

PROFILED AND PUBLISHED BY APPL FOUNDATION



ORGANIC

VOL 8 & 9 (OCTOBER 2015 - MARCH 2016)

GROWTH



SUSTAINABILITY



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TIME IS TICKING. ACT NOW

The earth is 4.6 billion year old.

Let's scale that to 46 years.

We have been here for 4 hours.

Our Industrial revolution began 1 minute ago.

In that time, we have destroyed more than 50% of the world's forests.

This isn't sustainable

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NATURENOMICS: THE ROAD TO RENEWABLE RESOURCING

The world's resources are finite. Humanity's dependence on non-renewable resources has presented our world with a grave challenge. The **Earth will run out of resources** if we continue to consume in the manner that we have in the past. Sustainability refers to the ability to **replenish** that which is being depleted, in this case natural resources. In order for organisations to become sustainable, there must be a paradigm shift – a disruption – in consumption patterns with an emphasis on renewable resources.

By the 1800s, the world's population had reached 1 billion, largely due to the **Industrial Revolution** that began in the mid-1700s in United Kingdom. Its **impact** could be seen in improved living conditions, sanitation, health

and longevity of life of the people during those times. In only 100 years after the onset of the Industrial Revolution, the world population would grow 100 percent to 2 billion people in 1927. A 400 percent population increase was recorded at the turn of the 21st century, when the population of the world was estimated to be a staggering 6 billion. Since the 250 years from the beginning of the Industrial Revolution till today, the **world human population has increased by over six billion people!**

Rapid industrialisation of the world has also had profound effects on the relationship between humans and the ecology of the Earth, entailing a movement away from wind and water as sources of energy to fossil fuels

such as coal. **The Earth's resources that were initially providing for the needs of approximately 1 billion people are now meeting the needs of 7.1 billion and even more in the coming years.** The Global Footprint Network (GFN) attempts to calculate humanity's ecological debt and as per their estimation in 2015, the Earth's 'overshoot day' was registered to be 13th August, which was 6 days earlier as compared to 2014. In other words, the GFN study, which takes into account demands placed on the natural resources and the Earth's ability to regenerate and compensate for this usage, states that the world's population consumes an entire year's resources in only 8 months!

Excessive and unscientific usage of chemicals (pesticides and fertilizers) in agricultural



Bali's spectacular and sustainable bamboo architecture



Photo credit to Sandeepan Bhattacharjee

practices have poisoned the soil and contaminated groundwater. Toxic waste and ineffective waste management practices have given rise to phenomenal levels of pollution of air and water bodies. These unsound practices have, in turn, led to the destruction of natural resources. Under these overwhelming circumstances, the need is to **focus on natural resource management** that are not simply abundant but can also be easily **replenished by the Earth's natural processes**. Examples in the field of energy would be **solar power**, having the potential to deliver energy and moving away from highly noxious fossil fuel, given that the generation, transmission and distribution processes for it are democratised and it is made available at affordable rates for public consumption. Another example would be the use of **bamboo** as a raw material, for construction and as a possible alternative for food and clothing, can revolutionise the ways in which we think about the limits to growth. **Naturenomics**, the **interdependence between nature and economics**, which realigns development interests with natural resource conservation, is the most rational

course of action before us at this juncture.

An important step in this direction has been made by the advocates of climate change who have been successful in **rallying different stakeholders to stop and take action**. More than a decade-long engagement on the issue, under the aegis of the UNFCCC, paved the way for the Paris Agreement, a historic document agreed to by 196 countries, likely to come into effect from 2020. The UNFCCC organised COP21 at Paris in the month of December of 2015, where the main purpose was to evolve a framework on which future global action on climate change for both, mitigation and adaptation, can be based. The Agreement lays down the principles for future low carbon economic growth, finance and investment while creating the foundations for government reform, private sector investment and market activity on climate change. The biggest highlight thus far has been that it has centre staged the **debate on resource optimisation** and compelled governments and businesses to think in terms of **renewable resources** in addressing depletion of resources for living.

Hathikuli Organic is our way of putting the **sustainability principle into practice**, to bring about a productive disruption in the way we do business. In 2011 Hathikuli tea estate was converted to a 100 percent organic estate thereby ensuring **zero chemical drainage into Kaziranga National Park**. This is the first plantation known to open a migration route for wildlife, reducing the collision between people and fauna and respecting the needs of animals to roam the land as they have done for millennia before the expansion of human settlements, and certainly prior to the establishment of a commercial plantation. **Hathikuli Organic** will put forward **a competitive business model for agriculture and industry** throughout the influence zone of the Kaziranga Park where the **value generated sustains the extraordinary ecosystem services from biodiversity to soil fertility, generates jobs, and fosters harmony within communities**.

Ranjit Barthakur, Chairman,
APPL Foundation 



What is Sustainability? By R.K. Ghosh

The definition of Sustainability has been stated differently by different individuals. The concept of sustainability varies from individual to individual depending upon his or her attitude to the world, nature and environment. To achieve at a sustainable world, one has to first appreciate some of mechanisms by which Mother Nature has been correcting the damage to the environment resulting from overpopulation, human activity and greed. The following table highlights some of Nature’s corrective mechanisms which have been observed :-

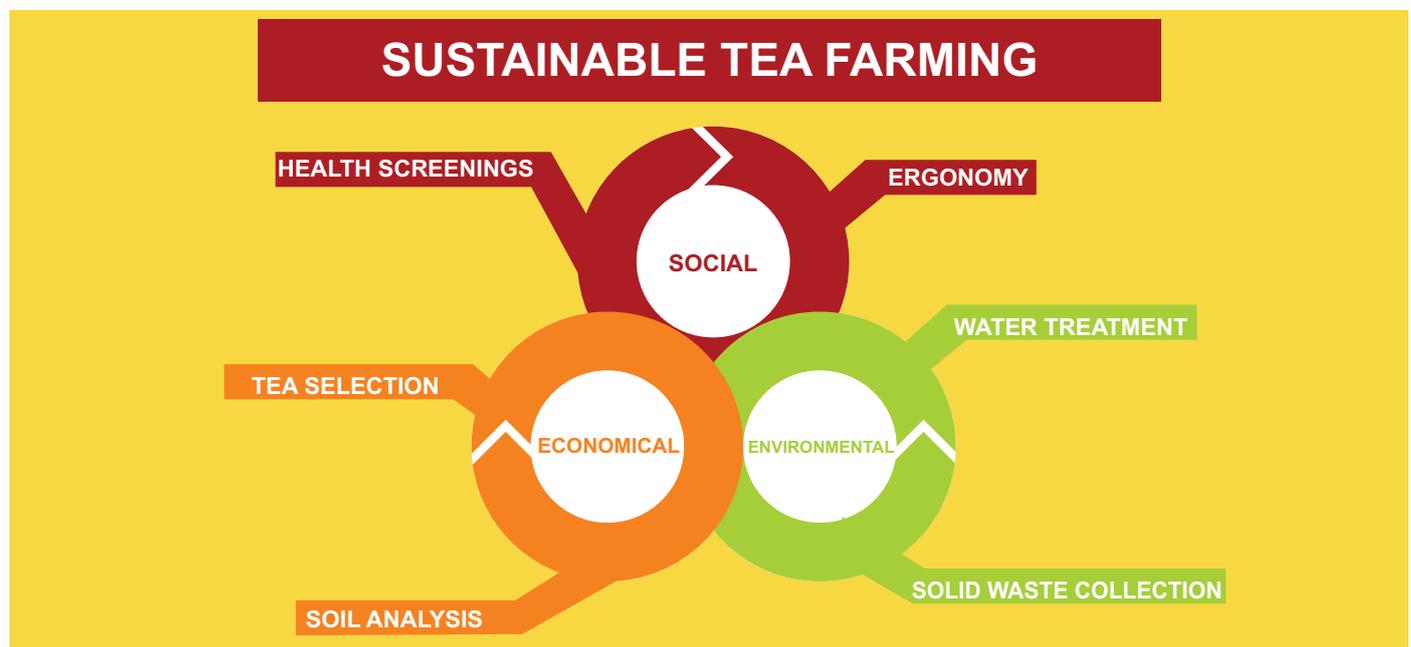
Human Activity		Nature’s Correction	
1	Use of CFC damages ozone layer (Now use of CFC has been totally banned)	A	Volcanic eruption at Pinatabo sends up SO ₂ , which seals ozone layers and causes cooling of the atmosphere.
2	Use of fossil fuel results in emission of methane and CO ₂	B	These gases, resulting from human activity, reflect heat from solar rays, creating localized cooling effect.
3	Deforestation results in emission of CO ₂	C	Bright white expanse of ice reflects the sunlight back into space. Melting sea ice draws heat from the ocean.
4	Human activity adds about 7 billion tonnes of CO ₂ every year. Total CO ₂ held in – Atmosphere – 750 Billion Tonnes Oceans – 35 Trillion Tonnes	D	Oceans covering 70% of earth surface store heat efficiently and transport it thousands of miles. Marine organisms consume huge amounts of CO ₂ .
5	Global Warming	E	Warm water collecting in places results in increased evaporation and cloud build – up. Cloud formation may have cooling effect. Cloud have both beneficial & adverse effects : i) Beneficial – Barrier to solar radiations ii) Adverse – Warms the earth by trapping heat.

Unfortunately, however, over the last few years things have deteriorated sharply. The decrease in pH of sea water is one such instance that highlights that we are crossing the threshold. The answer to check this decline lies at the doorstep of innovation. Had not Borlaug discovered the strain of wheat triggering the wheat revolution, half

the people of the world would have been starving. The Malthusian prophecy that the population will far outstrip food production has been proved wrong owing to human ingenuity. Similarly, to aim at a sustainable world we have to pull ourselves out from our static sense of equilibrium and address the key issues. It is not that it has not been attempted,

but, greater involvement of more people is needed. Some of the innovative techniques which are being attempted include :-

- a) To expedite the correction of the ozone layer, balloons filled with Sulphur dioxide were released into the atmosphere 24 KM above the earth’s surface.





