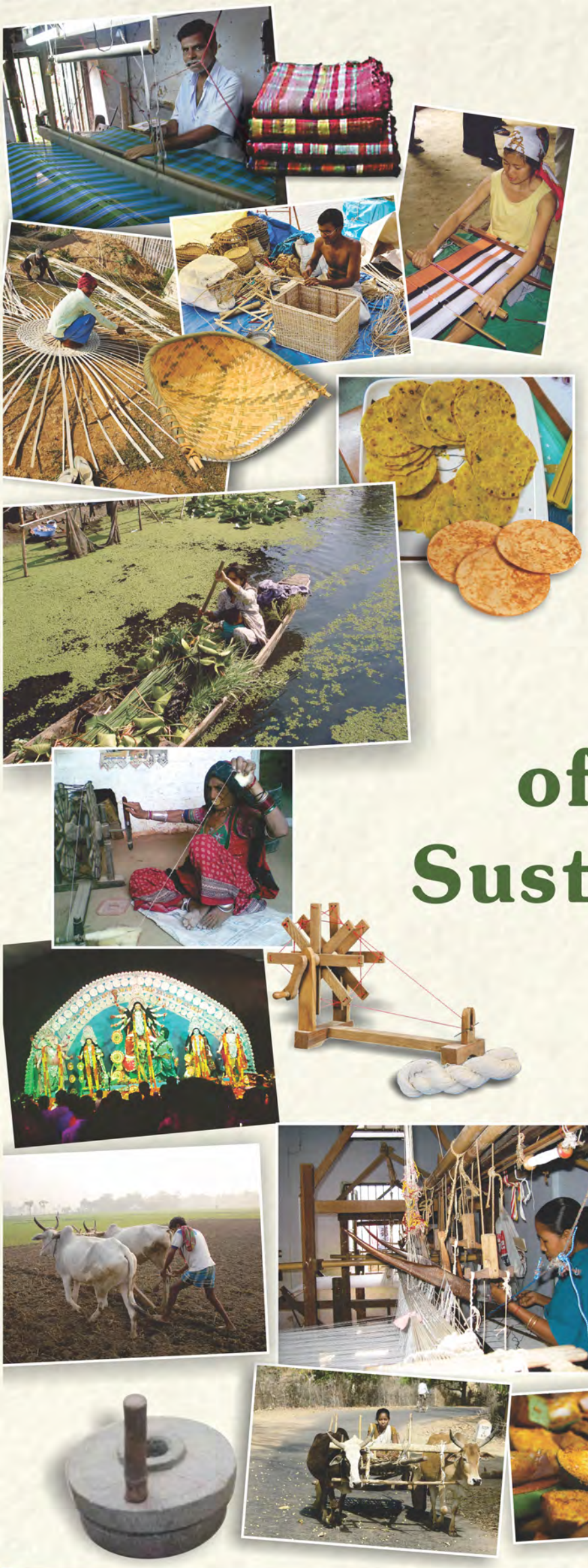

सत्यमेव जयते

PARAMPARA

India's Culture of Climate Friendly Sustainable Practices

The Parampara Catalogue is a collection of a range of climate friendly traditions and practices from across the country which promote more sustainable lifestyles, sustainable production and consumption.

The Catalogue groups these practices of India under the themes of solar and wind energy, agriculture, biodiversity, food, health, shelter, textiles and clothing and water. These living traditions are an integral part of the social and cultural fabric of India. These traditions have been selected based on their relevance to climate change, their perceived usefulness in climate change mitigation and adaptation, and relatability to energy and water conservation, recycling and environment friendly lifestyles.

सत्यमेव जयते

PARAMPARA

India's Culture of Climate Friendly Sustainable Practices

Ministry of Environment, Forest and Climate Change
Government of India

सत्यमेव जयते

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Ministry of Environment, Forest and Climate Change
Government of India

Prepared for
Twenty-first Session of the
Conference of the Parties (COP21) to the
United Nations Framework Convention on Climate Change
(UNFCCC) in Paris, France
30 November to 11 December 2015

ॐ द्यौः शान्तिरन्तरिक्ष शान्तिः
पृथिवी शान्तिरापः शान्तिरोषधयः शान्तिः।

Unto Heaven be Peace, Unto the Sky and the Earth be Peace,
Peace be unto the Water, Unto the Herbs and Trees be Peace.

Yajurveda 36.17

परम्परा

PARAMPARA

A continuation of tradition
without interruption

Prepared for
Ministry of Environment, Forest and Climate Change, Government of India by
Centre for Environment Education

ISBN No. 978-93-84233-06-8

Disclaimer

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Foreword

नरेन्द्र मोदी
NARENDRA MODI

सत्यमेव जयते

प्रधान मंत्री
Prime Minister

It gives me great pleasure to present '**Parampara** - India's Culture of Climate friendly Sustainable Practices'. Today, as the world faces a severe environmental crisis, it is very crucial that we find ways to combat it not just through modern technologies but with the wisdom of our collective cultural tradition. Like many other ancient cultures, India has a lot to offer to the world. This catalogue documents climate friendly traditions across the country to present living evidence of India's sustainability-oriented cultural perspective with a view to sharing them with the world.

For us in India, respect for nature is an integral part of our value system. We treat nature and natural resources as sacred. India's '*sanskar*' (traditions) and '*soch*' (thinking) are based on '*prakriti prem*' (love for nature) which has always been universally imbibed right from early childhood through the telling of stories and parables.

Personally, it is my reading of Vedic literature that educated me about the strong bond between humans and mother Nature. We are all aware of Mahatma Gandhi's Doctrine of Trusteeship. In this context, we, as the present generation, have the responsibility to act as a trustee of our rich natural wealth for all, including future generations.

Climate change is a pressing global challenge. And, it calls for dialogue and considered, collective human action as part of a comprehensive global responsibility and response. We must draw upon our entire wealth of wisdom; the strength of every institution; all possibilities of innovation; and, the power of science and technology.

Too often, our discussion is reduced to an argument about emission cuts. But, we are more likely to succeed if we offer affordable solutions, not simply impose decisions.

And, it is for the same reason that I call for a change in lifestyle. Because, the emission reduction that we seek will be the natural outcome of how we live and work.

And, it will also mean a different path to economic well-being.

India has given the world the invaluable gift of our ancient tradition, Yoga. Yoga awakens a sense of oneness and harmony with self, society and Nature. Yoga embodies unity of mind and body; thought and action; restraint and fulfillment; harmony between man and nature; a holistic approach to well-being. It is not just about maintaining physical health through exercise but to discover a sense of oneness with yourself, the world and Nature.

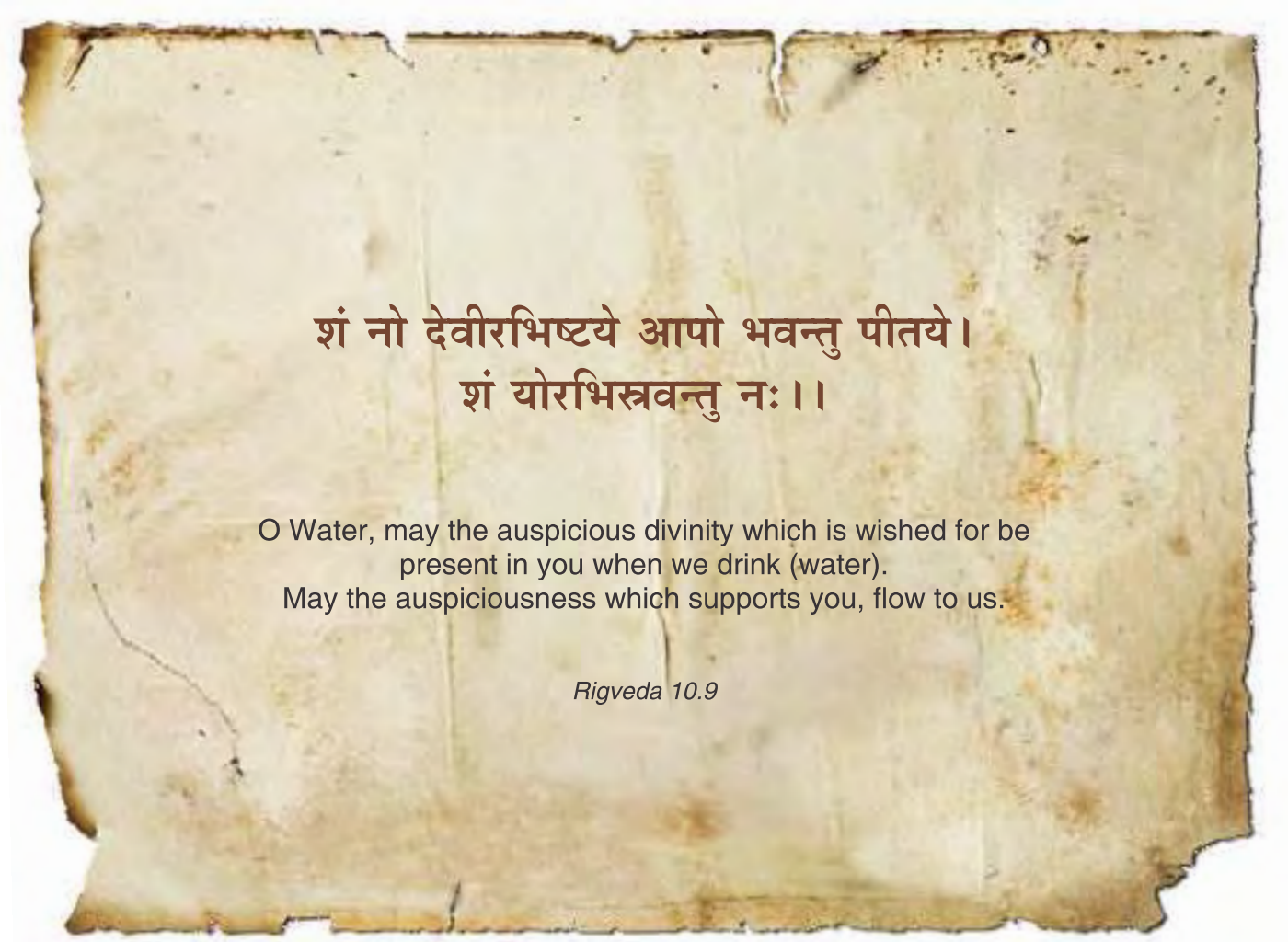
Changing our lifestyle and creating consciousness about Nature can help us deal with climate change and create a more balanced world. Deciding to celebrate a day on Yoga internationally reflected our collective ability to go beyond our familiar boundaries in search for solutions to common challenges.

We can achieve the same level of development, prosperity and well-being without necessarily going down the path of reckless consumption. It doesn't mean that economies will suffer; it will only mean that our economies will take on a different character.

We are at a historic moment. Every age defines its character; and, each generation is remembered for how it rose together to meet its challenges. Our generation must recognize and reaffirm our commitment to sustainability and climate health. **Parampara** offers rich evidence of the intuitive understanding of this commitment through our living traditions. I congratulate all those who were involved in its compilation.

(Narendra Modi)

New Delhi
18 November 2015



O Water, may the auspicious divinity which is wished for be present in you when we drink (water).
May the auspiciousness which supports you, flow to us.

