7B7CB6C080-A180-447A-8767-2D9F1FA4CC52%7D&cck=1

- Organic was not the only aspect of Wal-Mart's food business addressed at the conference. Mr. Holley stressed the company must run "a great fresh area" if it hopes to be successful in food. He said the company needs to do a better job in its deli, bakery and meat areas.
- "I think we've upgraded some of those (areas), but I think they have a longer way to go," he said. "We need to not just satisfy customer need, we should be exceeding some of those."

Indian Scenario

1. **Farmers launch organic farming initiative**

http://timesofindia.indiatimes.com/city/kochi/Farmers-launch-organic-farming-initiative/articleshow/46570179.cms

- A group of farmers in Kerala has launched 'Organic Farming Research Programme' to help propagate successful organic farming techniques among others.
- Figures from International Competence Centre for Organic Agriculture (ICCOA) show that the f organic products business in India will touch Rs 6,000 crore towards the end of 2015.

2. **Fabindia plans to sell organic produce online**

http://timesofindia.indiatimes.com/business/india-business/Fabindia-plans-to-sell-organic-produce-online/articleshow/46657582.cms

- You may soon be able to buy organic fruits and vegetables at the price of regular produce or even less.
- A study commissioned by Fabindia shows that by the time some items such as chilies and cauliflowers arrive at markets in Delhi, their prices go up by around 100% or more.
- Plans are afoot to establish a supply chain that can deliver fresh produce directly from farmers to households by cutting off middlemen.

3. **Adopt organic farming: Haryana Governor**

http://zeenews.india.com/news/haryana/adopt-organic-farming-haryana-governor_1568375.html

- Haryana Governor Kaptan Singh Solanki on Thursday called upon farmers of the state to adopt organic farming, saying excessive use of fertilisers and insecticides are affecting the health of people and land fertility.
- The government is implementing a number of schemes to promote organic farming in the state

Organic News

4. **Punjab to set up organic farming board: Badal**

http://www.thehindubusinessline.com/industry-and-economy/agri-biz/punjabto-set-up-organic-farming-board-badal/article6959169.ece

- Punjab Chief Minister Parkash Singh Badal has said that an organic farming board will be set up in his State to aid and promote chemical-free agricultural practices in the State.
- "We were number one in feeding the country, and we will make Punjab number one in organic farming in India, said Badal.

5. **Why organic farming has not caught up yet in India**

http://www.thehindubusinessline.com/markets/commodities/why-organic-farming-has-not-caught-up-yet-in-india/article6933518.ece

- The growth of organic agriculture in India has been accomplished by three categories of farmers.
- The first category is from no input or low input use zones, practising it as a tradition or by default with no organic certification such as the tribes of north-east region. The second and third groups are certified and non-certified farmers, who have recently adopted organic farming realising the ill-effects of modern agriculture and benefits under organic cultivation.
- Farmers don't get premium for their produce in the initial stages during transition to this agriculture

6. **Organic produce sells like hot cakes**

http://www.thehindu.com/news/cities/Thiruvananthapuram/organic-produce-sells-like-hot-cakes/article6944063.ece

- Event a prelude to launch of an organic market at Nanniyode
- The market had over 50 farm produce on display, including 'pulinji' 'mullaathi,' 'agasthyacheera,' green pepper, 'kaverivaazha' — fare the city residents are not very familiar with.
- There was a wide array of tubers, honey, fruits, and other organic farm products. "The produce was sold out within hours," the organisers said.

North-East Scenario

1. **Prime Minister Narendra Modi promises to develop Northeast into organic hub**

http://timesofindia.indiatimes.com/india/Prime-Minister-Narendra-Modi-promises-to-develop-Northeast-into-organic-hub/articleshow/46311314.cms

- With the government's thrust on development of Northeast, Prime Minister Narendra Modi today said the Centre was planning to make the region an organic hub to boost agriculture production and horticulture production keeping in view its conducive agro-climatic condition and has proposed establishment of six new agriculture universities in the region.

2. **International agriculture fair held to promote organic farming in the Northeast**

http://www.ibtimes.co.in/international-agriculture-fair-held-to-promote-organic-farming-in-the-northeast-35529

- The second edition of 'Assam-International Agri-Horticultural' show in Guwahati was an indication of continuous effort to promote modern farming techniques and organic farming in the state.
- With a participation of 425 stalls from 12 countries and 25 multinational companies, the fair provided an opportunity to state farmers to gain knowledge of global farm technology.

3. **CM for technology to boost organic farming**

http://www.assamtribune.com/scripts/detailsnew.asp?id=feb1115/city050

- Chief Minister Tarun Gogoi today advocated extensive use of science and modern technology for promoting organic farming in the state which will extend from pothar (field) to pak ghar (kitchen).
- He also advocated for smart agriculture which will be a right mix of soil management, seed management, ground water management and technology management to enhance agricultural production.

4. **200 pc fund hike for NE organic farming**

http://www.assamtribune.com/scripts/detailsnew.asp?id=mar0115/at051

- While, presenting his Budget, Jaitley declared that the hike for organic farming in the North-east, allocation for which has been hiked to Rs 125 crore from Rs 33 crore, marking a nearly 200 per cent hike.
- Prime Minister Narendra Modi had on Thursday said that the North-east has the potential of becoming the organic capital of the country.