- b) Creation of water bodies and protection of wetlands as a soak sponge for absorbing harmful carbon dioxide are being adopted.
- c) Switching over to renewable sources of energy to cut down on use of fossil fuel.
- d) Protection of rain forests.
- e) Releasing artificial satellites into space to track, predict and preempt natural disasters to enable necessary corrective steps to be taken in time.
- f) Encourage farmers to grow crops which match and follow water cycle patterns, rather than grow any crop anywhere. (One example of mismatch is the cultivation of sugarcane, which requires plenty of water, in rain shadow areas of Maharashtra).
- g) Reduce the use of hazardous chemicals in food chain.
- h) Make and implement strong legislation against polluting industries and municipalities. Some of the innovative techniques which have been implemented successfully to help in the cause of sustainability are mentioned below :-
 - i. Using recirculated water after treatment to cut down water consumption (The city of Las Vegas, with all their fountains and massive golf courses, has been able to reduce water consumption by 50%).
 - ii. The city of Perth in Western Australia meets 30% of their water demand from desalination plants. Moreover, the power to run these plants is supplied partly from solar panels.
 - iii. Qatar spends \$25 billion towards food security. (using solar energy driven desalination plants to grow

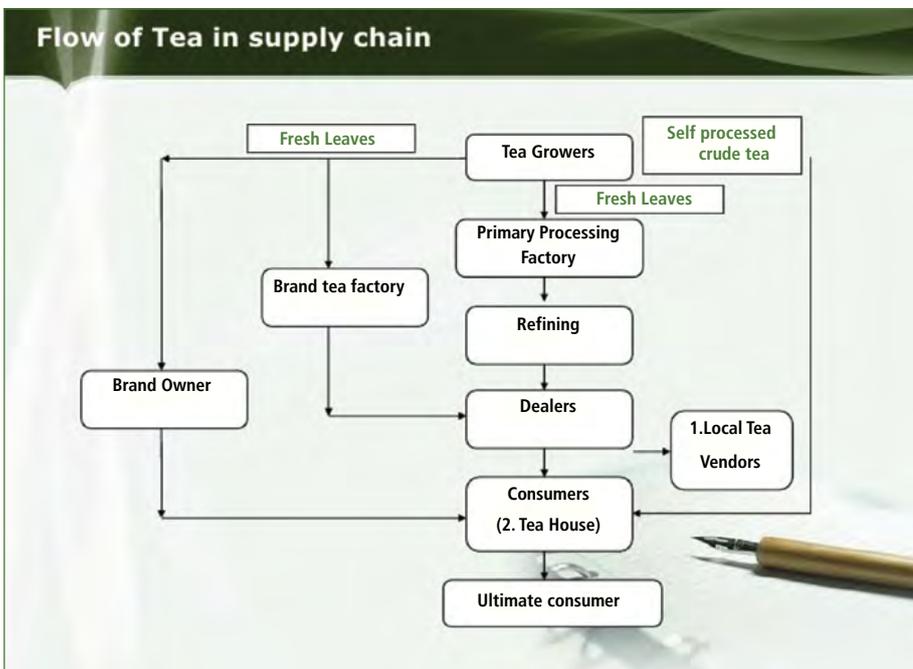


food products).

- iv. Niger, one of the Sub – Saharan countries of Africa, has started greening thanks to judicious use of water for agriculture.
- v. Plantation of poplar trees have resulted in the greening of the terraced regions of Kumaon. However, to really achieve a sustainable environment for the future, many more steps need to be taken. A few of these could be :-

- a) Cutting down on the water required for paddy cultivation, as set out and propagated by agricultural bodies, to 25% , which is what is actually needed to grow paddy.
- b) Water used for softening the soil for ploughing can be saved by using better mechanical equipment.
- c) Use of microbes for soil improvement and waste water treatment.
- d) Development of organic agriculture.

There could be millions of such innovative solutions which could be adopted to lead to a sustainable world. In view the burgeoning population growth, these are only small drops in the ocean. Therefore to aim at Sustainability everyone at every level has to be involved – starting from the school curriculum. To quote the Nobel Prize winner, Wangari Muta Maathai, who said “We owe it ourselves and to the next generation to conserve the environment so that we can bequeath our children a sustainable world that benefits all” .



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Thoughts on Ecological Degradation and Sustainable Management in Tea Plantations

by Dr. F. Rahman



Tea planting in India started in the 1830's in forest clearings. As cultivation of tea expanded in Assam and Bengal, forests were replaced by vast stretches of tea. In the beginning tea plantations were surrounded by forests. Gradually forests areas were replaced by tea. Now there are practically no forests and only tea and paddy fields can be seen. The transition from a stable ecosystem with natural diversity to a total monoculture started a chain reaction of degradation. Tea cultivation till the middle of the last century was basically organic with very little inorganic inputs in the form of fertilizers and pesticides. Use of fertilizers started in the nineteen-fifties. Use of pesticides started post Second World War with the development of DDT. Their use continued to increase with every passing year as the emphasis was on increasing crop. This approach depleted the

soil fertility and caused increasing imbalance in the ecosystem. Chemical weed control came into tea plantations in the mid 1960s to eliminate weed competition and make fertilizer use more efficient. This reflected the thinking of most agricultural scientists (trained in the west) and Indian agriculture was also following the guiding principles of agriculture in the west. It is interesting to note that as early as 1898 Dr. George Watt remarked (p.427, Griffiths):

“ I am firmly convinced that majority of diseases and pests are the direct results of defective and selfish cultivation – The plant is being made to yield more than is consistent with due regard to its health and future”.

I would also like to quote Sir Albert Howard (1945) from the preface of his book - An Agricultural Testament. “Since the industrial revolution the processes of growth have been speeded up to produce the food and raw materials needed by the population and the factory. Nothing effective has been done to replace the loss of fertility involved in this vast increase in crop and animal production. The consequences have been disastrous. Agriculture has become unbalanced: the land is in revolt: diseases of all kinds are on the increase : in many parts of the world Nature is removing the worn out soil by means of erosion”. These scientists of vision could

foresee the problems that we are facing now developing as a result of our obsession to monopolise the fruits of Nature to the exclusion of all other components of the ecosystem. This thinking continues still and we are heading for disaster if we do not start working with Nature instead of trying to conquer Nature.

Worldwide there is serious rethinking and discussion on the chemicalisation of Agriculture and the consequences of modern farming on ecology, productivity as well as on rural economy. As is to be expected there are extreme views ranging from back to nature farming suggested by Fukuoka (1996) to organic farming to an approach involving use of organic manures, mixed farming and mixed cropping. Fukuoka's “One Straw Revolution” followed his second book “The Road Back to Nature” has profoundly influenced the thinking of many. His views have lot of depth and aim at an idealized system which will be in complete harmony with Nature. But it is too radical to get widespread acceptance. It definitely has relevance where land is abundant or where subsistence farming is being practised. It envisions the farmer as a person who is contented with simple living and is happy to practice mixed cropping with crops and varieties most suited for the environment he is living. Fukuoka attributes





most of the problems of modern agriculture to monoculture, growing commercial crops, mechanization and chemicalisation of agriculture. He is also of the opinion that domesticated animals and birds on the farm beyond a certain limit disturb the balance of nature. He wants to maintain the balance of nature by creating diversity, growing clover and legumes and cause practically no disturbance in the natural processes except seeding without cultivation and harvesting when the crop is ready. It will be very laid back way of life. One very significant aspect of Fukuoka's natural farming is the use of crops and varieties which are most suited for the particular locality. His approach is to seed the area with all types of crops and varieties and in course of time the most suitable ones will establish themselves through a process of natural selection and survival of the fittest. This is a very significant part of his philosophy.

Sir Albert Howard in his book referred to earlier has said "The maintenance of the fertility of the soil is the first condition of any permanent system of agriculture. In the ordinary process of crop production fertility is steadily lost; its continuous restoration by means of manuring and soil management is, therefore, imperative". He has reviewed the various systems practised in different parts of the world from the beginning of agriculture. They are briefly described below:

The method of Nature which can be seen in primeval forests and undisturbed prairies. Its main characteristics are that diverse plant and animal species coexist, there is no soil erosion, the mixed animal and vegetable wastes are converted to humus. There is no waste. Growth and decay balance one another. There is stable balance. There is coexistence, symbiosis.

The second model is the agriculture of Rome:

The failure of Roman agriculture should have been a lesson for the world but unfortunately it has not been considered seriously. It did not realize the fundamental principles that maintenance of soil fertility and the legitimate claims of the agricultural population should never have been allowed to come in conflict with the operation of the capitalist class. A working compromise between agriculture and finance is a must without which it will end in the failure of both.

The third model is the agriculture of the 'East' (China, India and Japan). This refers to the period from the beginning – 4000 years ago till the early part of the twentieth century in India. The chief characteristics of this model were: the holdings were small, their primary function was to provide food for the farmers and their cattle, mixed crops including legumes (pulses) were grown crop, crop and live stock coexisted and supported each other and the farmer; cultivation methods were superficial, not deep, no pesticides and fertilizers were used, only cattle manure was applied.

This balance was upset when the land was diverted to sugarcane, cotton and a host of plantation crops to meet the needs of factories, export and increasing urban population. This has resulted in a number of problems including sustainability and pest and disease due to monoculture and excessive use of fertilizers and pesticides required for the high yielding varieties.

The fourth model is the agriculture of the 'West'. It has to satisfy the needs of the rural population including livestock for dairy and meat products, the need of the growing urban population and the need of factories for raw material. The size of holdings in western countries varies considerably from small family farms in Europe to the immense collective farms of Russia and ranches of USA, Canada and Argentina. The main characteristics of this farming were and are: rotations are unknown and monoculture is the rule, machines have replaced livestock, there is total dependence on chemicals, pests and diseases are on the increase, soil fertility is on the decline and soil erosion and degradation (waterlogging, salinity etc.) are rendering vast areas unfit for farming.



The capital of nations which is real and permanent is the soil. To protect and to safeguard this important possession, conservation of the soil and maintenance of its fertility is essential.

Scenario in Tea Plantations :

As a result of the agricultural practices followed in tea plantations over a period of time a number of negative developments have started manifesting themselves. Each of these developments is discussed under three subheads:

1. Degradation of soil and loss of fertility : Most old tea areas have been under tea for 100-150 years. Application of artificial fertilizers started in tea post 1950. First only nitrogen was applied as SOA and later as urea. Potassium deficiency was seen in late sixties so potash was included in the manuring schedule. Thereafter zinc deficiency appeared followed by phosphate deficiency. Soil pH dropped to very low levels (4.5 or less) due to leaching and application of SOA/Urea. To correct the pH application of lime/dolomite was advocated. More deficiencies started showing up. In addition to nutrients there has been considerable depletion of soil organic matter due to faulty cultivation and soil

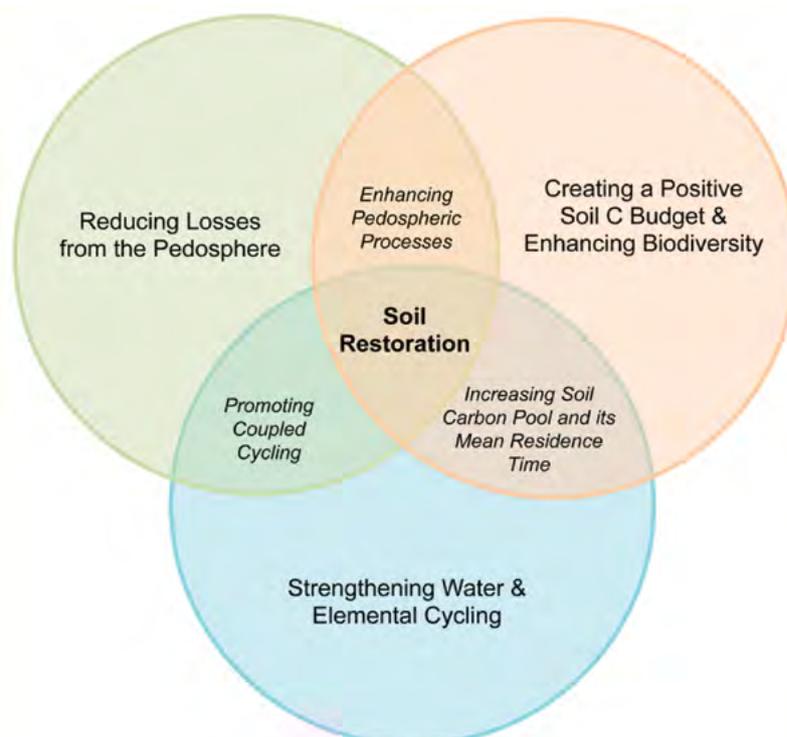
erosion, and export of tea from plantations, removal of pruning litter and application of only inorganic fertilizers.