Rigveda 10.9

Preface

प्रकाश जावडेकर
Prakash Javadekar

सत्यमेव जयते

राज्य मंत्री (स्वतंत्र प्रभार)
MINISTER OF STATE (INDEPENDENT CHARGE)
पर्यावरण, वन एवं जलवायु परिवर्तन
ENVIRONMENT, FOREST & CLIMATE CHANGE
भारत सरकार / GOVERNMENT OF INDIA

Community-based local and traditional knowledge offers valuable insights into environmental change due to global warming. These traditions of antiquity are still with us, continuing and evolving, and are therefore relevant even in today's times. The traditional knowledge can complement broader-scale scientific research with local precision and nuance. India is closely working on the convergence of traditional knowledge with modern science as we feel there is need for building on traditional knowledge to look at innovative solutions for meeting the challenges of Climate Change. Synergy between the past and the present knowledge and practices is a part of the strategy for India's approach to dealing with the impact of climate change.

We can see how ancient temples like Kedarnath survived massive flash floods. These are good examples of disaster resilience supported by ancient methods of engineering and architecture. The frame of several temples of that time is made out of timber, which is even today used in earthquake-resistant designs. The pillars have been joined together using wooden wedges rather than iron nails, making it earthquake-resistant.

Traditional Indian lifestyle has imbibed values of frugality, sustainability and does not have the concept of " waste". Indian value systems do not encourage us to replicate the same consumer culture that is rampant elsewhere. Even in our day-to-day life, we see how families in India still make younger children wear the clothes worn by older children in the house. This is not because of poverty, but because Indian value systems encourage three 'Rs', reduce, recycle and reuse material goods at home. This has therefore become ingrained in the pyche of Indian people.

Time has come when the world ultimately must debate about lifestyle issues, because this planet will not be sufficient for sustaining extravagant lifestyles. The Parampara Catalogue prepared by the Centre for Environment Education, a Centre of Excellence of our Ministry, is an effort by the Government of India for advancing an understanding of climate change, adaptation and mitigation in the context of culture and traditional knowledge. We hope it will help generate a dialogue on these issues, and will encourage sustainable living conducive to environment.

(Prakash Javadekar)

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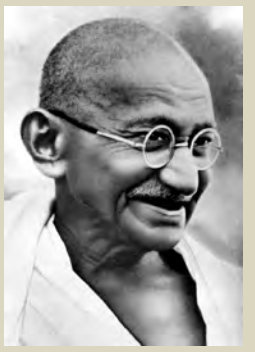
Schematic diagram, not to scale

Sustainable traditional practices are found all over India, in its 29 states and 7 union territories. This Publication provides a glimpse of these practices.



“Earth provides enough to satisfy everyone’s need, but not for anyone's greed.”

Mahatma Gandhi

Introduction

Most traditional societies all over the world lived close to nature with practices that were sustainable. With industrialisation, large shifts of rural population to urban areas, high economic growth and major shifts in lifestyle and, in some cases, due to conscious ideological changes, earlier practices rapidly disappeared. The model of development which emerged was one of linear growth, heavy use of fossil fuels, uncontrolled generation of waste and looking at nature and all other species from an anthropocentric point of view.

India in many ways represents one of the few ancient civilizations and cultures that have unbroken traditions. It is unbroken, yet dynamic and constantly changing. India is a land which has seen the rise of several religions and philosophical traditions. The Vedas, which go back over three thousand years, talk about key values of sustainability and humans being as being part of the larger cycle of life. Over the years, India has accepted and welcomed several other traditions and in the process changed itself, and has also had a major impact on the cultures which have come to this country. Therefore to talk of an Indian tradition is difficult because India has a multitude of traditions and what is practised in one place may be totally different from another. India's geography from the snowy mountains of the Himalayas to the tropical coastlines of Kerala represent several different biogeographical areas. Lifestyles that emerged in the deserts of Rajasthan were obviously different from those in the forests of Assam, and yet among all these varieties and multiplicity of traditions, there are certain core values which are in consonance with the need for sustainability and that transcends any one particular tradition.

At the heart of our traditions is perhaps the high value placed on diversity, and with it, on tolerance. There are not many places in the world which not only sustain such rich and complex diversity but also celebrate it. The people of India developed lifestyles that matched the local conditions. Types of houses, food habits, clothing, livelihoods, forms of medicine all matched the climate of the region. Emphasizing this the President of India, Shri Pranab Mukherjee said, “Over the years, our civilisation has celebrated diversity, plurality and promoted and advocated tolerance. These values have kept us together over the centuries.” India has abundant sunlight and using sunlight for drying, heating, cleaning and sanitizing, for providing natural light and as a key source of energy for agriculture and all plant life is very much a part of Indian life.

The Sun has always been seen as energy and the modern thrust towards solar energy comes naturally to the people of India. Uttarayan, celebrating the northern movement of the Sun, is one of many festivals celebrated by people together spontaneously using only natural energy, in this case the sun and the wind.

Conserving biodiversity which is a strong tradition of India, is a key strategy for Climate Change adaptation. When people talk of biodiversity and the need to maintain it, it is often forgotten that biodiversity is a subset of an attitude to diversity itself. In a survey conducted in just two districts of India, one found 32 different varieties of Nagli millet. The local community knew what each variety was good for and what their properties were. India today has started a major effort at documenting traditional wisdom on biodiversity at the village level through People's Biodiversity Registers (PBRs). Much of this diversity gets connected to the Indian tradition of medicine and food. But as important as biodiversity is, it is vital to protect our tradition of respect for the different cultures of the people of India which are so deeply connected to livelihoods and the local environment.

Indian traditions have a much deeper meaning than is often evident from their outer form. They are not items for cultural anthropology or museums but are living traditions. And as with all living traditions, changes in form have taken place over the years while retaining the original essence in place. It is the strength of this original essence that offers scope for the universal application of these practices. While a few have indeed been recognised globally and have been adapted throughout the world, most traditions still remain confined to the community and the people of India. Yoga is perhaps the best example of a tradition which goes back thousands of years, that is today practised by an increasing number of people throughout the world. Explaining the significance of Yoga, Prime Minister Shri Narendra Modi has said “Yoga is an invaluable gift of our ancient tradition. Yoga embodies unity of mind and body; thought and action; restraint and fulfillment; harmony between man and nature; a holistic approach to health and well being. It is not about exercise but to discover the sense of oneness with yourself, the world and the nature. By changing our lifestyle and creating consciousness, it can help us deal with climate change”. Through this Parampara Catalogue we wish to share some of the other traditions that in their essence have powerful lessons for sustainable lifestyles. While they are Indian in their essence, they offer lessons for the whole world.

The Parampara Catalogue provides a glimpse of the traditions that more obviously connect with Climate Change and sustainable living. But in the context of the overall idea of development and the new Sustainable Development Goals, there are many other practices that need to be shared as they contain learnings for the emerging future.

Fundamental to ancient Indian thinking on the place of man in the larger scheme of things was to see humans as part of the larger family of life forms. Vasudhaiva Kutumbakam is a Sanskrit phrase which means "the world is one family". A few years ago, we at CEE were asked to do a series of

public consultations on behalf of the Ministry of Environment and Forests on the possible introduction of the genetically modified Bt Brinjal (eggplant). At the end of the consultations, a strong argument was made for how bringing in a new variety would save an estimated 3 to 5% of the crop which is normally eaten by insects or birds. A local farmer got up to ask, “Please explain what is wrong in birds or insects eating this small quality”. He mentioned that in India we share grains with birds, chapattis with dogs, and put wheat flour around ant hills. It stopped the discussion for a while and made the audience think of our core values. Are we sharing this planet with others or is everything to be seen purely from a human perspective?

Another important part of Indian cultural thinking is looking at things from a holistic perspective rather than in terms of a single variable. When Mahatma Gandhi spoke of the need to adopt the charkha (spinning wheel) he did not argue merely from a production perspective. There would have been no comparison between the productivity of the hand operated device and the machinery of the textile mills. However, he brought in the value of dignity, decentralisation, the ability to work from home and other factors, to show how the hand operated charkha was clearly a much more sustainable choice. Using multiple variables, multiple objectives and finding an optimal solution has been very much a part of the overall thinking in India. Sustainability and climate change issues comes to the forefront when planning is undertaken looking only at industrialisation or development in the narrow sense of the word. Optimal solutions would give importance not only to growth but to other aspects such as livelihood, employment, dignity, pressure on the environment and the impact on Climate Change. This tradition is thus also key to the way the world will need to plan for the future.

It is the linear thinking on development which is at the heart of the problem. Nature has taught us to understand how natural systems which are cyclical have been sustained over the ages. As leaves fall in the forests and decompose to become organic manure giving energy to a new seed, it is difficult to say which part of the process can be termed 'recycling'. It is a continuum that represents what today industry calls lifecycle. Historically cultural festivals in India brought together elements from nature and, as the celebrations came to an end, these artifacts dissolved back into nature because they were made of materials that were largely biodegradable. The huge dumps of plastic waste and non-degradable materials that today clog so much of urban areas are a failure arising out of using non degradable materials and non-cyclical thinking.

As important as some of these aspects are, there is an overall attitude of resourceful use that permeates India. It is not poverty, rather it is culture that make people consume only as much as they want to eat or switch off lights wh they go out. In Gujarat, the Indian bread or roti, if left over after the entire family has eaten, is converted into 'Khakra' which can be preserved without refrigeration. Extra rice at night in Orissa becomes another dish in the morning for breakfast. An old saree gets converted into quilt. Thread from old clothing is unraveled and made into one of the softest fabrics. These practices are the way people live. They are not minimising waste or recycling materials because of the current global crises. Rather this is the way they have always lived by showing respect for nature and what they consume from it. It is these core values and core ideas that the Parampara catalogue depicts through over 150 entries, each being an example drawn from a different part of India. They are by no means exhaustive, but certainly give a glimpse of the richness of the culture of this country and the lessons it offers as the world tries to discover a lifestyle that is more sustainable and climate friendly.

The traditional practices highlighted in this document have been organised under eight themes or sectors. There are many more sectors and many more practices that can be included but limitations of time and space necessitate choices being made about what to include and what to exclude.

Solar and Wind Energy - India is a country well-endowed with sunlight and natural wind, and has traditionally always used these sources of energy for agriculture, shelter, education, food, and virtually all sectors. Yet, it is surprising that if solar panels are installed on a roof and vegetables are dried in a dehydrator, we call it solar technology but when people directly dry things in the sun, it is somehow not counted in our use of solar energy.

Solar energy is the most readily available source of energy, is non-polluting, and, therefore, helps in lessening the greenhouse effect. When we hang out our clothes to dry in the sun, we use the energy of the sun. Wind energy systems for irrigation and milling have also been in use since ancient times. Indians have built their shelters such that wind flows and sunlight naturally controls the temperature. Houses are built such that electricity is not required during the day. Likewise, a large part of living happens outdoors and semi-outdoors. Throughout this publication you will find examples of such techniques.

Agriculture – In a predominantly agricultural economy like India, a host of indigenous techniques and methods are prevalent in different regions of the country which cater to specific agricultural activities like irrigation, and crop and pest management. The most important factor in all these is the non-use of fossil fuel based energy and a reliance on wisdom derived from local experiences and observations.

Biodiversity – Traditionally Indian communities had deep respect for the biodiversity around them – both flora and fauna. There were sacred trees, sacred animals and sacred plants which were accorded special protection, often due to their association with local deities. Besides there were whole regions like sacred groves and sacred forests which were and are still protected by communities. Every crop cultivated in India has a huge diversity in varieties which have specific properties. Add to this the large variety of medicinal flora which is also used in India's indigenous healthcare systems. It is no surprise therefore that preserving and conserving biodiversity is ingrained in the Indian psyche.

Food – Food security is a topic being discussed all over the world today. Production, storage and processing of food consume a huge amount of energy both at the domestic as well as the industrial levels. Indians have been using renewable energy sources and local materials for all these activities by developing techniques based on local needs.