5. **Meghalaya withdraws subsidy on fertilisers**

http://www.assamtribune.com/scripts/detailsnew.asp?id=feb1815/oth052

- With an eye on brand-building and market Meghalaya as an organic food producing State, the State government has withdrawn the chemical fertilizer subsidy to farmers

NATURAL RESOURCES CONSERVATION SERVICE (NRCS)

unlock the secrets in the soil

www.nrcs.usda.gov

"We know more about the movement of celestial bodies than about the soil underfoot."
-Leonardo da Vinci

Living in the soil are plant roots, bacteria, fungi, protozoa, algae, mites, nematodes, worms, ants, maggots, insects and grubs, and larger animals.

science of soil

soil is

made of about **45%** minerals
25% water
5% organic matter **25%** air

what's underneath

Healthy soil has amazing water-retention capacity.
Every **1%** increase in organic matter results in as much as **25,000** gal of available soil water per acre.

One teaspoon of healthy soil contains **100 million-1 billion** individual bacteria

All of the soil microbes in **1ac/ft** of soil weigh more than **2 cows**

Earthworm populations consume **2 tons** of dry matter per acre per year, partly digesting and mixing it with soil

what it does

Healthy soil is key to feeding **9 billion** by **2050**

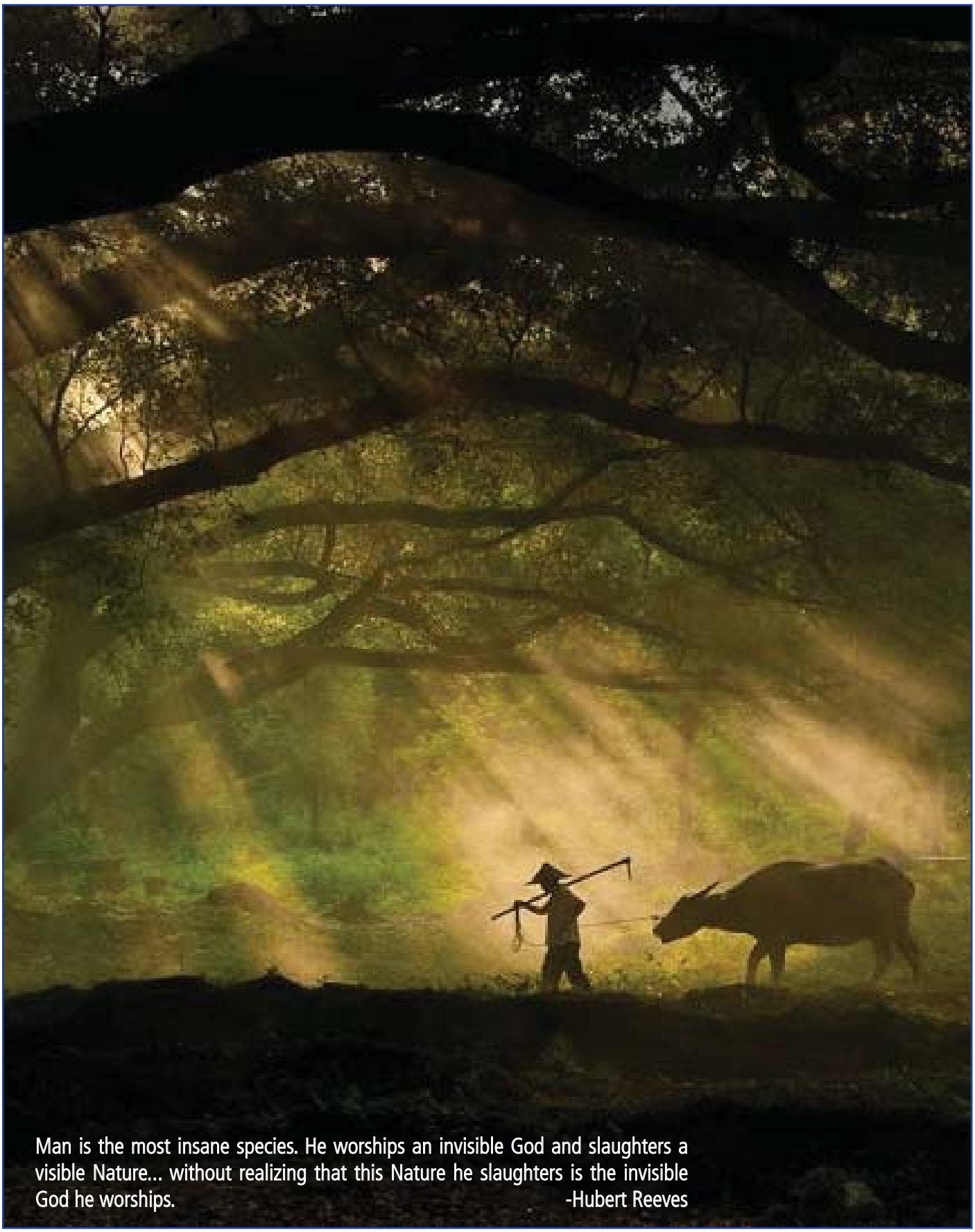
Source : nrcs.usda.gov

Things you can do to improve soil health.

1. Increase organic matter in soil through increasing groundcover, applying mulch and composts.
2. Encourage biodiversity – above and below the soil.
3. Support and protect microbial ecologies, including fungis.
4. Use biological-based fertilizers.
5. Use vegetation intelligently with managed landscapes to protect soil from the effects of wind and salinity.
6. Aim to have 100% groundcover, 100% of the time.
7. Practice minimum tillage and retain crop stubble.
8. Use time-controlled planned rotational grazing.
9. Reduce dependence on increasingly expensive fossil fuels and non-organic fertilizers and bio-cides.
10. Make sure to test the soil for fertility and pH levels once every 4 years.

Source: http://www.soilsforlife.org.au/international-year-of-soils-2015
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/

Source:http://www.authenticnj.org/2013/11/02/unseen-growth/



Man is the most insane species. He worships an invisible God and slaughters a visible Nature... without realizing that this Nature he slaughters is the invisible God he worships.

-Hubert Reeves

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