2. Loss of diversity : A natural ecosystem like a forest has the widest diversity of plants, animals and soil microorganism. The ecosystem in traditional farming villages is also diverse but the variety of plant and animal forms is reduced. When we come to the ecosystem in a tea plantation the scene changes completely. Instead of a variety of crops and crops rotating in the same field 2-3 times in a year we find a stand of tea which may have there from one year to anywhere upto 100 years or more as in Darjeeling. Then, there are 3-4 varieties of shade trees. The diversity of weed flora was always less in tea plantations and has been reduced further due to monoculture and use of herbicides. Animal and bird life is also reduced because of lack of food, habitat and nesting places. There is reduction in diversity in every sphere.

3. Increase in pests and diseases : Further changes in the ecosystem came with increasing use of fertilizers and pesticides including herbicides. In a natural ecosystem there is balance in the population of different species. When tea was first planted insect species persisted in the absence of their host plants

while other more adaptable insects started living on tea and became pests of tea. The more efficient ones multiplied and dominated the tea ecosystem. Their population was kept in check by their parasites and predators and a new equilibrium was arrived at. Then insecticides were introduced to control them. The insecticides used in the early years like DDT and other chlorinated hydrocarbons (Endin, Dieldrin, Aldrin) were broad spectrum and killed all insects including parasites and predators. Subsequently developed insecticides like organophosphates, carbamates and synthetic pyrethroids were also broad spectrum but had lower mammalian toxicity. Even now pesticides are not selective to the extent required and continue to kill beneficial insects. The damage to parasites and predators continued unabated.

Diversity was reduced further. Different insects and mites have dominated the pest scene at various times in the last fifty years. Diversity ensures that no single pest remains predominant. Indiscriminate use of toxic pesticides has resulted in the elimination of all but the most resistant and most prolific species. They have also developed resistance. At the same time their natural enemies have



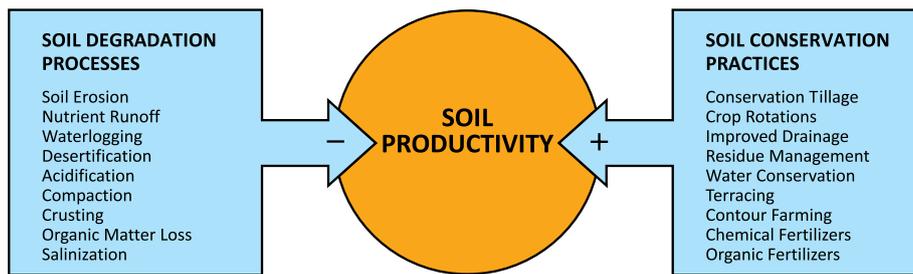


Fig.-1. Relationship Of Soil Productivity To Soil Degradative Processes And Soil Conservation Practices (Adapted From Parr And Meyer, 1987)

not survived the onslaught of increasingly intense spraying with toxic chemicals.

Sustainable Management of tea plantations :

Use of fertilizers started in the 1950s. In the beginning only nitrogen was deficient and only sulphate of ammonia was used. Deficiencies increased progressively. Now, nitrogen, phosphate, potash and zinc are universally deficient. Deficiency of magnesium and boron is also increasing. Low soil pH is a widespread phenomenon and use of soil amendment to correct pH is necessary in most areas. There has been phenomenal increase in the use of pesticides because of increase in incidence of pests. We have reached a stage where we can not stop use of fertilizers and pesticides and at the same time there are indications of stagnation and in some cases decline in productivity, particularly in high yielding estates. Also decline is setting in much earlier in many areas, as early as at 20 years age. This is due to a number of factors

– higher population, decline in soil fertility and overall deterioration of physical and biological properties of soil. To what extent other environmental factors, like drought, deforestation and higher temperature, are responsible, has not been quantified. It is an area of future research.

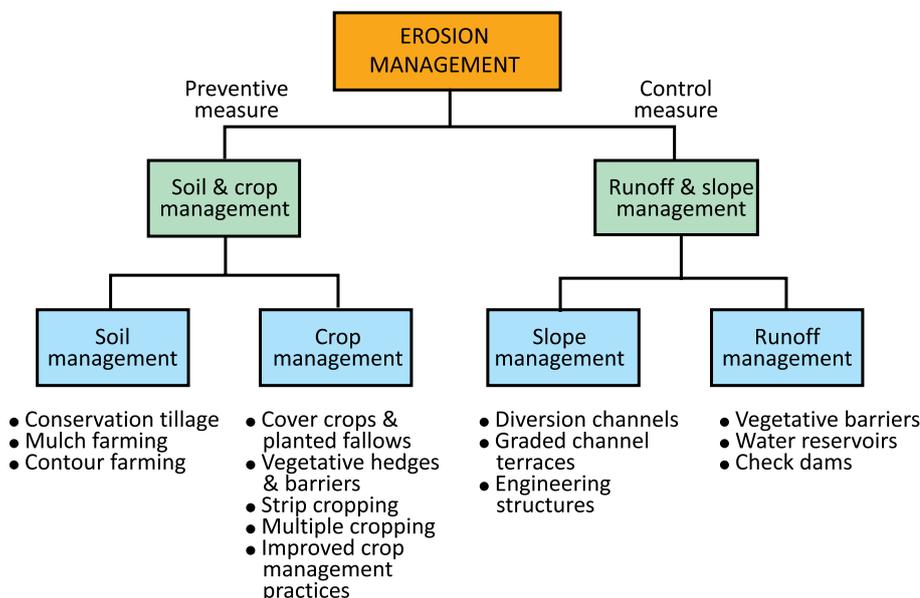
The following framework is suggested for a policy to ensure sustainable tea management. Some of the suggestions will require research to develop them into effective practices. Long term thinking and planning is essential for a sustainable system. Unfortunately many companies lack the commitment necessary for this approach to be successful. But it is high time industry and research wake up.

1. Ecological improvement in and around tea estates : Tea was planted in the beginning in forest clearings. Over period of time forests have ceased to exist. Tea estates also used to have sizeable area under private forest, bamboo baries and other trees and shrubs. These too have vanished resulting in a drastic

change in the ecosystem. This has adversely affected rainfall, humidity and temperature. It has also affected bird and animal life. It is suggested that some parts of the tea estate not suitable for tea should be brought back under natural forest and bamboo baries. Trees consisting mainly of species growing naturally in the ecosystem should be planted. Such trees should also be planted outside the tea sections along roads. Trees selected should encourage bird life (for nesting and food). Birds have a major role in the ecosystem as many of these feed on insects. Mango, Jackfruit and Nahor will be suitable for planting along roads, Jarul in low lying areas and Peepal in corners with plenty of vacant space so that it does not affect the adjoining tea. The policy to bring all available land under tea is not good from ecological point of view. Estates should set up a target for such planting.

2. Soil Management : Soil is the most important resource of a tea estate and the current management practices are accelerating its deterioration.

Estates should ensure that soil fertility is improved and soil erosion is stopped. This will involve use of soil amendments, green cropping, maintenance of shade, retention of pruning litter and use of compost and vermicompost and limited weed control. Not enough attention is given to check soil erosion particularly at the time of uprooting and planting/replanting. Still planting across slope is not well accepted because of inconvenience when rows do not run straight from one end of the section to the other end. Evidence of the insidious effect of soil erosion can be seen in the abandoned teelas and vacancies, poor growth and low yields of tea planted on slopes and teelas.





Soil rehabilitation and loss of organic matter : There is considerable loss of organic matter when tea is uprooted in the dry season and the land remains exposed to hot sun and dry wind till the rains. Ideally uprooting and land preparation should be completed within December and some cover crop should be planted under irrigation. A short duration legume can be planted and harvested before rain. This will pay for the cost of planting and irrigation and protect the soil Thereafter normal rehabilitation crop can be planted. Some estates consider soil rehabilitation unnecessary. This is unfortunate and those who are not doing good rehabilitation are doing so at the cost of future. Unfortunately many in the industry are not concerned about the future. The widespread sickness is proof of this mindset.

There is considerable soil wash in the newly planted tea in the first rainy season. Proper drainage, planting tea and green crop across slope and mulching can reduce this loss considerably.

Retention of pruning litter : Experiments in Tocklai have demonstrated that removal of pruning litter results in loss of crop and amounts to closing the estate once in six years. But today it has become a challenge to retain pruning litter. It has become a matter of right for workers and adjoining villages to take away pruning litter. Estates have accepted it. I wish it was possible to educate all concerned in this matter.

Use of bulky organic manures : There is an

impression that application of one to two tones/ha of concentrated organic manure like oilcake or some proprietary formulation can help increase organic matter in soil. Nothing could be further from truth. Only regular application of bulky organic manures like compost, vermicompost or mulch can help maintain organic matter level along with retention of pruning litter and a stand of good shade. This is also essential to maintain the efficiency of applied artificial fertilizers. Use of biofertilizers, like Azotobacter, Azospirillum along side will also help. Experiments to quantify the benefits are required.

All estates should have a programme of making good quality compost/vermicompost to meet their requirement of organic manure. Methods are now available to make high quality compost enriched with phosphate and microorganisms.

Growing green manuring crops like glyricidia and adding loppings regularly will be another way of enriching the soil.

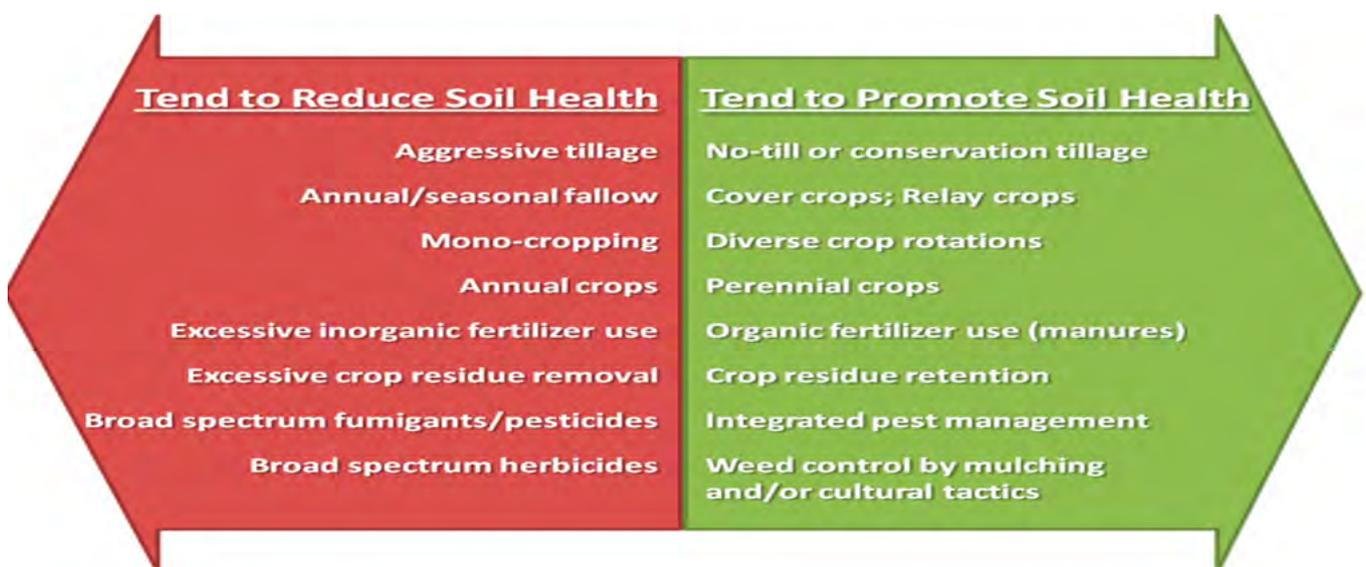
3. Pest Management: This is the most serious problem which tea estates are facing today. Unfortunately this is the direct result of the short sighted policies like indiscriminate use of highly toxic chemicals, particularly synthetic pyrethroids, use of sublethal doses, excessive fertilization and foliar application. In order to achieve economical and efficient pest management our mindset has to change and we must reduce our total dependence on pesticides. We must opt for sincere integrated pest management approach which will be



a harmonious integration of different pest management techniques like

- Improvement of ecology and increase diversity.
- Conservation of parasites and predators.
- Bush sanitation, improved growing condition, use of organic manures, good shade, drainage etc.
- Use of ecofriendly chemicals like plant extracts, neem.
- Hand collection, light trapping for some pests.
- Cheeling, thulling and forking for some pests.
- Use of biopesticides.
- Early detection, efficient and timely spraying.