The other important concern about food is wastage, where again Indian traditions show the way – excess prepared food is never thrown away but either given to those who need it or is converted into a new dish for the next meal.

Health – The traditional health care system of India has two important features. Firstly, it is a holistic system that treats a person's disease through careful diagnosis and prescribing lifestyle changes rather than merely treating the symptoms. Secondly, a major part of the medicines are made from natural and local resources, especially herbal/medicinal plants.

Shelter – The building sector contributes to almost 30% of Greenhouse Gas emissions while consuming about 40% of all energy. Hence is it an important sector where climate change adaptability techniques are likely to show good results. Two important areas of concern which traditional building techniques address are reduced energy use and disaster risk reduction with the many biogeographic zones, housing have evolved suitably to respond to local environmental conditions.

Textile and Clothing – While there is a variety of textiles, patterns and designs that have developed in different regions across the country, the one feature that stands out is the recycling or reuse of clothes, by which when a garment or cloth outlives its function, it is converted into a new product but with an artistic twist like embroidery or quilting. This section focuses on such reuse and recycling of textiles techniques from various parts of the country.

Water – Water is becoming a precious commodity with huge demands by an increasing population and less availability, especially due to wastage and pollution. Each region and area of India has developed its own systems and methods for water conservation and usage, and rainwater harvesting, which are unique to that region, is community needs based and use local materials and technology.

Methodology

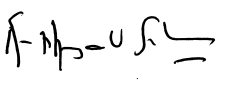
The traditional climate change friendly practices presented under the eight themes have been selected based on their relevance in the current situation, their perceived usefulness in climate change mitigation or adaptation, and relatability to current concepts like energy conservation, recycling and environment friendliness. Care has been taken to ensure representation of the various geographical regions of the country as well as tribal, folk, rural and urban community practices. Eminent persons from diverse fields have shared their views and ideas about tradition and practices which add an element of reflection to the document itself. Extracts from contemporary and scriptural readings also provide some unique perspectives on the themes and practices included in the document.

As in an endeavour of this kind, the quantum of traditional practices that can be identified and included is mind boggling. Hence a selection has been made based on their climate change friendliness and perceived value in terms of sustainability and relevance to modern lifestyles.

Very often a product or an artifact connected to a tradition is confused with the tradition itself. Traditional practices are as much to do with process and the essential concept rather than a product. For instance, not throwing away things but finding other users for them is an old practice. Today in India, you have websites and mobile apps in which you take a photograph of a thing you do not want any more and upload it so that a potential user who may wish to have it would be able to purchase it. Several architectural traditions such as rain water harvesting, inner courtyards, streets designed to have social spaces and other features are seen incorporated in modern architecture in India even though the outer form may look anything but traditional. Women in rural India, especially in the arid areas of Gujarat and Rajasthan, used to walk to a well to collect water in an earthen pot and walk back balancing it on their head. Today there are Reverse Osmosis (RO) and purification devices that purifies water and women carry the pure water canisters on their head much as they have done over hundreds of years. In one of the villages where the CEE worked, it was suggested that piped water be provided to the homes. While the people wanted the tap, the women explained that their outing to the well was also a social event and an opportunity to go out. The challenge in modernizing such practices is to take the hardship and negative aspects out and retain what people consider as the core value.

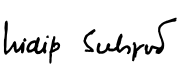
There are traditional foods in India, which over the years and with experience have scientific merit without people necessarily being aware of the how or why of the practice. Typically when bread is made in the West, today, yeast is added. In India, fermentation products like idli or dhokla adds a lentil which essentially attracts wild yeast from ambient air and it is this yeast that causes the fermentation. Modern packaged foods often do away with the essence of traditional practices which retain food values. Often you find that food which is frozen and microwaved continues to retain the outer form while losing out on the nutrition, which it had in the first place.

It is only when you go to the essence of the idea that you can attempt design of the form or the product. It is the idea which has the potential of becoming universal and of possibly being applied in different situations and cultural contexts. India is a rich repository of such practices and this catalogue offers a way of sharing some of these with the rest of the world. These practices have the potential of being inspirational in evolving the lifestyle of the future which is sustainable and climate friendly. The challenge is to learn from these practices, build upon them and where necessary, transform them for the current context. But when looking at the catalogue and the various examples, it is important for the reader to grasp the idea behind the practice rather than merely the product coming out of it.



Kartikeya V. Sarabhai

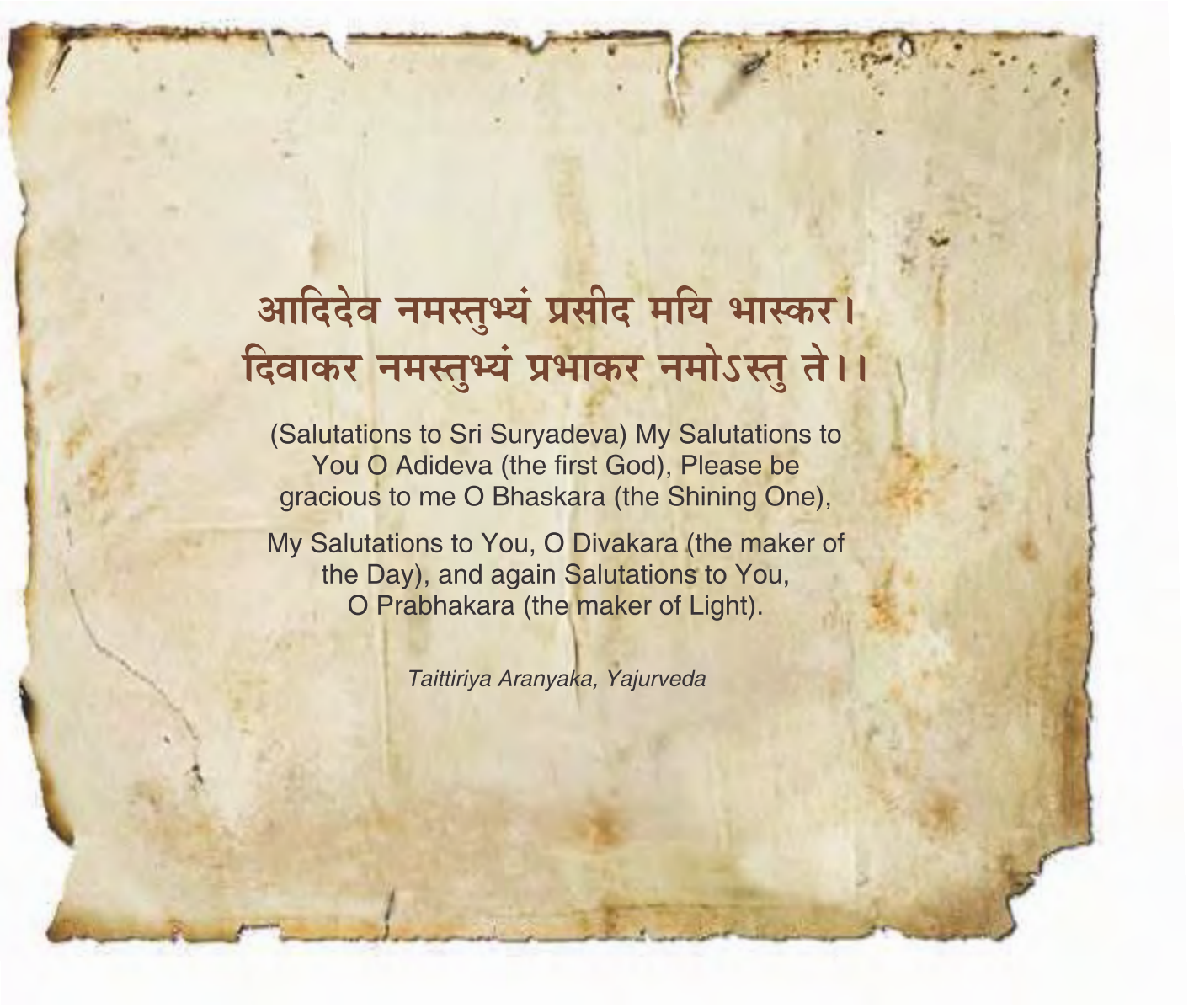
Prithi Nambiar



Tridip Suhrud

Ashoke Chatterjee

Prarthana Borah


आदिदेव नमस्तुभ्यं प्रसीद मयि भास्कर।
दिवाकर नमस्तुभ्यं प्रभाकर नमोऽस्तु ते।।
(Salutations to Sri Suryadeva) My Salutations to
You O Adideva (the first God), Please be
gracious to me O Bhaskara (the Shining One),
My Salutations to You, O Divakara (the maker of
the Day), and again Salutations to You,
O Prabhakara (the maker of Light).
Taittiriya Aranyaka, Yajurveda

Solar and Wind Energy

India is a country well-endowed with sunlight and natural wind. These natural elements have traditionally been revered and considered integral to Indian society, lifestyle and culture. The *Adityahridayam Stotra,* widely used in traditional prayers, specifically recognizes Sun as a major energy source of heat and light and maker of seasons. This traditional wisdom perceives Sun's energy for providing health (e.g. *Suryanamaskar* in *Yoga Shastra*) and peace; in addition to its large scale use in daily life for food production; processing; drying clothes; shelter and so on. The festival of *Uttarayan,* which marks the day the Sun begins its northern journey, is celebrated across India in view of arrival of longer and warmer days. This signifies the traditional wisdom of considering Sun as a major source of energy influencing day to day lives.

A simple yet powerful example of direct solar energy use is the common Indian custom of drying clothes in the sun, rather than using electrically operated driers. This practice is non-polluting and does not contribute to any greenhouse gas emission. Similarly, use of solar energy for drying food is a common household activity. Yet, these traditional practices are seldom perceived as part of the carbon mitigation measure and its significance only felt when one compares this practice to the modern practice of using solar panels on roof tops to generate electric energy for running dryers.

Traditional Indian shelters have been designed and built based on the knowledge about the Sun's movement and wind direction. This naturally controls the temperature and does not require fossil energy source for lighting or ventilation.

India is building its solar and wind energy capabilities on these cultural pre-dispositions.

Hydropower energy is also being used traditionally and designs of water mills have been introduced for electrification of remote villages

Indian society has traditionally been using renewable energy sources, which are locally available, low cost and integrated with cultural practices. However, these traditional sources are relatively diffused sources of energy.

India has policies and programmes in place to scale up and improve the efficiency of renewable energy, particularly solar and wind, thereby boosting clean energy projects.

> As Shri Narendra Modi, Prime Minister of India says - India has the potential to turn into surya putra rashtra (land of solar power) and use modern technology to generate clean solar energy. India has decided to anchor a global solar alliance, of all countries located between the Tropic of Cancer and the Tropic of Capricorn. (pg.9 of INDC, 2015)

Solar and Wind Energy

Sun Drying to Savour Food for Long Term

Sikkim

Sinki

The Gorkha and Gurung tribes of Sikkim make *Sinki*, which is a non-salted fermented radish tap root. The radish are washed, cut into small pieces and dried under sunlight in typical traditional utensils made of bamboo called *naaglo* for 3-4 days. The dried pieces are then packed and placed inside a pit 1 m deep. The pit is then covered with cow dung and soil and the radish left to ferment for over 15 days.

Sinki has an acidic flavour and is mostly used to make soup and as a pickle. It is a popular appetizer and is said to cure diarrhea and stomach pain. It can be consumed throughout the year much after the radish season is over. *Sinki* contains 14.5% of protein, 2.5% of fat and 11.3% of ash in dry weight[1].

Source: 1 http://www.ripublication.com/ijafst_spl/ijafstv4n5spl_03.pdf accessed 24.9.15

"How do you explain the environment influencing us? Many causes produce one effect. Environment is one of the modifying effects. We make our own environment."

Swami Vivekanand

All India

Aam Papad

Aam papad is a snack made from mango pulp and is a recipe for preserving mango to be eaten off-season. It is made in a way that it has layers of flaky fruit sheets. The pulp of mango is mixed with concentrated sugar and sun dried on trays to create a layer. When the first layer dries, another layer of pulp is spread over it. This method of preparation gives it a flaky texture.

Aam papad has high nutritional value and can be consumed as a snack. It is considered excellent for people suffering from scurvy. It is also considered good for digestion.

Source: http://ifood.tv/indian/aam-papad/about

http://www.bubblews.com/posts/health-benefits-of-mango-by-rjnjlly, accessed 24.9.15

Jammu & Kashmir

The Science of Surya Namaskar

Surya or Sun is the primary source of light and energy and Indians have always revered the sun, both physically and spiritually, as the creator of all life itself. By extension, the sun is also the primary source of our energy. Without the sun, there will be no life on earth.

Surya *Namaskar* or 'Sun Salutation' is a very ancient technique that pays respect or expresses gratitude to the sun, which is the source of all forms of life on the planet. According to the ancient *rishis* of India, different parts of the body are governed by different divine impulses. The solar plexus, located behind the navel (the central part of the human body) is said to be connected with the sun. Therefore, regular practice of Surya *Namaskar* enhances the solar plexus which helps increase one's creativity and intuitive ability.

Surya *Namaskar* is a set of 12 postures, ideally done at the time of sunrise, ideally facing the sun itself. These postures act as a good link between warm-ups and yoga *asanas* and can be done any time on an empty stomach. However, morning is considered to be the best time for Surya *Namaskar* since it revitalises the body and refreshes the mind.

The regular practice of Surya *Namaskar* improves circulation of blood throughout the body, maintains health, and helps one remain disease-free. There are numerous benefits of Surya *Namaskar* for the heart, liver, intestine, stomach, chest, throat, legs. Surya *Namaskar* is an excellent cardiovascular workout and a good way to lose weight. It strengthens the nervous system and helps to improve memory. Moreover, it stabilises the activity of the endocrine and thyroid glands, thereby reducing anxiety and inducing the sensation of calmness and tranquillity. If done facing the sun, the body also absorbs vitamin D naturally.

Source: http://food.ndtv.com/health/the-ultimate-full-body-workout-surya-namaskar-769780, accessed 24.9.15
http://www.healthandyoga.com/html/news/surya.aspx, accessed 24.9.15
http://www.yogapoint.com/info/sunsalutation.htm, accessed 24.9.15

"When we pay attention to Nature's music, we find that everything on the Earth contributes to its harmony."

Hazrat Inayat Khan

Himachal Pradesh

Passive Solar Building Design in the Kullu Valley

There are more villages on the eastern side than on the western side in the Kullu Valley which runs north to south. This is because the former gets more sun in the afternoon when the sky is clearer.

The villages are tucked away in the flat areas of the mountain slope far away from the rivers to avoid the cold winds that flow along it. Because of snow and heavy rain, the houses in Kullu Valley have pitched roofs.

The design of the houses is based on the direction of the sun and the houses are so located that there is plenty of sunshine on the balcony and in the drying yard around the house. The main living area of the house is kept warm by the heat from the cooking stove and by the body heat of humans and cattle. The houses are constructed so as to face the sun, so that sunlight reaches areas within the house making drying of clothes possible.

The balcony has various uses. On the sunny side of the house, it is used for sitting and working in the well-lighted area, while on the north and the non-sunny side, it becomes a store for wood and fodder. On the shaded side, the balcony is covered completely to protect the main house from the cold winds that come down the mountain slope.

The main building is built of stone rubble masonry and the floors are supported on timber beams. On the first and second floors, the stone structure is surrounded by a light-weight balcony of timber. Usually there is a high plinth and the slate roof projects beyond the balcony making it earthquake resistant.

The timber cornered building or *Kat-Ki-Kunni* suffered minimal damage in the epicentral tract of Kullu Valley during the 1905 Kangra earthquake.

The ground floor is used for housing the milk cattle and for storage of fodder. During the summer the kitchen moves upstairs.

Source: http://www.devalt.org/images/L2_ProjectPdfs/Climate_and_construction-an_impact_assessment(1).pdf accessed 12.8.15

http://www.space-design.com/upload/rs0008.pdf, accessed 12.8.15

http://www.devalt.org/newsletter/may01/of_10.htm, accessed 12.8.15

Rajathan

Typical Havelis of Jaisalmer

The typical *havelis* of Jaisalmer were four to five storied buildings. These were built around courtyards and had balconies, basements, terraces, and high parapets. The ground level had low temperatures maintained by the stack effect of being in the shadow of high buildings. These areas were used for daytime activities. These were also the main source of light and ventilation. The upper floors were nighttime and evening spaces when the temperatures cooled down. The external facades had *jharokhas* (balconies) or *chajjas* (shades) to prevent direct sunlight and rains. The basement was usually a dark place used for storage.

Source: Climate responsive architecture of North India, Piya Gupta

All India

Drying in the Open vs Electric Dryers

Clothes line is one of the easiest devices to save energy, because we can erase 100% of the cost by simply hanging our clothes up to dry and not use the electric clothes dryer. A modern clothes dryer accounts for a massive 12% of electricity use in a typical household in developed countries.

India, being a climatically tropical nation, enjoys sunlight all the year round. Using solar energy to dry clothes is an efficient and eco-friendly process.

Source: http://michaelbluejay.com/electricity/dryers.html#), accessed 29.9.15

Solar and Wind Energy

Jammu & Kashmir

Ladakhi Homes – Designed for Sustainable Living

The people of Ladakh change their spaces for domestic activity according to the season. The typical house of Ladakh is two stories high. During winter, the family lives and sleeps on the first floor. In the sub-zero temperatures of winter, the family stays inside most of the time.The kitchen is the main living area and usually has a smokeless stove. This makes it possible for the family to stay in this room even when cooking is going on. The few existing windows are small. Windows are fitted with solid timber shutters, which provide the choice of letting in or keeping out light and cold air. Windows are on the sun facing sides of the building. The sides exposed to cold winds have no openings at all. During summer, the well-insulated and poorly ventilated house becomes very warm. The Ladakhi family moves upstairs and shifts all activities, including cooking and sleeping, to the roof. A temporary shade is erected over the roof for shade from the fierce sun. This area is used as a storage in winter.

Since the climate is extremely cold, the cattle occupy the lowermost floor of the house and do not venture out in winter. This is often attached to an enclosed yard on the ground floor where cattle can bask in the sun.

Source: https://www.youtube.com/watch?v=qZd2TCLEZE0, accessed 10.8.15
www.space-design.com/upload/rs0008.pdf, accessed 10.8.15
http://www.ncert.nic.in/ncerts/l/eeap113.pdf, accessed 10.8.15

Odisha

The Sun Temple of Odisha

The sun temple in Odisha was built in 13th century and is in the shape of a gigantic chariot elaborately carved stone wheels, pillars and walls. It is one of the UNESCO's world heritage site. The name Konark derives its name from the combination of the Sanskrit words, Kona (corner) and Arka (sun), since it is dedicated to the Sun god Surya.

The temple is built in the form of a giant ornamented chariot of the Sun god, Surya. A masterpiece of creative genius in both conception and realisation, the temple represents a chariot of the Sun God, with twelve pairs of wheels drawn by seven horses evoking its movement across the heavens. It follows the traditional style of the Kalinga architecture and is oriented towards the east so that the first rays of the sun strike the main entrance of the temple. The wheels of the temple are sundials which can be used to calculate time accurately to a minute including day and night.

Konark Temple is also built on the fact that in ancient times worship of Sun god was in vogue and the people were accustomed with the worship of two Supreme deities--one mother Earth as Dharitri Maata and the other the Sun, the Dharam devata. Sun god is regarded as the supreme lord of the universe and the prime object of life giving energy, being the healer of diseases and bestower of desires.

Source: http://whc.unesco.org/en/list/246, accessed 24.10.15
http://www.orissatourism.org/travel-to-orissa/konark/sun-temple-konark.html, accessed 24.10.15

"Here the language of stone surpasses the language of human."

Rabindranath Tagore

Andhra Pradesh

Sun Dried Spices

Andhra Pradesh and Telangana are known for their chillies. When the green chillies are in plenty and still green, these are sun dried and eaten as accompaniments long after the chilli season is gone. Known as *Challa Mirapakayilu, Majjiga Mirapakayily or Vooramirapakayilu*, these are made by soaking fresh green chillies in buttermilk made from sour curd. *Challa* or *majjiga* means buttermilk and *voora* refers to the marination. The marination of chillies in salted buttermilk serves as a preservative, and lends tanginess and a buttery flavour to the chillies. The chillies, intact with their stalks but with a little slit in the middle are soaked overnight in the buttermilk. During the day, these are taken out from the buttermilk and dried in the sun. The chillies are put back in the same buttermilk for another night. This process is repeated for 2-3 times. The chillies are dried until they are dessicated — the chillies by now produce a hollow sound and become quite light. These are stored in air tight containers and are ready to be deep fried in oil and eaten crisp. These go well with *pappuannam* (rice and dal) or *peruguannam* (rice and curds).

All India

Wind as a Cooling Agent in Ancient Architecture

Hawa Mahal also known as the Palace of Winds was built in 1799 by Maharaja Sawai Pratap Singh. It is named so because it has a high screen wall built so that the women of the royal household could see streets and festivals, while being unseen from the windows. The cooling effect in the Hawal Mahal is provided by the breeze passing through the small windows of the facade which provided a proper ventilation channel inside the palace. Even in the heat of summer the hawa mahal captures and circultes the wind to provide an effective cooling.

The Golconda fort is another example of architecture that uses wind direction efficiently for cooling. Although the structure is a closed one it allows just enough space for ventilation, thus allowing circulation of cool breeze that provides respite from the summer heat.

Sources: http://www.pinkcity.com/places-to-visit-2/hawa-mahal-palace-of-winds/ accessed 24.9.15

Northern and Western India

Passive Air Conditioning Methods of Mughal Architecture

Mughal architecture in India offers unique passive air conditioning methods to beat the summer heat. Mughals introduced unique layered spaces to Indian architecture. They realised that rooms should not be flooded with direct daylight. They used intermediary spaces like courtyards and verandas in relation to the climate of the place, to buffer and to protect interiors from extreme weather conditions. The courtyard was the heart of the Mughal buildings, socially as well as environmentally. It prevented interior spaces from being exposed to solar radiation and the hot winds. Mughals added vegetation and water design elements to these courtyards to further enhance the microclimate and for better humidity control. They shaded the doors and walls with stone chajjas (cantilevers). A stone jaali (latticed screen) is another Mughal feature. While offering privacy it allows diffused light and controls air flow in interiors.

Source: http://www.newindianexpress.com/education/student/Lessons-from-The-Mughals/2015/02/16/article2670312.ece, accessed 24.9.15

All India

Sun Drying to Increase Shelf Life of Food

Sun drying is a highly preferred method for food preservation in India. Desiccated coconut is a popular food product which is made by dehydrating coconut meat by sun drying. Desiccated coconut has a higher shelf life than the fresh coconut and is a good substitute for cooking. It contains no cholesterol or transfats while being rich in a number of essential nutrients, including dietary fibre, manganese, copper and selenium.