The main problem in moving back to sustainable tea production is that many tea companies do not have the patience and commitment to go for rationalization. They



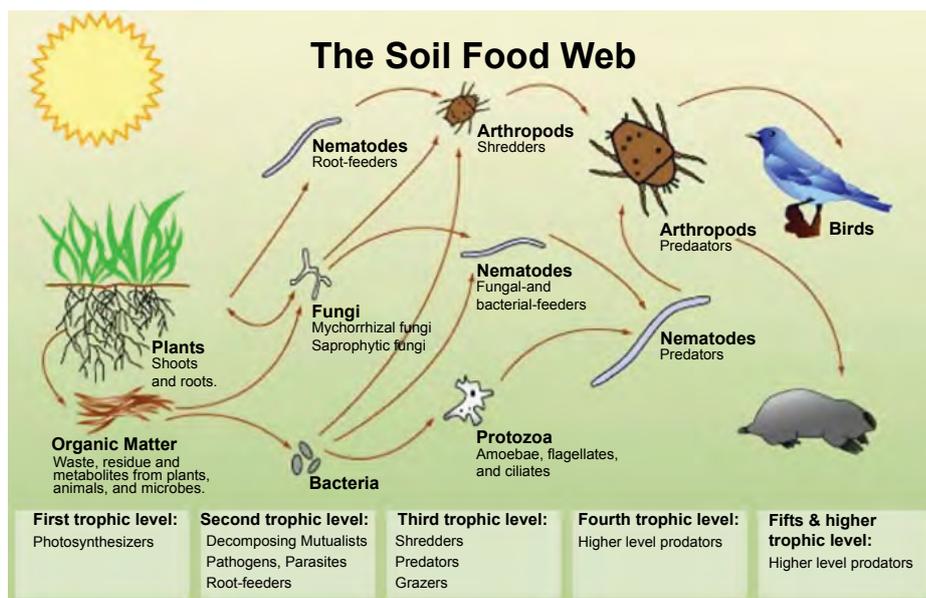
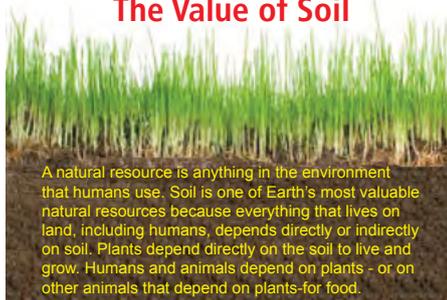


would not like to lose any crop in the process. In view of the tremendous increase in pest activity, particularly loopers and helopeltis any attempt to reduce use of traditional pesticides is likely to result in crop loss at least in the short term (1-3 years). The only thing which will force the transition will be when the cost of chemical control will be more than what the estates can afford and that means when estates become sick. A number of estates have become sick and were abandoned or were run by workers without any inputs. Many of these have been taken over by new owners. The general thinking in the industry is to maximize crop. No one is willing to take the risk of losing crop. But it is very important for the long term well being of the tea industry to have sustainable policies.

4. Weed management : When chemical weed control was introduced it was believed that forest floor condition would be created under tea bushes. This has not happened and soils under continuous chemical weed control have become hard and compact. Using herbicides in newly planted tea results in lot of soil erosion. No one thought about the greater role of weeds as a component of the ecosystem. Experience of the last forty five years suggests the need to review weed management practices. Diversity in weed flora appears to have significant impact on pest incidence. Experiments and observations are needed in this area. The various other functions which weeds perform in tea plantations are :

- They check erosion and add organic matter.
- They reduce compaction of soil.
- They act as alternate hosts for tea pests.
- Diversity in weed flora encourages diversity in insect population which can

The Value of Soil



- have moderating influence on the activity of some pests.
- Roots of many weeds have mycorrhizal associations. The role of mycorrhiza in increasing absorption of soil nutrients by plant roots is well established.

The present thinking that tea sections should remain weed free round the year needs reexamination.

5. Use of seeds along with clones : The basic difference between clone and seed is one of adaptability. Seeds can adapt to a wide range of cultural and environmental conditions and are unlikely to suffer due to adverse changes in environment while clones, being uniform, will react differently. Clones are selected for desirable characters of yield, quality and better response to inputs Barua (1989). They can also be selected for drought and pest and disease resistance. Tocklai has suggested planting clones and seeds alternately. A continuous programme of developing better seeds and clones and planting them

alternately is envisaged. In view of the recent emphasis on diversity in ecosystem and wide adaptability of seeds it becomes important to consider planting of seeds more seriously. Research should continue to develop better seeds emphasising on the need of more drought and temperature tolerance.

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Disruptive Innovation in Power Sector by Roopen Roy

Who would have believed that the staid and stable power industry is at the cusp of innovative disruption? And guess what? The seeds of this innovation were sown in the R&D laboratories of automobile companies! There are two alternative roadmaps in this disruption: (a) The combined solar energy and battery vision of Elon Musk — founder of Tesla Motors, and, (b) The Hydrogen Society vision of Japanese innovators pioneered by Toyota and massively supported by the Japanese government.

Both roadmaps are trying to find new answers to an old question: how do you efficiently store electricity? The Elon Musk solution is to pack solar energy in lithium-ion batteries. The alternative answer is to store electricity in the form of liquid hydrogen. Musk put it rather simply: "The obvious problem with solar power is that the sun doesn't shine at night. We need to store the energy to use at night."

Tesla is tasting early success after its announcement on May Day. It has already accepted 38,000 orders for its home system called the "Powerwall." It means the order book is full until mid-2016. It sells two versions — a 7kWh and a larger 10kWh unit — which cost \$3,000 and \$3,500 respectively.

Tesla is also building what it calls a gigafactory in Nevada in collaboration with Panasonic at a cost of \$10 billion. The gigafactory is designed to increase scale and reduce costs

dramatically. By 2020, it will produce more lithium ion batteries annually than were produced worldwide in 2013. By the end of the first year of volume production, Tesla expects the gigafactory will have driven down the per kWh cost of battery packs by more than 30 per cent.

Musk has also claimed that Tesla will manufacture systems that are infinitely scalable. He has announced the powerpack for industrial-strength generation. It is an "infinitely scalable system" that can work for even public utility companies. It comes in 100 kWh modules that can scale from 500 kWh all the way up to 10 MWh and higher.

"Our goal here is to change the way the world uses energy at an extreme scale," as Musk put it. In short, Musk wants to change the way the world generates, stores and consumes electric power and do so in a clean and green manner.

Most Americans and, many Indians by now, know about Musk, the gigafactory and his plans. But fewer know about the Hydrogen Society. After the Fukushima disaster in 2011, Japan became averse to creating new nuclear energy capacity. It needed energy innovation pretty desperately, so it came up with the concept of a hydrogen society.

As prime minister Abe described it in a seminal policy speech, "Hydrogen is the energy of the future. We've deregulated rules involving various ministries that used to

hinder hydrogen development. The Hydrogen Society used to be a dream, and now it is about to become reality."

Why do we need hydrogen energy? The Japanese government set out four compelling reasons — energy-saving, environment, energy security and industrial competitiveness. It is well known that hydrogen emits no carbon dioxide when burned, so it is considered clean energy that can greatly help reduce greenhouse gases.

Like Musk's battery-inverter plan, hydrogen fuel cells also eliminates transmission. An apartment building will produce its own power needs through a hydrogen fuelled "generator" and the power will be consumed in the apartment complex. While theoretically this is possible, in all probabilities it will be connected to some form of smart micro-grid.

The vision is to obtain hydrogen from water using electrolysis, with the process being powered by such renewable energy sources as solar and wind. That will allow hydrogen to be produced without carbon emissions. But the plan of a 100 per cent renewable energy plan seems a bit utopian at this point. Generating power from renewable energy remains expensive and unreliable due to its reliance on the weather. A mixed energy approach for electrolysis may be more realistic.

Which one is a better answer — battery or hydrogen? It is very difficult to make the call





right now. It is quite possible that it is not an “either/ or” scenario. A coexistence of both systems is likely. The battle will be won or lost based on five parameters: safety, cost, speed of adoption, carbon footprint and ease of transportation. It is my hunch that based on these parameters, particularly cost — and ease of transportation — hydrogen has a brighter future.

What should India do? We should be like Panasonic. It is investing in Musk’s gigafactory and it is also invested in the Hydrogen Society. It is watching how the game plays out. While doing the same, we should be agile. We should be prepared to switch more investments to one or other as the battle outcomes become clearer. What is already clear, however: the power industry landscape will soon change dramatically and we are at the cusp of a technological revolution.

Hydrogen society is no longer sci-fi

Japan is betting big time on hydrogen society. What is it? Simply put, it is a society where hydrogen becomes a driving force of clean and efficient energy. When hydrogen and oxygen are combined to react together, the chemical process produces water along with electric energy which is called hydrogen power.

It has the potential of bringing about a revolution in how energy is produced and

consumed. It can transform the automotive industry. It may change how homes are powered and lighted without transmission lines. These are just two examples of how hydrogen-based energy can change our planet.