Desiccated coconut is called *copra*. It is available in coarse, medium and fine grades and also in special grades such as threads, strips and granules. Good desiccated coconut is crisp, snow white in colour with a sweet, pleasant and fresh taste of the coconut kernel.

Source:
http://www.agritech.tnau.ac.in/expert_system/coconut/coconut/coconut_processing.html

http://healthyeating.sfgate.com/health-benefits-desiccated-coconut-7270.html accessed 13.8.15

http://healthyeating.sfgate.com/health-benefits-desiccated-coconut-7270.html accessed 13.8.15

http://www.livestrong.com/article/469237-what-are-the-health-benefits-of-desiccated-coconut/ accessed 13.8.15

Maharashtra

Sun Dried Bajra Bhakri

Solapur and adjoining regions of Maharashtra and Karnataka have a tradition of making thin sun dried bajra *bhakris* which can be stored for weeks, without refrigeration. It is normally eaten with ground-nut-chilli chutney and curd. This was traditionally used as a carry along food due to its high shelf life especially used by people during pilgrimages like Siddheshwar Yatra on Makar Sankranti. Sun dried bajra *bhakri* is also preferred because it is a nutritious, healthy fibre rich food that was produced using direct solar energy.

Bajra is a millet crop which is believed to have arrived about 4000 years ago in India from Africa. This was a time in Indian history which was marked with a dry climate and disintegration of the Indus civilization. Bajra along with Jowar (Sorghum) is credited for sustaining rain fed agriculture in the country.

Solar and Wind Energy

All India

Makar Sankranti

Makar Sankranti is a major harvest festival celebrated in various parts of India. According to the lunar calendar, when the sun moves from the Tropic of Cancer to the Tropic of Capricorn or from *Dakshinayana* to *Uttarayana*, in the month of Poush in mid-January, it commemorates the beginning of the harvest season and cessation of the northeast monsoon in southern India. The movement of the earth from one zodiac sign into another is called *Sankranti*.

Since the festival is celebrated on 14th January, food prepared for this festival is such that it keeps the body warm and gives high energy.

Sankranti is also said to signify the termination of winter, the beginning of a new harvest and the advent of the spring season. It is also a time to acknowledge those who have assisted in the harvest. Since the farm animals play a major role in harvesting, one day of the festival is dedicated to them. The first day is for the earth, the second is for people and the third is for animals and livestock.

Makar Sankranti is celebrated in different ways in Andhra Pradesh, Bihar, Goa, Sikkim, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Orissa, Uttar Pradesh, Uttarakhand and West Bengal. It is called Uttarayan in Gujarat and Rajasthan. Flying kites is an integral part of Uttarayan.

Source: www.ishafoundation.org accessed 11.9.15

"To live a pure unselfish life, one must count nothing as one's own in the midst of abundance."

Gautam Buddha

All India

Winnowing

Wind winnowing is a method of separating grain from chaff. This method was developed by ancient cultures. It is also used to remove weevil or other pests from stored grain. Traditionally, winnowing fan is used as aid which is known as Soop. Threshing, the loosening of grain or seeds from the husks and straw, is the step in the chaff-removal process that comes before winnowing. Because of high density the grains fall back and are collected down while wind carries the lighter part (husk) away.

Winnowing can also describe the natural removal of fine material from coarser sediment by wind or flowing water, analogous to the agricultural separation of wheat from chaff. No fossil fuel is consumed.

Source: http://www.antiquefarmtools.info/page3.htm

Solar and Wind Energy

All India

Windmills and Windpumps

Wind has been recognized as an important source of energy for mechanical purposes in India since long. An early example of a wind-driven wheel was the prayer wheel, which has been used in ancient India since the 4th century. Windpumps were used to pump water since at least the 9th century in the part of the world which is now Afghanistan, Iran and Pakistan. The use of wind pumps became widespread and spread to China and India. Windmills were later used extensively in Europe, particularly in the Netherlands and the East Anglia area of Great Britain, from the late Middle Ages onwards, to drain land for agricultural or building purposes. In India, thousands of wind pumps are in operation. A water- pumping windmill converts kinetic energy of the wind into mechanical energy for pumping of water from bore wells or open wells. A wind pump needs no fuel, little maintenance and usually lasts 20 years or more. The first wind-powered gristmills were also built in the 9th and 10th centuries in what are now Afghanistan, Pakistan and Iran.

Source: Lucas, Adam (2006), Wind, Water, Work: Ancient and Medieval Milling Technology, Brill Publishers, p. 65, ISBN 90-04-14649-0

Donald Routledge Hill, "Mechanical Engineering in the Medieval Near East", Scientific American, May 1991, p. 64-69. (cf. Donald Routledge Hill, Mechanical Engineering)

http://www.mahaurja.com/RE_Wind_Pumping.html

Lucas, Adam (2006); op.cit., P.105.

All India

Sailing

The use of sails for harnessing wind energy to give mechanical advantage to boats sailing on water has been traditionally known to our societies and is known to have been used widely. Most of these boats were driven by sail. The world's first dock at Lothal was located away from the main current to avoid deposition of silt. The earliest known reference to an organization devoted to ships in ancient India is to the Mauryan Empire.

Owing to the large coastline and many rivers, Indian boats sailed to many parts of the world for trade and fishing. The sailing harnessed the kinetic energy of wind for mechanical purpose. This was free from the use of fossil fuels and generation of greenhouse gases.

Source: Purthi, Raj (2004), Vedic Civilization, Discovery Publishing House, P.273

Climate change is a pressing global challenge.

And, it calls for a collective human action; and, a comprehensive response.

We must draw upon our entire wealth of wisdom; the strength of every institution; all possibilities of innovation; and, the power of science. In India, faith and Nature have had a deep link since ancient times.

For us, the only path to prosperity is the sustainable one. We make this choice with the natural instincts of our culture and tradition. But, we also do this with a commitment to our future.

We have, for example, set a target of adding 175,000 MW of clean and renewable energy. Too often, our discussion is reduced to an argument about emission cuts. But, we are more likely to succeed if we offer affordable solutions, not simply impose choices. That is why I have called for global public action to develop clean energy, that is affordable and accessible to all.

And, it is for the same reason that I call for a change in lifestyle. Because, the emission reduction that we seek will be the natural outcome of how we live. And, it will also mean a different path to economic well being.

Prime Minister Narendra Modi,
UNESCO Paris, April, 2015

क्षेत्रस्य पतिना वयं हितेनेव जयामसि।
गामश्वं पोषयित्न्वा स नो मृळातीदृशे।।

We invoke the Lord of the Kshetra (i.e. Kshetrapati or lord of the field)
by whose grace indeed we prosper; may he through his gracious look
increase our cattle and horses.

क्षेत्रस्य पते मधुमन्तमूर्मिं धेनुरिव पयो अस्मासु धुक्ष्व।
मधुश्चुतं घृतमिव सुपूतमृतस्य नः पतयो मृळयन्तु।।

O Lord of the Kshetra (Field), with the sweet waves of Mother Nature's blessings,
may you milk our fields like the milk of a cow (i.e. yield abundant harvest);
with the sweetness of rita (Mother Nature's Divine Law conferring bounty),
which falls like clarified butter; may you shed your grace on us.

शुनं वाहाः शुनं नरः शुनं कृषतु लाङ्गलम्।
शुनं वरत्रा बध्यन्तां शुनमष्ट्रामुदिङ्गय।।

May the oxen drawing the plough bring welfare and prosperity to all; may the farmer
driving the oxen bring welfare and prosperity to all; may the plough making furrows
bring welfare and prosperity to all;
may the strap binding the plough bring welfare and prosperity to all; and may the goad
swinging towards the oxen bring welfare and prosperity to all.

Kshetrapati Suktam, Rigveda, 4.57

Agriculture

India has been a predominantly agricultural economy, with the agricultural sector being one of the sectors both contributing to GHGs and also very vulnerable to climate change. Traditional adaptation and mitigation techniques have a very significant role in achieving reduction in emissions and contributing to sustainability.

Traditional Indian agricultural activities have always included methods like crop diversification and supplementing crop cultivation with aquaculture to provide food security, which are today being recognized as a major strategy for communities to adapt to climate change. Climate affects the availability, access, utilization and production system stability of food in a big way. Mixed cropping, diversified agriculture and organic farming are ways in which agricultural communities, especially in tribal areas of India, have been meeting their food needs and adapting to climate change.

An important factor in Indian agriculture was the traditional irrigation system. Irrigation by wells, channels and tanks is found around the country which shows a water and energy efficient system of cultivation. Irrigation practices involved sourcing a supply of water and constructing water storage or water diversion devices using local material and according to the suitability of the surroundings. Even the various devices for lifting water showed traditional innovation in addressing adaptation.

Animal draught power is being extensively used for crop cultivation and transportation – which is a very significant low carbon energy source considering that India has the largest livestock population in the world. Biomass energy is also one of the extensively used energy source particularly in rural households.

Many of the agricultural management activities practised by communities (such as conservation tillage, erosion control practices, irrigation) sequester carbon in soils, and have positive effects on biodiversity. Traditional agricultural techniques reduce the dependence on fossil fuel. Pest management and storage practices involve the use of plant products instead of chemical fertilizers.

Many of these methods are today being integrated within agricultural policy to help protect food supplies and make agriculture more resilient to the effects of climate change.

Government of India is implementing Paramparagath Krishi Vikas Yojana to promote organic farming practices. (INDC, 2015, p 20)

Agriculture

Kerala

Enhancement of Livelihood Benefits and Effective Resource Management through Aqua-Culture

Kaipad is a unique rice-fish farming system that is practiced in the coastal wetland regions of North Kerala, particularly Kannur district. Rice cultivation takes place from April/June to October and prawn/fish farming from November to April. The Kaipad wetland ecosystems are swampy and water-logged areas that experience flooding during monsoon and salinity during summer due to their proximity to estuaries. Tides also bring in and drain water regularly. Kaipad farms are formed by constructing bunds around the wetlands with mangroves as outer boundaries. In April the saline water is drained out completely and the land allowed to dry for a month followed by preparing mounds on which to sow the seeds. The seeds are germinated by traditional methods like keeping them moist in banana leaf moulds or coconut fronds, and sown once the monsoon sets in. After 45 days, the mounds are scattered and seedlings dispersed. No further work, not even weeding is required on the field after this till harvest time. When harvesting, only the panicles are cut and the stalks are left on the farms. After the harvest, the sluices on the bunds are opened to allow saline water to enter the field along with prawns and fish. Traditional aqua culture is carried out till April. The yield from rice farms is not very high, but this is offset by the high profitability of prawns and fish. The uniqueness of this farming is that no chemical fertilizers or pesticides are used – it is purely organic. The rice stalks and marine fungi provide food for the shrimp and fish, while the excreta and remains of the latter become the fertilizer for the rice. No real management is required to keep up the fertility of the soil. Five varieties of salinity tolerant rice are cultivated here which are found to be highly nutritious (contain fairly high amounts of iron, calcium and potassium) and medicinal properties. Rice flakes from *Kaipad* rice is also popular and fetches a better price compared to others.

In central Kerala, the same system of aqua-rice culture is followed and it is called *Pokkali* – it is believed that Pokkali is the oldest variety of rice in Kerala, claiming a tradition of 3000 years.

Source: KAIPAD – A unique, naturally organic, saline prone rice ecosystem of Kerala, India: T. Vanaja - American Journal of Environmental Protection – 2013: 2(2): 42-46, accessed 19.8.15

Arunachal Pradesh

Rice Fish Culture - A Unique System of Sustainable Agriculture

The Apatani are a tribe inhabiting the Ziro Valley of Lower Subansiri District of Arunachal Pradesh. The Apatanis practice aquaculture along with rice farming on their plots. Their economy base comprises the sustainable integration of land, water and farming systems.

Rice-fish culture in the valley is a unique practice in the state. The farmers grow wet rice integrated with fish culture in terraces, and finger millets on the terrace bunds. Two indigenous paddy *Mipya* and *Emo* are cultivated. The growing of finger millets varieties on the terrace bunds binds the soil and also suppresses weeds growing on the bunds. Millets are used in local breweries.

Within one month of transplanting paddy, fingerlings of size 40-50mm are stocked. Mainly the common carp (Cyprinus carpo) is reared in the terraces. There is no cost of maintenance as the fishes feed on the naturally available phytoplankton and other microorganisms. No additional feeding is required.

Terraces prepared in the main valley are broad, perfectly levelled and provided with strong bunds. These are leveled manually with the help of indigenous wooden tools and fish channels dug with wooden crowbars which have a flattened tip. Streams from the surrounding hills are channeled at the rim of the valley and diverted to the terrace fields by a network of primary, secondary and tertiary channels. Nutrient management of the terraces is achieved mainly through recycling of agricultural wastes, which reflects a deep understanding of ecosystem resources.

There is no concept of chemical fertilizers. The plots utilised for rice-cum-fish culture are mainly based on organic fertilization using a variety of animal excreta such as poultry droppings (*Paro pai*), pig excreta (*Alyi ekha*) and cow dung (*Sii ekha*). Straw is left to decompose in the field and then mixed in the soil when the land is prepared for cultivation. Pig and poultry droppings, rice husk, kitchen waste, ash and weeds are all used as manure. The domestic sewage from the villages, which are normally located at a higher elevation, is directed to the fields. This adds organic matter to the soil in the terrace and also provides feed to the fish reared in the terraces.

Fish is reared from April to September when the paddy crops grow in the field and also from November to February after the harvesting of paddy crops and before the transplantation for the next season. Apatanis use paddy field channels (*Siikho*/*Parkho*/*hehte*) for water management.

In order to maintain and regulate water supply to the fields, the surrounding hills are covered with forests.

Source: Parampara Catalogue. CEE Report to Ministry of Culture, 2012 nopr.niscair.res.in/bitstream/123456789/.../IJTK%204(1)%2065-71.pdf, accessed 15.8.15

Kerala

Farming below Sea Level: An Adaptation to Landscape Peculiarities

Kuttanad, in central Kerala, considered the rice bowl of Kerala, is one of the few places in the world where traditionally farming is carried out below sea level due to the peculiarities of its landscape. To enable this, a series of bunds have been built to regulate the flooding and salinity. Unlike the concrete dykes in Holland built to keep the sea water away, Kuttanad farmers have developed bio bunds using coconut tree, banana waste, bamboo, coir, clay and other locally available materials. The farming technique developed by the local farmers is more than 150 years old. Farmers in the region practise rice and aqua culture by alternating flooding and draining, using the bunds according to the farming calendar. The biodiversity in this region is also unique and includes abundant fish species (65 fin fish and 14 shell fish), mangrove forests (biological shield against sea level rise), three varieties of salt tolerant rice and ducks.

The United Nations Food and Agriculture Organisation (FAO) formally declared the Kuttanad below sea-level farming system as one of the Globally Important Agricultural Heritage Systems (GIAHS) at the International Forum on GIAHS held in Japan in 2013.

Source: http://www.alappuzha.com/kuttanad.htm, accessed 19.8.15

> *"An economy that is based purely on monetary or material standards of values, does not take in a realistic perspective in time and space. This shortcoming leads to a blind alley of violence and destruction from which there is no escape. The more advance in culture a person become, the less will he be guided by such short sighted perishable standards of value. Blend to any degree of permanence the standard of values itself must be saved on something, who is after all perishable."*
>
> ***JC Kumarappa***

Andhra Pradesh

Pannendu Pantalu

Farmers in Andhra Pradesh's Medak district on the south-eastern coast of India practise *pannendu pantalu* or the 12 crop system. They grow millets, pulses, oilseeds and a range of vegetables on a single piece of land. In the millet category, foxtail millet, finger millet, pearl millet and barnyard millet are grown. This is supplemented with oilseeds such as linseed, sesame and safflower. In addition to this, pulses such as green gram, red gram and black gram and a variety of vegetables such as squash and okra are grown.

This sustainable practice of agriculture can thrive without external irrigation, even with annual rainfall as low as 350-500 mm, and achieve pest resistance without the use of chemical fertilizers.

Source: Rising to the Call: Good Practices of Climate Change Adaptation in India, Centre for Science and Environment, 2014

"The most important principle of environment is that you are not the only element."

Mahavir

Nagaland

Alder Based Farming System for Improving *Jhum* Land

In Nagaland, a unique and highly productive form of shifting cultivation called the Alder based system of *Jhum* cultivation[1] is practised.

The people of Khonoma village in Kohima district of Nagaland plant alder (*Alnus nepalansis*) trees in the *jhum* cycle area, which they use for cultivation. This is based on the scientific principle that the root nodules of the alder tree improve soil fertility by fixing atmospheric nitrogen. The tree sheds its leaves to retain moisture and mulches which add abundant humus to the soil. This method has helped to increase crop yield and reduce soil erosion.

Normally, a farmer cultivates the field for two years within a nine year span, but the alder based system allows two harvests in every four to five years. The system involves pollarding of alder trees in two phases - Initial pollarding[2] and cyclical/subsequent pollarding[3]. This practice has been used for more than 100 years by the entire community.

The farmers grow paddy in the alder based agro-forestry system. The high rate of regrowth of alder helps supply a good quantity of biomass for the nutrient enrichment of the soil. Other crops like turmeric, cardamom and *cinchona* are also grown. In the terraced slopes maize, barley, chilly and pumpkin are grown as mixed crops. As a result of alder tree cultivation, crops like coffee and cardamom have also been possible as the trees provide the required shade.

Shifting cultivation or slash and burn farming (*Jhum* Cultivation) is widely practiced in North East India. It is believed that this system leads to a number of environmental problems such as loss of forest cover, erosion of top-soil and desertification.

When the main trunk is cut horizontally at a height of 2 m or above from the ground, care is taken that the pollarded stump head is not split. The head is covered with mud/straw to prevent it from drying. A stone slab is placed on the head to facilitate the uniform sprouting of new shoots around the stump. This is the initial pollarding.

During the cyclical/subsequent pollarding, the pollarded stumps that coppice profusely are allowed to grow till the harvest of the first year's crop.

Source: http://www.kiran.nic.in/nagaland.html accessed 10.10.15
http://globelics2009dakar.merit.unu.edu/papers/Linkage%20between%20indigenous%20agriculture%20and%20sustainable%20development%20 %20evidences%20from%20indigenous%20communities %20in%20NE%20India.pdf accessed 15.8.15
http://nopr.niscair.res.in/bitstream/123456789/10317/1/IJTK%209(4)%20677-680.pdf accessed 15.8.15

Uttarakhand

Mixed Farming to Counter Rain Dependency

The indigenous farmers in Garhwal, Uttarakhand have, over the centuries, built a rich base of agricultural biodiversity adapted to local agro-climatic conditions. The mixed cropping system developed is specially suitable for the rain fed areas in high altitudes. The farming communities cultivate many species and varieties of legumes. A similar practice of diverse farming is also seen in the lower altitudes of Garhwal.

This system helps the farmer to withstand the uncertainties of the weather, so that overall production is never zero at any point of time. The synergistic combination of many different species preserves soil fertility and the land does not have to be kept fallow.

The farmer is assured of at least one crop even if a major crop fails because of pests, diseases or drought. The farmers of Garhwal grow 126 varieties of rice, eight of wheat, 40 of finger millet, six of barnyard millet, 110 of kidney beans, seven of horse gram, eight of traditional soybean and 10 of French beans. They have chosen these plants for their pest resistance and high yield.

Since all crops are not harvested at the same time, the diverse agricultural output helps to meet the various household requirements over a long period. This agro-biodiversity is also an important aspect of the sustainable food system in the region. It enables the farmer to benefit from certain varieties even when there is damage to other crops.

Source: Rising to the Call: Good Practices of Climate Change Adaptation in India, Centre for Science and Environment, 2014

All India

Mixed Farming to Build Climate Resilience of Communities

Traditionally, farmers in different parts of India have been following a system of mixed cropping. Mixed cropping helps farmers fight the uncertainty of drought or floods and heavy rains and keeps the soil healthy. It also keeps crops pest free without using chemical pesticides. Besides, when different crops are grown together, nutrients are shared and plants thrive well.

Mixed farming also gives farmers access to a rich variety of food to fulfil their nutritional requirements. Usually a mix of cereals and pulses is grown. Sometimes vegetables are also grown.

Crop diversity prevents farmers from going hungry and serves as a risk mitigating measure that relieves them from excessive dependence on rainfall for agriculture.

Source: Rising to the Call: Good Practices of Climate Change Adaptation in India, Centre for Science and Environment, 2014

Agriculture

Nagaland

Rain Water Harvesting and Soil Management through Zabo

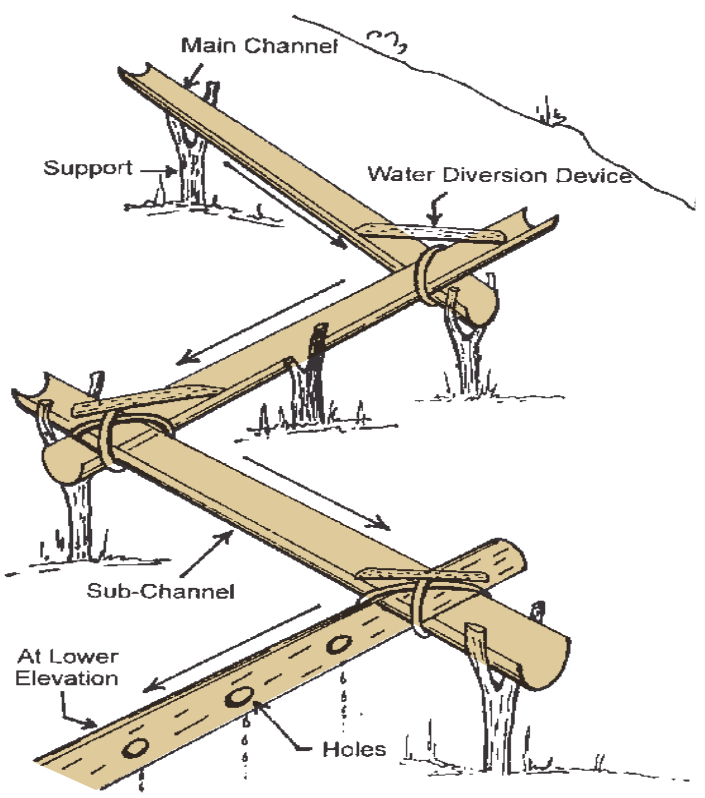
The Chakhesang tribe of Nagaland recognised the importance of water centuries ago and developed a unique rain water harvesting and management system for meeting irrigation and drinking water needs. The system utilises the elevation of the area in a complex process of managing water and soil. It would be technically and financially resource heavy to provide water to such large areas.