Toyota has already announced the hydrogen fuel cell Mirai car. In Japanese, Mirai means the future. Toyota has an interesting story of how it will drive into the future. It has made the first move by making 5,680 hydrogen fuel cell related patents available for use royalty-free. The list includes 1,970 patents related

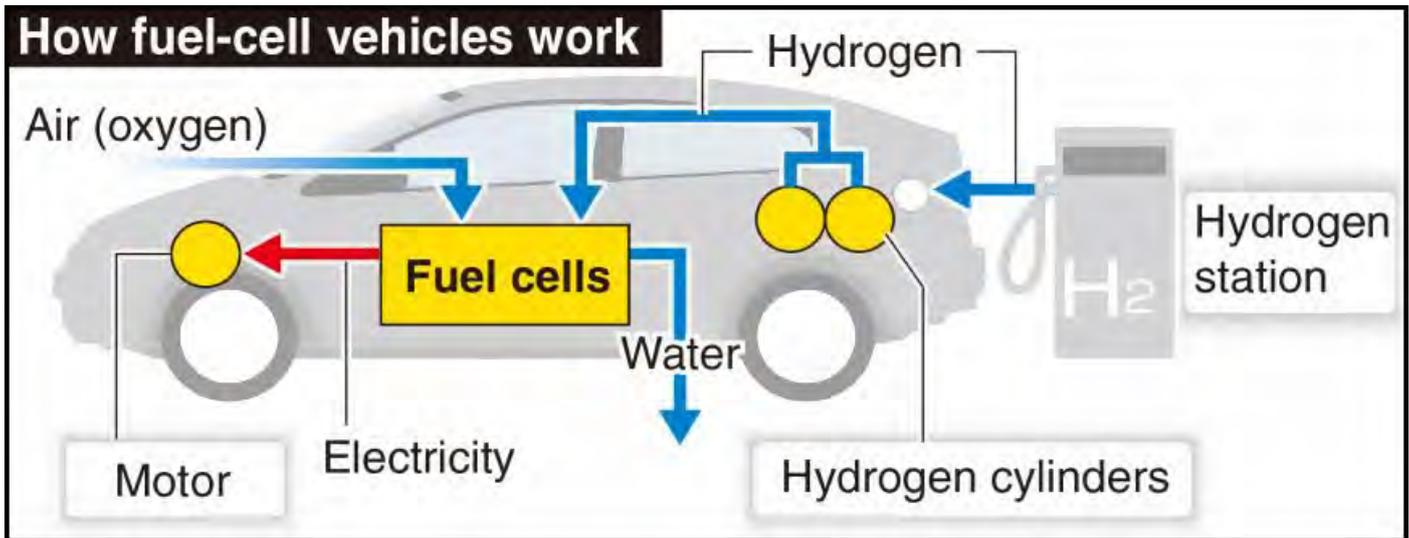
to fuel cell stacks, 290 associated with high-pressure hydrogen tanks, 3,350 related to fuel cell system software control and 70 patents related to hydrogen production and supply.

The pharmaceutical industry typically does not do this. They do not license for free even life-saving drugs. The model in pharma is to amortise the cost of a new drug so that part of the money can be ploughed back into research for the next blockbuster molecule.

Is Toyota out of its mind by giving away technologies for free? It cost them billions of dollars to develop and patent the technologies. Well, think again. Do you remember what Sun (now part of Oracle) did with Java? They licensed it for free to enable a widespread adoption of Java. The results are available in the public domain on Oracle’s website. Today, 97 per cent of enterprise desktops run Java. There are over 9 million Java developers worldwide. All of blue-ray disc players ship with Java. There are 5 billion Java cards in use and 125 million television devices running Java.

Toyota wants to be like Oracle and not like a pharma company. Bob Carter, senior vice president of automotive operations at Toyota Motor Sales, USA, outlined the company’s vision: “At Toyota, we believe that when good ideas are shared, great things can happen. The first generation hydrogen fuel cell vehicles, launched between 2015 and





2020, will be critical, requiring a concerted effort and unconventional collaboration between automakers, government regulators, academia and energy providers. By eliminating traditional corporate boundaries, we can speed the development of new technologies and move into the future of mobility more quickly, effectively and economically."

Hydrogen does not mean the end of fossil fuels. Hydrogen can be produced by using a number of different inputs: fossil fuels, lignite, wind, solar and biomass. Why is it critical for India? To begin with, it will enhance the energy security of our country. Hydrogen can be generated from many sources and can be stored for a long time. It can be used as the demand goes up or down without back-down costs. It is also a green source of energy. Hydrogen-based car engines, for example, emit water only. Hydrogen can reduce global warming by reducing the carbon footprint if it is produced from sewage, wind or solar energy.

Among the Japanese automotive companies

that are betting on hydrogen fuel cell technology are Toyota, Nissan and Honda. Hydrogen fuel cell based technology will be used in homes and apartments as well. The two Japanese companies that are focusing on this application are Panasonic and Toshiba. Japan has chosen 17 prefectures and 9 cities and towns which are locally developing hydrogen societies at an accelerated pace. While India travels on the path of planning smart cities we should look at this smart energy option as well.

Japan is working on making hydrogen a source of home energy that will not require transmission. The fuel-cell technology is already in use in factories and commercial buildings. Now, Japanese manufacturers are working to make them compact and attractively priced for homes. The country has set a goal of installing them in 5.3 million homes by 2030, about 10 per cent of all households.

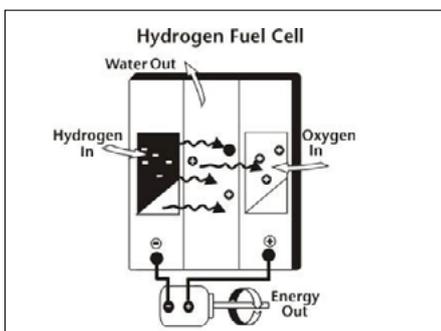
Already 1,00,000 units have been installed. The model of the future will not be to build

gigantic generating plants and then transmit and distribute the energy. It will be to produce the energy close to where it is consumed.

"Home fuel cells are one strong weapon to improve energy efficiency," said ChihiroTobe, head of a ministry of economy, trade and industry office promoting fuel cells. "The use of hydrogen can contribute to saving energy, tackling environmental issues and increasing energy security."

Tokyo is planning to invest \$385 million on hydrogen fuel-cell vehicle subsidies and hydrogen power stations for the 2020 Olympics. It is central to prime minister Shinzo Abe's plan to reduce Japan's reliance on nuclear power.

A recent editorial in The Asahi Shimbun summed up the lofty goal very well: "The rest of the world is also moving toward wider use of hydrogen. Japan, which has experienced a harrowing nuclear accident, should lead the global movement to craft a new sustainable energy future for human society.



Roopen Roy

Roopen Roy is the Founder of Sumantrana, an advisory firm focused on guiding, advising and mentoring start-ups and young entrepreneurs.

He was the Country Leader and Managing Director of Deloitte Consulting in India until July 31, 2015.

He is also on the board of Amalgamated Plantations Pvt. Ltd.

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Agriculture Research : The Way Forward by Roshan Kishore



Research and development in agriculture is a crucial requirement for meeting future challenges

One of the key conditions for the rejuvenation of Indian agriculture is a significant increase in crop yields. Data show that India was on a par or even ahead of countries like China or those in South-East Asia in terms of yields till the 1960s. It now lags behind by a large margin in many important crops. Research and development in agriculture is a crucial requirement for meeting these future challenges.

A paper published on the basis of work done by the task force on agricultural development constituted by NITI Aayog, the government's think tank, suggests that the existing system of agriculture research and development is failing to live up to the task because it has spread scarce resources thinly. What is intriguing is that the paper does not cite any facts to support its claim.

A report released by the United States Department of Agriculture (USDA) in December suggests that NITI Aayog's task force could have been harsh in assessing the contribution of agriculture research and development in India. Every dollar spent in such research between 1980 and 2008 generated \$18.34 in benefits, the report says. These findings are in keeping with other

studies which have noted the important contribution of research and development in Indian agriculture.

The USDA report concurs with the NITI Aayog's expert group finding that the rate of return from agriculture research and development has been declining in India and there has indeed been a proliferation of state agricultural universities (SAU) in recent times.

However, this is where the similarity ends. The USDA report cites figures to show that there was a 20.8% decline in the number of full-time equivalent scientists working in SAUs between 2000 and 2008, primarily on account of inadequate resources. Seen against this backdrop, NITI Aayog's claim about the proliferation of SAUs and a subsequent thin spread of resources being the main reasons for diminishing agriculture research and development returns does not seem credible. Instead, looking at the reason for the resource crunch and comparing India's agriculture research and development spending—which is less than 0.5% of its agricultural gross domestic product (GDP)—with other countries would be useful.

India remains at the bottom of the ladder compared with countries such as China, Brazil and South Korea. While public agriculture research and development spending has increased significantly in India during 2000-

08, it is just not enough. Interestingly, the Planning Commission, the NITI Aayog's predecessor, had set a target of increasing this spending to 1% of agricultural GDP during the 12th five-year plan that ends in March 2017.

Like all research, the bulk of agriculture research in the world is also carried out in developed countries today. In 2008, high-income countries accounted for 51% of public expenditure on agriculture research and development. China accounted for 13%, while India's share was 7%. A 2006 study by the International Food Policy Research Institute, Washington, argued that unlike in the past, the developing world's option of adapting agricultural research being done in developed countries might be coming under strain due to the changing nature of that research and a squeeze on funding for international research organizations. This only underscores the need for the rejuvenation of such research in the domestic economy.

As far as the point about focused research against resource-thinning proliferation is concerned, it needs to be kept in mind that extension services are more important in agriculture than anywhere else. The soil health card mission, one of Prime Minister Narendra Modi's flagship projects, is a classic example. The scheme targets covering 140 million farmers in a span of three years beginning 2015-16. Data as on 13 January shows that only 257,000 soil samples have been tested so far. Paucity of funds and human resources are key factors affecting the successful implementation of the scheme. One hopes that those advocating a top-down model of agriculture research and development do not expect expert farm scientists to issue soil health cards to millions of Indian farmers.

Roshan Kishore is a data journalist at Mint.

(Article originally carried by Livemint on 22 January, 2016)



Sikkim Assumes Leadership Role in Organic Farming By P D Rai



Sikkim
become india's first fully organic state

Prime Minister Narendra Modi on Monday lauded Sikkim's efforts to become an organic state. Any which way you look at it, Sikkim has assumed leadership in organic agriculture. The rest of the country will have to follow suit. Years of toil and leadership has made this happen. The people of Sikkim, the farmers, agriculturists, bureaucrats and politicians have all played their part in this great Sikkimese narrative.

One must commend Prime Minister Narendra Modi for taking a look at the great potential of this venture. He has found it to be a significant public policy move that can transform the agriculture policy within the rest of India. Little wonder then that he addressed a meeting of all agriculture ministers of the Indian states to push home the point of going organic.

Everyone is aware that the Himalayas serves the Indo-Gangetic plains as well as the Assam ecosystem by just sending down water through its myriad rivers. It also extends much needed replenishment of fertile top soil carved out from the mountains.

Climate change may actually disrupt this entire process. The rivers are going to be seasonal as more and more warming will lead to drying up of the important glaciers and permafrost. Loss of biodiversity all across the Himalaya will prove very costly for the nation.

The entire Himalayan ecosystem is under threat from climate change and global warming. We have signs of that even as our

farmers are reporting that oranges are better off in higher altitudes than before. And so many such like empirical evidences that are discussed in different settings.

In order to combat and delay the problems of ecosystem services from the Himalayas, the remedy will be to start with organic farming. Let the entire Himalayan belt get into farming the way it was done traditionally but with much more scientific inputs and understanding.

This will change the way we all think of farming and getting our food. Food security will once more move into the hands of farmers rather than remain in the clutches of politicians and bureaucrats.

The Prime Minister's deep dive into sustainability will have the overtones of the global understanding of sustainable development. The International Federation of Organic Agriculture Movements (IFOAM) writes on Sustainable Development Goal #2: "Organic agriculture supports and enhances ecologically sound systems of food

production that can achieve food security by increasing and stabilising yields, improving resistance to pests and diseases, and battling poverty through reducing debt incurred by the purchase of expensive chemical inputs."

How significant is this can be fathomed by the keen interest that Sikkim's organic journey is being viewed all over the world. Prime Minister Modi sees great public policy value in this. He also sees that it can be scaled up to all the other states of India. This perhaps is a fine example of cooperative federalism.

But greater still is that the significance of organic agriculture is the path changing public policy initiative in agriculture which can be compared to the Green Revolution of the Nehruvian era. The next phase of food security will be built on Sikkim's success and Sikkim's mantra of clean food, clean water and clean air. Don't pay more for cleaning the environment. Nature's way is the best. This is a true partnership at play between the Prime Minister and the State Chief Minister.



P. D. Rai

P D Rai was elected to the Lok Sabha from the Sikkim constituency of Sikkim, India. He has the distinction of being the first member of parliament with both Indian Institutes of Technology and Indian Institutes of Management degrees. Among his other accomplishments, he is also founding chairman of the Ecotourism and Conservation Society of Sikkim (ECOSS), and CEO (north-east) of BASIX.

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The Blob in the Northeast Pacific Ocean by James Thomson

Why are normally foreign creatures swimming North America's west coast waters this summer?

For the past couple of years, researchers from California to Alaska have witnessed a warm-water phenomenon mess with the coastline's marine food web. It's like watching a horror B-flick unfold: suddenly, a strange miasma emerges, things get weird, and everyone starts behaving differently. Appropriately, a scientist nicknamed this tepid ocean broth The Blob.

"It's the type of thing you might expect to happen once in a millennium," says Richard Dewey, associate director of science with Ocean Networks Canada. The abnormally warm water is the result of a low-pressure system off Alaska's Aleutian Islands, called the Aleutian Low, which makes the mid-latitude jet stream go haywire. There have been drastic effects on both the marine environment and weather.

The recent ice storms in Texas and warm Alaskan winters have been tied to the blob. And many local marine species are feeling a pinch, food wise. The warm water and associated weather conditions have disturbed typical ocean mixing, which means nutrients remain deep and inaccessible to surface

creatures that are essential to the food web. The tiny animals that drift on ocean currents—zooplankton—feed bigger species, such as salmon.

Primary production at the surface of the ocean sets the limits for the rest of the food web, explains Brian Hunt, a Hakai Institute/University of British Columbia biological oceanographer. "This has implications for juvenile salmon, for example."

Dining on zooplankton gives juvenile salmon the heft they need to survive the long journey from the marine estuaries of their natal streams to their open-ocean feeding grounds—a swim that for some salmon can be over 3,000 kilometers.

Further up the food chain, the biggest of animals also appear to be reacting to the current dietary upheaval. Less productive waters are especially difficult for huge whales that need dense, consistent swarms of krill to survive. They may not starve to death, but they will lose weight and produce fewer offspring.

"I would expect that you'd start to see [lower birth rates] in the next year," says Ari Friedlaender, an associate professor at

Oregon State University's Marine Mammal Institute. When food is scarce, "the first thing you do is save yourself," he says.

But Friedlaender, who spends a lot of time observing whales, says he's noticed another change. "We've seen Bryde's whales, false killer whales, pilot whales, and a few other species that tend to live in much warmer water to the south."

And, looking elsewhere along the food chain, fish species such as ocean sunfish, thresher sharks, mackerel, and even some warm-water plankton species have moved further north than usual.

With a lengthy and strong El Niño year approaching, things are only going to get weirder in the ocean.

Illustration by Mark Garrison

The research of Brian Hunt is supported by a grant from the Tula Foundation, which also funds Hakai Magazine. The magazine is editorially independent of the institute and foundation.





United Nations Framework Convention on Climate Change & Conference of Parties



- The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty (currently the only international climate policy venue with broad legitimacy, due in part to its virtually universal membership) negotiated at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro from 3 to 14 June 1992.
- The objective of the treaty is to “stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system
- The treaty itself set no binding limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. In that sense, the treaty is considered legally non-binding. Instead, the treaty provides a framework for negotiating specific international treaties (called “protocols”) that may set binding limits on greenhouse gases.
- The UNFCCC was adopted on 9 May 1992, and opened for signature on 4 June 1992, after an Intergovernmental Negotiating Committee produced the text of the Framework Convention as a report following its meeting in New York from 30 April to 9 May 1992. It entered into

force on 21 March 1994.

- As of March 2014, UNFCCC has 196 parties.
- The parties to the convention have met annually from 1995 in Conferences of the Parties (COP) to assess progress in dealing with climate change.
- In 1997, the Kyoto Protocol was concluded and established legally binding obligations for developed countries to reduce their greenhouse gas emissions.
- The 2010 Cancún agreements state that future global warming should be limited to below 2.0 °C (3.6 °F) relative to the pre-industrial level. The 20th COP took place in Peru in 2014.

UNFCCC COP21 in Paris, France from 30 November to 11 December 2015

- The twenty-first session of the Conference of the Parties (COP) and the eleventh session of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP) will take place from 30 November to 11 December 2015, in Paris, France.

COP - What's it all about?

The international political response to climate change began at the Rio Earth Summit in 1992, where the ‘Rio Convention’ included the adoption of the UN Framework on Climate

Change (UNFCCC). This convention set out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases (GHGs) to avoid “dangerous anthropogenic interference with the climate system.” The UNFCCC which entered into force on 21 March 1994, now has a near-universal membership of 195 parties.

The main objective of the annual Conference of Parties (COP) is to:

- Review the Convention’s implementation. The first COP took place in Berlin in 1995 and significant meetings since then have included COP3 where the Kyoto Protocol was adopted, COP11 where the Montreal Action Plan was produced
- COP15 in Copenhagen where an agreement to succeed Kyoto Protocol was unfortunately not realised and COP17 in Durban where the Green Climate Fund was created.
- In 2015 COP21, also known as the 2015 Paris Climate Conference, will, for the first time in over 20 years of UN negotiations, aim to achieve a legally binding and universal agreement on climate, with the aim of keeping global warming below 2°C.
- France will play a leading international role in hosting this seminal conference, and COP21 will be one of the largest international conferences ever held in the country. The conference is expected to attract close to 50,000 participants including 25,000 official delegates from government, intergovernmental organizations, UN agencies, NGOs and civil society.

What was the outcome of COP20 in Lima?

- In 2014, COP20 held in Lima attracted over 15,000 official delegates, and negotiators concluded talks with the ‘Lima Call For Climate Action’, a draft document that lays the foundations for a new global climate deal.



- Alongside COP20, there were more than 400 conferences in which new research projects and initiatives were presented.
- The Sustainable Innovation Forum 2014 was the largest commercially-focused event during COP20, attracting high profile speakers, celebrities and over 500 pre-approved delegates representing private sector, government, NGO, UN agencies and civil society.
- During the two weeks of COP20, over 140 press conferences were held and more than 900 journalists from around the world covered the international event.

ICUN's key policy recommendations on climate change in 2015

- Be ambitious, fair and balanced – it should, at the very least, enable the rise in global average temperature to be held below 2°C above pre-industrial levels
- Be comprehensive in its coverage of greenhouse gas (GHG) sources and sinks, taking into account all major economic sectors, including the land sector
- Facilitates global efforts to reduce dependence on fossil fuels, decarbonise energy systems, and expand the use of renewable and other low-carbon sources of energy in a manner that improves human and ecosystem well-being
- Clearly recognises and supports the substantial and effective role of healthy ecosystems – terrestrial, marine and coastal – as natural sinks and reservoirs

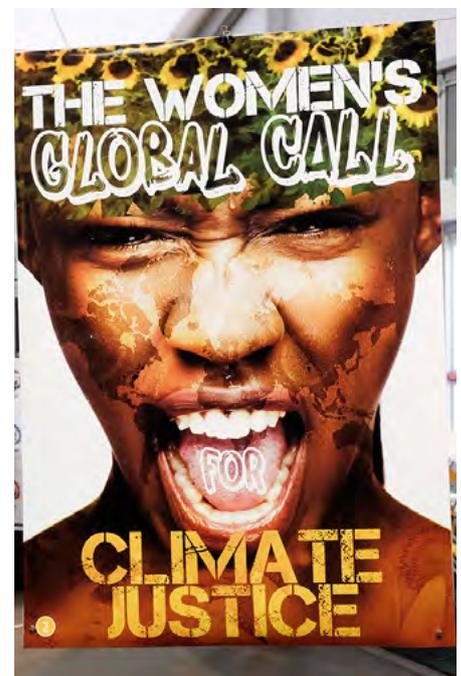
of GHGs

- Advances the important role that ecosystem-based approaches and nature-based solutions can play in both climate change mitigation and adaptation
- Respects gender equality and human rights, taking into account local, indigenous and traditional knowledge, and the needs of the most vulnerable communities
- Catalyses more ambitious action on climate change by all actors across all sectors, particularly from the business community
- Ensures that climate finance provisions enable the enhanced uptake of all ecosystem-based mitigation and adaptation measures across all levels, noting the agreed overall international goal of mobilizing US\$ 100 billion per year by 2020 With respect to the Intended Nationally Determined Contributions (INDCs) being prepared and communicated by countries ahead of Paris for the post-2020 period, it is important that these:
 - Incorporate specific and ambitious ecosystem-based mitigation and adaptation measures. Taking into account that ambitious action is also needed in the pre-2020 period, these could include, for example:
 - Joining international efforts to combat forest loss and degradation including

those launched under the New York Declaration on Forests to halve global natural forest loss by 2020, and end it by 2030

- Contributing towards the restoration of 150 million hectares of degraded landscapes and forestlands by 2020, and 350 million hectares by 2030 through the extended Bonn Challenge, noting also the commitment made to achieve land degradation neutrality under the UN Convention to Combat Desertification (UNCCD)
- Expanding the existing coverage of terrestrial, coastal and marine protected areas consistent with Aichi Biodiversity Targets 11 and 15
- Ensuring the conservation of other natural ecosystems and carbon reservoirs such as oceans and wetlands (i.e. blue carbon), when not already included within existing mechanisms

ICUN's overall message is that while biodiversity and ecosystems are threatened by climate change, their conservation, restoration and sustainable management generate significant and practical nature-based solutions to climate change. These cost-effective solutions can contribute to both mitigation and adaptation objectives while also yielding other important economic, social and environmental co-benefits.





Sustainability-Success Stories by Prof. Gunter Pauli

IS YOUR BUSINESS SUSTAINABLE?