The word *Zabo* means impounding of water. In the *Zabo* or *Ruza* system, there is a protected forest land at the top of the hill, water harvesting tanks in the middle, cattle yard and paddy fields on the lower level. The irrigation water from the main water collection tank goes through the animal yard and carries the dung and urine of the animals to the field below the slope. Branches and leaves of trees are also added to the field for enhancing soil fertility. When it becomes difficult to get a suitable location for construction of water storage tanks, the runoff from the catchment area is directly taken to the paddy fields for storage and irrigation during the cropping period. Special techniques for seepage control in the paddy plots are followed. Paddy husk is used on shoulder bunds.

The catchment area also serves as a water source for the tanks. Near the catchment area (mid-hill), tanks for silt retention and water harvesting are dug out with earthen embankments. Silt retention tanks are constructed at two or more points and the water is kept for two or three days in these tanks before being transferred to the main tank. The silt retention tanks are cleaned annually and the de-silted materials, which have a good amount of organic matter and nutrients, are transferred to the terrace fields. In constructing the water harvesting tank, the bottom surface is well rammed and the sidewalls are plastered with paddy husk to minimise the loss of water through seepage.

Source: http://nopr.niscair.res.in/bitstream/123456789/19366/1/IJTK%201(Inaugural)%2032-39.pdf, accessed 18.8.15

http://hydrologie.org/redbooks/a286/iahs_286_0184.pdf accessed 18.8.15



Meghalaya

An Efficient Non–Mechanised System for Irrigation in Hills

The bamboo drip irrigation system is being practised in the Jaintia and Khasi Hills of Meghalaya for the last 200 years. Water from the natural streams located at the top of the hills is transported with gravitational flow by using bamboo channels (split pipes) supported on the ground by wooden or bamboo supports, to the plantation sites. In a region where the soil has poor water retention capacity in spite of good rainfall, this is an efficient irrigation system that uses no electrical energy.

The topography of the area is rocky and undulating. Betel vines, areca nut and black pepper are grown in these hills and irrigated with this system which helps the water trickle or drip drop by drop at the base of the crop. The system is so created that it requires no mechanics except the use of the uneven heights to control the flow of water. The bamboos are tied to each other with holes at appropriate points. In the process, no water is lost as it is distributed to the site of actual use without leakage and loss on the way.

The system enables 18-20 litres of water to enter the bamboo pipe system per minute and get transported over several hundred metres before finally getting reduced to 20-80 drops per minute, at the site of the plant. The amount of electrical power required to irrigate such areas in the absence of the drip irrigation system would be quite huge.

There are many advantages of using bamboo: it prevents leakage, thus increasing crop yield with less water. It is a natural, local, widely available and inexpensive material, which keeps the cost at a minimum. As compared to synthetic material, it does not require energy for production. Usually the farmer himself sets up the system with some help from neighbours/co-farmers. Because of the heavy rains in the area, the installation lasts for only 2-3 years. Once the rains are over, the undergrowth is cleared and reinforcements are provided. The byproduct of this system is bio-degradable waste as the old bamboo is left to rot and over time returns to the soil as humus.

Source: http://cseindia.org/node/2839 accessed 15.8.15
http://www.rainwaterharvesting.org/methods/traditional/bamboo.htm accessed 15.8.15
http://permaculturenews.org/2014/02/28/bamboo-drip-irrigation/ accessed 15.8.15

Andhra Pradesh

Horticulture – The Practice of Garden Cultivation and Management

Growing of fruit bearing trees in tribal villages is being explored as a climate change adaptation practice that helps generate income and food security. Mango, sapota (chickoo), custard apple, pineapple, guava, citrus and cashew are cultivated because the mortality rate of these species is less and there is a healthy demand for the fruits in the community and market. Laya, an NGO working with the *Adivasi* community in Andhra Pradesh, is also experimenting to integrate the drip irrigation system using solar energy and gravity flow based hydrams (hydraulic rams) in horticulture.

Source: Laya Resource Centre, Vishakhapatnam

Assam

Kitchen Gardens – A System of Growing Organic Food and Managing Food Waste

The traditional *Bari* (home garden) is commonly seen in most Assamese households with the women of the house involved in its upkeep. It is based on a system of efficient soil management as fallen tree leaves and kitchen wastes including ash are regularly added to the soil. Even water that has been used to clean fish along with the fish scales that are removed, are mixed as a manure in the soil of the *bari.* This increases the soil fertility, conserves moisture and serves as an effective waste management system. An indigenous mechanism of pits dug in the ground to collect rainwater is used to irrigate the garden. The trees are protected from termites by sprinkling wood ash and common salt. A traditional Assamese *bari* has local edible species like jackfruit, banana, mango, pineapple and beetel nut.

Andhra Pradesh

Homesteads Development

These are a set of agricultural and horticultural practices on *garuvulu* (less gradient land) usually located near the farmer's residence for easy accessibility and maintenance. The land is fenced with vegetable/fruit bearing trees. Within the plot the soil is treated with organic manure and is, as far as possible, irrigated manually or through stream channels. A selection of vegetables, fruits and medicinal herbs are planted in the plot to ensure generation of some amount of cash income, and provide nutrition and health care for the household. This cultivation practice ensures yields from multiple crops and an array of different agricultural and horticultural products from the farmer's land.

Source: Laya Resource Centre, Vishakhapatnam

Kerala

Local Green Manure for Sustainable Agriculture

Till about three decades back, the only manure used in Kerala was organic. Every household would collect cow dung from cattle sheds or from open fields where the cows are set free or tied to trees. The dung is kept in pits prepared for this purpose. The used fuel wood from cooking and the ash from the kitchen would also be collected and mixed with the cow dung along with the waste generated when fibre from coconut husks was removed. This would then be left to decay and create compost which could be used as manure for the coconut trees, tapioca and vegetables.

Another source of manure was the accumulated leaves and algae in the backwater inlets and small rivers flowing into the sea which get stagnated during the summer and winter months. Villagers would collect this soil in boats and supply it to farmers as manure. This served as a source of income for them during the lean months. This soil also had water retention properties and helped trees grow better.

Traditional Weather Management

"Vedic people were one with nature (RV. VIII; 58, 2-3; apud SS &SV, a Valakhilya hymn): "One is that which manifests in all", which in contemporary ecological terms is expressed as "everything is related to everything else". It was essential for the survival of ancient people to learn how they could interfere with the world around them to improve quantity and quality of food, shelter, health, hunting and fighting potential. Man had to recognize what powers of nature he would be unable to control and he was thus compelled to resort to magic and religion to win the cooperation of winds, rains, regularity of the monsoon and astronomical recurrences, for the control of earthquakes or natural dam-bursts, forest or savannah fires, river flow and all major elements of nature. All these are described, invoked, and prayed to in the Veda, with fear and respect. Interference of the Gods was sought for the repetition of favorable phenomena such as regular rains to ensure rich pastures and good crops, healthy cattle, horses and sheep, as well as fecundity of the land and of women. Rites would be performed also to forestall destructive natural events. Man learned that there were also natural phenomena with which he could interfere and with which he could collaborate after having understood how the system worked. Thus, rational agriculture and the use of natural products such as provided by plants, or the smelting of metal ores and improvement of the wheel, the plough and irrigation devices as well as harnessing of horses and bullocks were already well developed in Rigvedic times."

Marta Vannuci

All India

Seasonal Vegetable Cultivation for Food Security

Traditionally Indian homes had what is today called the "kitchen garden" and fresh local vegetables were available in every home. *Adivasi* communities of Vishakhapatnam are being encouraged to revive this concept. Seasonal vegetable cultivation is being encouraged among the *adivasi* farmers so that they can grow vegetables organically in their own backyard, farm-land, farm bunds and fence line.

As a result of this farmers are now not dependent on fertilizers or pesticide intensive (expensive) vegetables from the market, and are also able to ensure food security when cash is not readily available. Since the vegetables are easily accessible, women and growing children are nutritionally provided for, particularly in the lean season when food grains are not easily available.

Source: Laya Resource Centre, Vishakhapatnam

Agriculture

Uttarakhand

Baranaja

Farmers from Almora, Chamoli and Ranikhet explain that *barah anaaj* is a system of mixed farming wherein farmers grow twelve food crops on a piece of land. *Baranaja* is a Hindi word comprising of two words – *Barah*, which means twelve, and *Anaja*, which means grains. These crops not only include food grains, but also oilseeds, pulses, vegetables and spices.

In traditional agri-systems in Himachal, about eight crops are grown on the same field in both seasons – *kharif* (summer) and *rabi* (winter). In *rabi*, it is *kanak* (wheat), *chana* (Bengal gram), *matar* (peas), *masur* (lentil pulse), *sarson* (mustard), *jau* (barley), *gama* (a local millet) and *jai* (oats), while in *kharif*, it is rice, *makki* (maize), *til* (sesame), *maah*, *raung* (lobia or black-eyed peas), *moong* (green gram), soya bean and *kulthi*, along with vegetables like okra, chilli, cabbage and cauliflower.

Baranaja promotes diversification of crops and protects against drought and crop failure. The twelve crops are selected such that they can grow in harmony with each other. The creepers of legumes use the stems of grains/plants as a natural support, while the grain roots grip the soil firmly, preventing soil erosion. Due to their nitrogen fixing abilities, legume crops return nutrients to the soil which are used by other crops. Besides, plants grow at different levels or storeys much like a natural forest, thereby utilising multiple levels of space on the same terrace. No external chemical inputs are used and pest control is achieved through the use of the leaves of walnut and *neem*, and the application of ash and cow's urine.

Farmers explain that if some crops are destroyed by either drought or heavy rain, there are still others left and there is never a shortage of food. Each crop has its own sowing and harvesting time and if one crop fails because of weather vagaries, another crop can be harvested.

Source: http://www.projectsurvivalmedia.org/baranaja/
http://www.paramparaproject.org/traditions_baranaja.html, accessed 11.8.15

"I will plant at least five trees in my neighbourhood and grow.
I will always keep my village clean, city clean and state clean so that my earth will be clean and green. I will do my best to achieve Energy independence by 2030."

Dr APJ Abdul Kalam

Former President of India

Assam

Adoption of Native Varieties of Paddy as a Climate Resilient Agriculture Practice in Nalbari District

Lotus Progressive Center (LPC), Morowa village of Nalbari district in Assam, is promoting cultivation of native varieties of paddy in 45 villages in the district under the project 'Promotion and Conservation of Native Varieties of Paddy through Sustainable Agricultural Practices' since 2009, supported by UNDP GEF SGP CEE (India).

Paddy is the principal crop grown in Nalbari district in both the *Kharif* (*Sali*) and summer (*Ahu*) seasons. The entire cultivation of paddy is confined to a few (4-5) high yielding varieties (HYVs) and hybrids. Traditionally, farmers cultivated about 25-30 native varieties of paddy according to the type of land and amount of precipitation received during planting time. HYVs and hybrids are sown in May-June and transplanted during June-July. In the last several years, it has been observed that the amount of rainfall during pre monsoon has decreased drastically. The pattern of distribution of rainfall during peak monsoon has also changed considerably and is limited to a few days with high intensity. As a result, the crop suffers from water stress during the early growth period and sometimes gets submerged in the later stages because of high amount of precipitation within a very short span of time. These new varieties are not capable of tolerating such adverse conditions. Under the circumstances, growing of native varieties is the only solution. These varieties can be transplanted up to the last part of September which is not possible with HYVs and hybrids. Considering the broad adaptability of native varieties, communities are being encouraged to conserve and cultivate native varieties to mitigate any eventuality of environmental changes. In the chemical intensive farming regime, rice biodiversity has lost out to a great extent, because of HYVs and hybrids, and insect. Other animal diversity is in danger because of haphazard use of chemical pesticides. Local varieties of paddy can be grown organically as pest and disease infestation is less and requires less management on that score. Thus growing native varieties of paddy enables farmers not only to overcome adverse climatic conditions, but also preserve the environment and biodiversity.