In The 90's I was the biggest buyer of Palm Oil from Indonesia. The govt. of Indonesia gave me a red carpet welcome when I visited them. Using the palm oil I was making bio-degradable soaps for the buyers in Europe. And apart from generating thousands of jobs in Indonesia, and making soaps in a zero wastage factory I was also helping clean up the rivers of Europe. I was already hailed as the "Green Guru". But then I discovered something that while I was cleaning up the rivers of Europe I was in effect destroying the rainforests-the habitat of thousands of wonderful animal and plant species-like the Orang-utan

So I discovered that I was doing was not Sustainable



A LOT CAN HAPPEN WITH COFFEE

To be sustainable we need to break out of our present mindset. And to do that we need to innovate

Take the example of coffee. We can take the waste of the coffee, mix it with straw and farm mushrooms. And with the mushroom waste you can feed your chickens (or your dog if you are a city dweller)

Today there are over 3000 mushroom farms in Africa doing this. But most importantly this is so easy to do that even children can adapt it and learn about sustainability from childhood.

THE TUSK FAIRY-A FABLE

I have written hundreds of fables for children. Each teaching our children some basic lesson on how they as future leaders should view our world.

They are going to be launched by the Chinese government soon.

The tusk fairy is one of them, based on the fact that the elephant population across the world is rapidly dwindling thanks to the rampant poaching going on for their tusks.

While a huge number of ideas have been tried to control poaching, this is a problem that has remained, mainly due to the fact that the demand for ivory is very high.

So we decided to make use of the little tooth that baby elephants shed- and which must be lying in the thousands around the savannah.

But these little tusks are not in much demand mainly because they are smaller and also because they are much harder to cut and shape. We challenged the Chinese craftsmen to use their skills on these tusks and join them to form larger pieces of work.





PAPER FROM STONE

Paper making involves cutting down of trees. So how do we innovate?

By making them from stone of course!

We crush stone to 3 microns then add a polymer (which can be old plastic bottles)

This process does not require water or cellulose and it can be recycled forever.



THE REAL MEASURE OF SUCCESS

We spend huge sums of money on petroleum and gas. But can we do something differently? And sustainably?

We tapped trees and extracted turpentine from them. This was then used as a substitute for petroleum. This helped save huge amounts of money. Which we then used to give the local populace three litres of pure drinking water—a scarcity in those parts. We also gave every child over six years a bicycle. So what happens when a child gets to drink pure water and cycle every day? He stays healthy.

We had also opened a big hospital for them. Which had to be closed down shortly due to the lack of enough patients.

So let us not measure success by the number of additional hospital beds but by the number of hospitals you have closed down.



Gunter Pauli

Gunter Pauli is a self-styled "serial entrepreneur", author and initiator of The Blue Economy. His entrepreneurial activities span business, culture, science, politics and the environment. He founded the "Zero Emissions Research and Initiatives" (ZERI) and subsequently established The Global ZERI Network.
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(Excerpts from a Lecture by Prof. Pauli at the Balipara Foundation Annual Award, November 2015)



Growing Organically

Profiled and Published by APPI Foundation

Organic growth
for a healthy planet

Inside

- From article to the front cover of nature, to a cup of tea, the Nutriball story
- In defence of nature - Organic farming and the need to cultivate a sustainable planet
- Organic Introduction - Healthy Choice For Healthy Nations
- Conventional Farming vs. Organic Farming
- Organic Mythsbusters
- Organic News

Charting the Organic Trail in Assam

Dr. Rajat Barik of APPI Foundation gives insight into the present you with the very first edition of "Organic growth" - the all encompassing journal for the organic user of the day. Designed to be an up-to-date, ready reference into the organic world, this journal will keep you posted about all the latest technological advances and breakthroughs in organic farming, current happenings and forthcoming events. From time to time we will also present feature stories by experts in the field of organic research as well as stories and vignettes for a glimpse into the lives of producers who have successfully adopted organic methods for a far more inclusive and successful lifestyle. We intend to create an opportunity for modest individuals who appreciate the gifts that nature has bestowed on us, and practicing exploring avenues to help consume animal and plant life in their part of the world. Our organic trail starts at Hahaluahour our cover article, and which will be covered further in our subsequent issues.

"Organic growth", while giving you a broad perspective on topics and activities from around the world, will highlight and focus on efforts that are underway in the North Eastern border region of India, offering you an in-depth analysis of organic projects in the region and a perspective into the efforts of the local community to safeguard endemic plant and animal species and preserve the delicate ecological balance of the area.

So, as we begin this exciting journey of horticulturalism, I invite you to share your ideas, thoughts and insights with the community. Do write to us with your reports and suggestions. Look forward to engaging you as a contributor, a dialogue that will help us in a more sustainable and inclusive future for all of us.

Rajat Barik, Chairman, APPI Foundation

Profiled and Published by APPI Foundation

Organic growth
for a healthy planet

Inside

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- Why is organic food not and people struggle to buy it?
- Organic Farming, Not Self-sufficiency
- Rising Organic: Rise Up to Food and climate security
- Organic Farming Support - That Never Stops!
- Organic News
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Going organic is a better way to save the planet

A recent study by the Oxford University's Department of Plant Science and the Swedish University of Agricultural Sciences reveals that organic food support if farmers reap their "most and most common than conventional farms. This is particularly true for pesticides such as herbicides. As the largest organic crop grown in the world, wheat is a major crop and organic farming has a clear advantage - it rarely uses any herbicides or pesticides to control weeds and other life forms that impact the quality, taste and yield. That and the fact pesticides that will harm up produce healthy crops and reduce costs. The study shows that, but much of the top produced in the farmstead by small independent growers. Our hope is that in the future, we extend our reports to their small-scale farms and encourage them to grow organically.

- As the world moves in almost to focus on it to be the great value now learned there need to ensure these the Nutriball has stable is better.
- Given by consumer demand, market across the world is now demanding choice free tea, not merely for the sake of their own health, but because consumers want to disengage from damage caused by toxic pesticides when these back into the environment like pesticides.
- At Nutriball, the transition from chemical to organic farming has been an incredibly challenging journey, working with these in the time, you can see to show the organic farming can be viable and that the tea industry can sustain itself without dropping natural biodiversity.
- We are in the process of reducing pesticides and developing organic pesticides and products which will help create a favourable market for farmers across the world and more importantly in India and especially in Assam.
- Nutriball is a farmstead who has both a passion and a conviction of organic farming in our homeland. We will continue to be a part of the organic industry market for us to work and learn from.
- The issue has made studies and notes from the Nutriball team when we embarked on the organic, please do also check out our website and follow us on Facebook for organic products and projects.

Rajat Barik, Chairman, APPI Foundation

Profiled and Published by APPI Foundation

Organic growth
for a healthy planet

Inside

- Prime Minister stresses on "Organic Farming" - saving global health!
- Background History of The Organic Movement
- All That Consumers Needs To Know About Organics
- Organic Farming on the Rise In Assam
- Confessions Of An Organic Tea Drinker
- Nutriball cover story
- World News
- In Memoriam - Mark Shand

Growth of Organic Sector

On behalf of APPI Foundation, it gives the great pleasure to present you with the first edition of "Organic growth" - the all encompassing journal for the organic user of the day. As the most editor we focus on "Elevating awareness on Organic Consumption". As the value continues to progress towards better eating habits, organic food products are finding their way into the households of the Indian home. Given across the spectrum of product offerings, these products have become better sources of nutrition value than their conventional peers, regions of the increased awareness and growth of organic products which have been addressed to production and quality control standards, regularly of consumers have failed to differentiate between the organic and the conventional offers. Owing to this, the awareness has not translated into actual consumption.

Additionally, it is our responsibility to also create awareness and build culture of the ecological benefits that accrue from organic farming practices and prevent any further degradation of our natural capital - an inheritance that we have been gifted with, which must be nurtured and protected.

The first issue of magazine while promoting the organic culture in the country therefore also seeks to spread education amongst the consumers. This initial takes the consumers through the history of organic movement along the "Nutriball Organic Care" - giving a look on the composition of organic in India, but also also gives an insight on the pricing of the organic products, on which the buying decision is largely based. A section has also been devoted to some authentic questions that are usually but in relation to organic consumption. Lastly, it takes the importance of Assam as one of the major states of the "Organic Movement" in the country by its geographical size to the growing organic culture.

We would like to express our thanks and gratitude to our PR & Media Minister, Shri. Narendra Choudhary for highlighting and promoting the cause of organic agriculture with a special focus on the North East. "It is a small state but Assam can do it, why can't we dream of developing the entire of North East as an organic state?"

So, we welcome your thoughts and vision to both creating a sustainable and safe India and promoting the already high tea culture.

Rajat Barik, Chairman, APPI Foundation

PROFILED AND PUBLISHED BY APPI FOUNDATION

ORGANIC GROWTH

VOL 6 (OCTOBER - DECEMBER 2014)

GOING THE ORGANIC WAY

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ORGANIC GROWTH

VOL 5 (JANUARY - MARCH 2015)

SAVE WATER SAVE LIVES

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OUR SOIL MATE

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GLOBAL WARNING

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ORGANIC GROWTH

VOL 8 & 9 (OCTOBER 2015 - MARCH 2016)

SUSTAINABILITY

Download all our issues at:
www.applfoundation.in



Organic News

World Scenario

World Scenario

1. Organic farming conference touts benefits of less inputs

<http://www.farmanddairy.com/news/organic-farming-conference-touts-benefits/293329.html>

- Our goal is to not have any soil leave our farm at all, any time you have soil exposed to the elements, you're going to be losing soil organic matter. You're going to burn up organic matter in your soils.

2. Organic farmers body calls for reduced certification rates

<http://www.farmersjournal.ie/organic-farmers-body-calls-for-reduced-certification-rates-191376/>

- An organisation representing organic farmers is looking for reduced certification rates and a reduction in the number of organic certification bodies in Ireland.

3. Nestlé sees 4.2% organic growth in the first 9 months of 2015

<http://www.newfoodmagazine.com/2016/1/news/industry-news/nestle-sees-4-2-organic-growth-in-the-first-9-months-of-2015/>

- The company saw organic growth of 4.2%, composed of 2.0% real internal growth and 2.2% pricing.
- Nestlé continued to grow in each of its three geographies with organic growth of 6.2% in the Americas, 4.0% in Europe, Middle East and north Africa, and 1.1% in Asia, Oceania and sub-Saharan Africa.

4. Organic social media festival finds millions eager for the facts

<http://www.prnewswire.com/news-releases/organic-social-media-festival-finds-millions-eager-for-the-facts-300163946.html>

- Equipped with fresh science and recent trend data posted as artfully designed daily infographics, OTA and more than 100 member companies' online celebration reached 15 million

consumers throughout the campaign, garnering well over 200 million social media impressions[i] on Facebook, Twitter, Pinterest, Instagram and LinkedIn.

5. Celebrating 25 years of organic standards

<http://www.farmanddairy.com/top-stories/celebrating-25-years-of-organic-standards/303413.html>

- Twenty-five years later, the Ohio Ecological Food and Farm Association acknowledged this milestone in a teleconference, Nov. 30, by talking about the challenges of creating unified standards in organic production. Participants also shared their hopes for the future of the National Organic Program.

6. GCC organic farming produce to reach \$1.5 billion

<http://www.bna.bh/portal/en/news/700705>

- Industry professionals attending the inaugural SIAL World Summit, a three-day showcase of the latest trends and innovation in the food, beverage and hospitality sector, were provided with expert insights into the burgeoning regional organic food market.

7. Organic Valley Passes \$1 Billion in Sales

<http://www.bevnet.com/news/2015/organic-valley-passes-1-billion-in-sales>

- On Tuesday, December 22, CROPP Cooperative / Organic Valley reached a remarkable milestone: The farmer-owned cooperative surpassed \$1 billion in sales.

8. Organic food: boosting EU production and enhancing consumer trust

<http://www.europarl.europa.eu/news/en/news-room/20151013IPR97385/Organic-food-boosting-EU-production-and-enhancing-consumer-trust>

- Organic farmers, processors, traders and importers must meet higher but realistic

sustainability criteria and undergo strict food fraud checks to boost trust in the EU organic label, said agriculture MEPs on Tuesday.

- They introduced measures to avoid contamination of organic food, including on mixed organic and conventional farms, and endorsed plans to help small farmers turn organic.

9. Chinese demand for organic powder blasts Bellamy's into multi-million dollar expansion

<http://www.dailymail.co.uk/news/article-3340465/Bellamy-s-Organic-signs-multimillion-dollar-deal-Fonterra-meet-Chinese-demand-baby-formula.html>

- Bellamy's Organic signs multimillion-dollar deal to meet formula demand
- The baby powder manufacturer and dairy giant Fonterra have teamed up
- From 2016, Fonterra will make a new formula range for Bellamy's Organic
- The announcement comes after an Australian shortage of the milk powder

10. Organic on the World Stage: Expo Milan 2015

<http://blogs.usda.gov/2015/10/16/organic-on-the-world-stage-expo-milan-2015/>

- Across the country and around the world, more people are looking for organic options at their local markets.
- Thanks to the remarkable growth in the number of USDA certified organic operations, which now number more than 27,800 worldwide, consumers have more choices than ever.

Indian Scenario

1. The Problems Facing Organic Farming in India: Study

<http://food.ndtv.com/food-drinks/the-problems-facing-organic-farming-in-india-study-1237807>

- A study conducted by the Consumer Unity and Trust Society (CUTS) highlights key



Organic News

hindrances to organic farming Despite the government's constant efforts to promote organic farming, only 16.3 per cent farmers of Rajasthan use organic inputs, while fear of less production and unavailability of organic inputs form the major hindrances to the chemical-ridden farming.

2. 'Gandhi of organic farming' passes away

<http://indianexpress.com/article/cities/ahmedabad/gandhi-of-organic-farming-passes-away/>

- Bhaskar Save had committed his life to organic farming and had won many awards nationally and internationally.

3. Organic products' exhibition soon at DilliHaat

<http://timesofindia.indiatimes.com/city/delhi/Organicproducts-exhibition-soon-at-DilliHaat/articleshow/49758646.cms>

- NEW DELHI: In a bid to boost rural livelihoods, organic products produced by women entrepreneurs will be showcased in an exhibition at DilliHaat, INA from November 13-23.
- The products on sale will include tribal and ethnic foods, pickles and preserves, rice, pulses, spices, vegetables and fruits, fabrics, dyes and dresses and cosmetics and household products.

4. Aruppukottai weavers take to organic saris

<http://www.thehindu.com/news/cities/Madurai/aruppukottai-weavers-take-to-organic-saris/article7724774.ece>

- "They are preferred for being lightweight and trendy"
- Clusters of weavers from Aruppukottai are slowly but steadily making inroads into the production of organic saris for the Tamil Nadu Handloom Weaver's Society or Cooptex.

5. Organic food market growing at 25-30%, awareness still low:

Government

<http://economictimes.indiatimes.com/industry/cons-products/food/organic-food-market-growing-at-25-30-awareness-still-low-government/articleshow/49379802.cms>

- The organic food market in India is growing at 25-30 per cent, but the awareness about organic farming is still low in India despite huge spending, the government today said.
- It released a study which projected that the domestic organic food market would touch the \$1.36 billion mark by 2020.

6. Agriculture Minister stresses on pulses, organic farming

<http://www.financialexpress.com/article/markets/commodities/agriculture-minister-stresses-on-pulses-organic-farming/152806/>

- Minister of State for Agriculture MohanbhaiKalyanjibhaiKundariya has urged the farmers to shift from paddy to pulses and organic farming for making better profits.

7. Organic food start-up Terra Firma to add 8,000 farmers to its network

http://www.business-standard.com/article/companies/organic-food-start-up-terra-firma-to-add-8-000-farmers-to-its-network-115101401062_1.html

- Terra Firma develops and offers natural food alternatives and produces organic food harvested from its organic farms and partner organic farming groups spread across India

North - East Scenario

1. Sikkim – India's First State to Go All Organic

<http://www.khmertimeskh.com/news/17207/sikkim----india---s-first-state-to-go-all-organic/>

- This month, the remote and mountainous Indian state of Sikkim announced it would become the first state in the country to go all organic.

- For three days, 52 international buyers and delegates from tour operators and media from 23 countries traveled up the harrowing curved streets of the mountains to visit the mysterious state of Sikkim for the fourth International Tourism Mart (ITM).

2. Organic Arunachal clothes to hit national market soon

<http://www.india.com/business/organic-arunachal-clothes-to-hit-national-market-soon-723552/>

- Retired Indian Air Force (IAF) Group Captain MohontoPangin has been giving new designs and shapes to cloth products

3. Naturenomics initiative

<http://www.thestatesman.com/news/north-east-page/naturenomics-initiative/110421.html>

- At a function last month in Guwahati, the 2015 Balipara Foundation Awards were given to seven conservation activists in diverse fields and three community-based organisations like the PanchanLakhar Community Conserved Area Management Committee (Arunachal Pradesh), KhanchendzongaConsevation Committee (Sikkim) and the Bicone Bio-diversity and Nature Conservation Network (Mizoram) for their "inspirational conservation work" and successful efforts to protect wildlife, restore deforested land to biodiversity rich forest status, promote organic farming as a measure of sustainable food security and replace agro-chemical inputs and energy security through the spread of renewable energy systems in villages.
- Six, including two women from Assam, Bhutan and Meghalaya, received Forest Guards Awards for their "tireless service to protection and conservation at wildlife sanctuaries", often at great risk to their lives.



A Nice Cup of Tea By George Orwell



Evening Standard, 12 January 1946.

If you look up 'tea' in the first cookery book that comes to hand you will probably find that it is unmentioned; or at most you will find a

few lines of sketchy instructions which give no ruling on several of the most important points.

This is curious, not only because tea is one of the main stays of civilization in this country, as well as in Eire, Australia and New Zealand, but because the best manner of making it is the subject of violent disputes.

When I look through my own recipe for the perfect cup of tea, I find no fewer than eleven outstanding points. On perhaps two of them there would be pretty general agreement, but at least four others are acutely controversial. Here are my own eleven rules, every one of which I regard as golden:

- First of all, one should use Indian or Ceylonese tea. China tea has virtues which are not to be despised nowadays — it is economical, and one can drink it without milk — but there is not much stimulation in it. One does not feel wiser, braver or more optimistic after drinking it. Anyone

who has used that comforting phrase 'a nice cup of tea' invariably means Indian tea.

- Secondly, tea should be made in small quantities — that is, in a teapot. Tea out of an urn is always tasteless, while army tea, made in a cauldron, tastes of grease and whitewash. The teapot should be made of china or earthenware. Silver or Britanniaware teapots produce inferior tea and enamel pots are worse; though curiously enough a pewter teapot (a rarity nowadays) is not so bad.
- Thirdly, the pot should be warmed beforehand. This is better done by placing it on the hob than by the usual method of swilling it out with hot water.
- Fourthly, the tea should be strong. For a pot holding a quart, if you are going to fill it nearly to the brim, six heaped teaspoons would be about right. In a time of rationing, this is not an idea that can





be realized on every day of the week, but I maintain that one strong cup of tea is better than twenty weak ones. All true tea lovers not only like their tea strong, but like it a little stronger with each year that passes — a fact which is recognized in the extra ration issued to old-age pensioners.

- Fifthly, the tea should be put straight into the pot. No strainers, muslin bags or other devices to imprison the tea. In some countries teapots are fitted with little dangling baskets under the spout to catch the stray leaves, which are supposed to be harmful. Actually one can swallow tea-leaves in considerable quantities without ill effect, and if the tea is not loose in the pot it never infuses properly.
- Sixthly, one should take the teapot to the kettle and not the other way about. The water should be actually boiling at the moment of impact, which means that one should keep it on the flame while one pours. Some people add that one should only use water that has been freshly brought to the boil, but I have never noticed that it makes any difference.
- Seventhly, after making the tea, one should stir it, or better, give the pot a good shake, afterwards allowing the leaves to settle.

- Eighthly, one should drink out of a good breakfast cup — that is, the cylindrical type of cup, not the flat, shallow type. The breakfast cup holds more, and with the other kind one's tea is always half cold before one has well started on it.
- Ninthly, one should pour the cream off the milk before using it for tea. Milk that is too creamy always gives tea a sickly taste.
- Tenthly, one should pour tea into the cup first. This is one of the most controversial points of all; indeed in every family in Britain there are probably two schools of thought on the subject. The milk-first school can bring forward some fairly strong arguments, but I maintain that my own argument is unanswerable. This is that, by putting the tea in first and stirring as one pours, one can exactly regulate the amount of milk whereas one is liable to put in too much milk if one does it the other way round.
- Lastly, tea — unless one is drinking it in the Russian style — should be drunk without sugar. I know very well that I am in a minority here. But still, how can you call yourself a true tealover if you destroy the flavour of your tea by putting sugar in it? It would be equally reasonable to put in pepper or salt. Tea is meant to be bitter, just as beer is meant to be bitter. If

you sweeten it, you are no longer tasting the tea, you are merely tasting the sugar; you could make a very similar drink by dissolving sugar in plain hot water.

Some people would answer that they don't like tea in itself, that they only drink it in order to be warmed and stimulated, and they need sugar to take the taste away. To those misguided people I would say: Try drinking tea without sugar for, say, a fortnight and it is very unlikely that you will ever want to ruin your tea by sweetening it again.

These are not the only controversial points to arise in connexion with tea drinking, but they are sufficient to show how subtilized the whole business has become. There is also the mysterious social etiquette surrounding the teapot (why is it considered vulgar to drink out of your saucer, for instance?) and much might be written about the subsidiary uses of tealeaves, such as telling fortunes, predicting the arrival of visitors, feeding rabbits, healing burns and sweeping the carpet. It is worth paying attention to such details as warming the pot and using water that is really boiling, so as to make quite sure of wringing out of one's ration the twenty good, strong cups of that two ounces, properly handled, ought to represent.

(taken from *The Collected Essays, Journalism and Letters of George Orwell, Volume 3, 1943-45*, Penguin ISBN, 0-14-00-3153-7)





"Climate change is real, it is happening right now. It is the most urgent threat facing our entire species, and we need to work collectively together and stop procrastinating. We need to support leaders around the world who do not speak for the big polluters, but who speak for all of humanity, for the indigenous people of the world, for the billions and billions of underprivileged people out there who would be most affected by this. For our children's children, and for those people out there whose voices have been drowned out by the politics of greed ... Let us not take this planet for granted. I do not take tonight for granted."

Acceptance speech by Leonardo Di Caprio at the Academy Awards 2016

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