Some of the native varieties which are being preserved and promoted are Samraj, Tengre, Kalamdani, Bardhan, ManoharSali, Phulgaz, and also 4-5 types of scented rice like TulsiJoha, KunkuniJoha, BogaJoha , KharikaJoha, along with a few types of Bora (Bonni) like Nolbonni, Parasakuabonni and Boka. Amongst these Boka (soft rice or *komalchaol*) has a special character: it can be consumed with milk or curd and sugar or jaggery or ripe banana, without cooking. During flood and other disasters, it is the best food for victims as it does not require any fuel to cook. Besides its food value, the cost of its cultivation is much less. Boka is also highly valued for its flakes (beaten rice) and produces the best quality of popcorn. Farmers traditionally use this rice in their homes and during social festivals as breakfast and light refreshment.

Source: UNDP GEF Small Grants Programme

Karnataka

Local Crop Variety for Improving Food Security

There are about 3000 farmers who cultivate a unique salt water tolerant rice variety in Uttara Kannada (North Karnataka). It is pest-free and resilient to environment stress.

The farmers consider this variety of rice their staple food and believe that the thick coating of red bran on it enables slow digestion, which gives them more energy. It also acts as a coolant and helps them sustain long hours in the sun and heat. *Kanji* (soup) made from this rice prevents heat strokes and keeps one cool. *Kanji* is also an excellent baby food, has medicinal properties and is said to cure diarrhoea .

Kagga rice was cultivated on some 2000 ha on the bed of Aganashini Creek in Uttara Kannada district of Karnataka before the area shrunk to less than 1200 ha. The area has a very high percentage (84.4 per cent) of uncultivable land among the coastal districts of Karnataka.

In this harsh area, cultivating *kagga* rice does not require any investment and there is no risk of crop failure. The seeds are soaked in a creek for a week. The seedlings are sowed after manually puddling the land. Within a week, seedlings rise six inches above water after which they are harvested. Drought does not impact its cultivation because cultivation itself is within the creek bed.

There is an assured yield of 1000 to 1200 kg per acre (0.4 ha) per season. The paddy fields double up as prawn cultivation areas. In June, farmers sow *kagga* rice seeds and in September prawn seeds are released into the wet fields. After the prawn harvest, the famers get leftover prawns from the prawn contractors and thus are assured of food throughout the year.

Source: Rising to the Call: Good Practices of Climate Change Adaptation in India, Centre for Science and Environment, 2014

All India

Chemical Free Preservation Techniques

Preservation by *Neem*

A *neem* tree (*Azadirachta Indica*) is a common sight on the Indian landscape. It not only provides shade to people during the harsh summers, but also has medicinal and preservative properties. *Neem* leaves are a naturally available pesticide, insecticide and germicide. It is used by farmers to preserve cereals and pulses (rice, wheat or any type of whole or broken pulse) without any side-effects. The *neem* leaves can be dried under shade for 3-4 days and crushed after drying. The crushed dried leaves are tied in a muslin cloth, which is then placed in grain containers.

Use of *neem* leaves in preservation of materials is a traditional practice in India. It acts as a natural insect repellent and has been in use for a long time. It has been proven effective against cockroaches, silver fish, book lice and fungal attack. *Neem's* insect repellent property is due to the presence of active phytochemicals in the leaves.

Neem leaves can also be used to preserve delicate clothes like silk saris, sari with jari work, woollens and chiffons, which require delicate handling and protection from silver fish and mite. Naphthalene balls are commonly used which causes a musty smell in clothes.

Naphthalene enters the human body through inhalation or passing through the skin. Exposure to large amounts of naphthalene may damage or destroy red blood cells. Some symptoms include fatigue, lack of appetite, restlessness and pale skin. Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhoea and blood in the urine.

Neem leaves have also found their use in agriculture - to protect crops.

The method is to grind the *neem* leaves, mix it with water and spray on the plants in terraces and kitchen gardens to protect crops from pests. *Neem* leaves are also kept in granaries to repel pests that attack stored grains.

Neem leaves have also been found useful in preservation of manuscripts.

Source: Preliminary report on use of Neem and Negundo leaves in preservation of library and archival materials by B.V. Kharbade. http://www.iiap.res.in/archives/pdfs/kharbade.pdf- accessed on 10/9/15

Indigenous Methods of preserving manuscripts: An Overview by Mrs. Jyotsna Sahoo and Mr. Basudev Mohanty http://odisha.gov.in/emagazine/Journal/journalvol3/pdf/28-32.pdf -accessed on 10/9/15

http://www.silentmenace.com/Moth_Balls.html- Accessed 6/10/15

http://www.scientificamerican.com/article/how-do-salt-and-sugar-pre/-accessed 6/10/15

http://www.encyclopedia.com/topic/food_preservation.aspx- accessed on 6/10/15

Uttarakhand

Chemical Free Pest Management Techniques

Agriculture in the Himalayan region has always been environmental friendly due to its distinctive and rich traditional practices. Traditional management and ecological knowledge have been the important means through which communities involved in agriculture have evolved diversity rich food and, by extension, their livelihoods. Indigenous pest management was traditionally practised much before chemical pest management was introduced. These practices were cheap, local and would effectively manage the pests without damage to the environment.

Source: http://www.rkmp.co.in/content/indigenous-insect-pest-management-in-rice-accessed on 9/10/15
Indigenous Pest Management Practices prevalent among hill farmers of Uttarakhand by Chandola et al. http://nopr.niscair.res.in/bitstream/123456789/11510/1/IJTK%2010(2)%20311-315.pdf-accessed on 9/10/15

"Turning to the animal world, we find that animals have always received special care and consideration. Numerous Hindu texts preach that all species should be treated as children. In Hindu mythology and iconography, there is a close relationship between the various deities, and their animal or bird mounts. Each divinity is associated with a particular animal or bird, and this lends a special dimension to the animal kingdom.

In addition, according to the Vaisnava tradition, the evolution of life on this planet is symbolized by a series of divine incarnations beginning with the fish, moving through amphibious forms and mammals, and then onto human incarnations. This view clearly holds that man did not spring fully formed to dominate the lesser life-forms, but rather evolved out of these forms himself, and is, therefore, integrally linked to the whole of creation."

Dr. Karan Singh
Author and Parliamentarian

Himachal Pradesh

Plant Products as Alternative to Chemical Pesticides

A mixture of tobacco, *neem*, *aritha* and *gwarpatha* is effectively used against the insect pests of mustard crops in Una district of Himachal Pradesh. A leaf decoction (1 kg) of *gwarpatha* and tobacco powder extract (200 g) is prepared by boiling these in 5 litre of water for 3-4 hr to make a 2 litre solution. *Neem* leaf extract (200 ml) and a decoction of 50 g *aritha powder* are added to the above solution after the evaporation process and mixed thoroughly. This is sprayed on the mustard crop at intervals of 2-3 weeks.

Source: Use of Certain Bio-products for Insect-pest Control by Chaman Lal and L.R Verma http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijtk/Fulltextsearch/2006/January%202006/IJTK-Vol%205(1)-January%202006-pp%2079-82.htm- accessed on 10/10/15

Meghalaya

Pest Management through Pine Twig

A pine (*Pinus kesiya*) twig along with its leaves is dipped into the source of water for agriculture terraces. The field is kept flooded with this water. After a few days, the water is drained away. This process is repeated 3-4 times in each season. Sometimes the twigs and leaves tied together are also placed within the paddy field. Though used for all insect pests, the main pest targeted is *gundhi* bug. The pine leaves soaked in water produce a pungent solution that repels insect pests from the paddy field. Khasi pine is abundantly available in Meghalaya.

Meghalaya

Use of Jambura Fruit

Jambura (Citrus maxima) is used in different ways in different villages of West Garo Hills. In some villages, half of the fruit is stuck on a stick and placed in terraces. As it starts decomposing insects including the *gundhi* bug gets caught in it. By the time the fruit dries up completely, a large number of insects are gathered and the fruit is taken out of the field and the insects are killed either by burning or smashing. The process is repeated till harvesting. In some other villages, half of the fruit is dipped in the terrace irrigation channel. It kills some pests and drives away others. The peel or extract of the peel is thrown in terraces to check damage of paddy from pests in some other places. The latter two methods are carried out once in a week throughout the cropping season. The fruits used are cheap and locally available.

Source: Traditional Practices in Pest Management: Some Examples from North-east India by B.Sinha, D.Choudhary and S. Roy http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1303383- accessed on 9/10/15

All India

Ginger – Garlic for Pest Management

Ginger and garlic come across as organic pesticides which do not have any negative environmental impact. They have natural fungicidal and pesticidal properties. Due to the incessant use of chemical pesticides during the past few decades, the land has become degraded and it has also led to contamination of water. Hence use of natural pesticides is important to sustain farming.

Garlic and ginger are mixed in equal ratios and are ground to make a paste. The paste is kept overnight for decomposition and then a litre of water is added to it. The mixture is then applied at the time of fruiting of paddy to protect it from the damage caused by insect pests.

Source: http://www.thehindu.com/todays-paper/tp-features/tp-sci-tech-and-agri/biopesticides-ginger-garlic-extract-measures-up/article1446677.ece, accessed on 9/10/15

http://www.doityourself.com/stry/using-garlic-as-a-natural-pesticide#b, accessed on 9/10/15

Traditional practices in pest management: some examples from north-east India by B.Sinha, D.Choudhary and S. Roy

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1303383- accessed on 9/10/15

Uttarakhand

Use of Table Salt

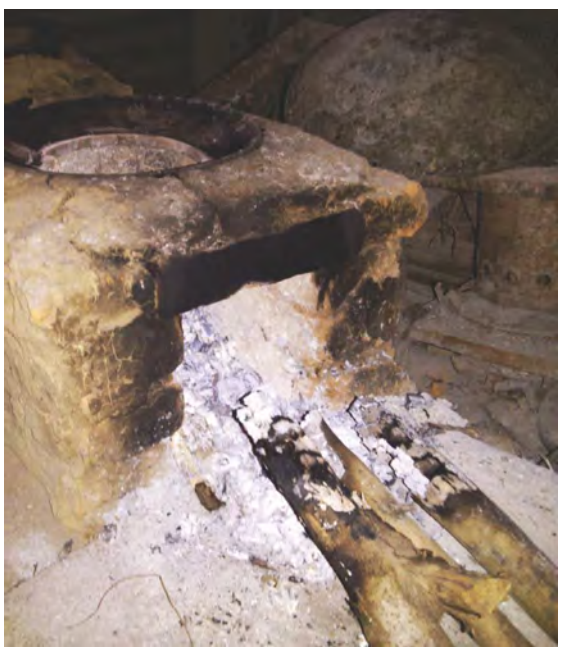
For controlling white grub, common salt is broadcast in fields at the rate of 1 kg per 1/20 acre. Farmers in the hill use salt stone for household and pest control purpose. They grind the salt stone and mix it with the household ash to bulk it up. When the field is ploughed after the first wheat harvest, this mixture is added in the field. The land is irrigated after the broadcasting of this mixture. The practice of using table salt is adopted in areas where the white grub damage is severe. A similar practice is carried out in Tripura for controlling the stem borer of paddy crops. Farmers in south Gujarat also incorporate common salt in the soil to control wilting, which is called *Sukara* in Gujarat.

White grub infestation is a common problem in the paddy fields which, causes severe losses in the yield. It can be controlled by use of common salt.

Source: http://www.rkmp.co.in/content/indigenous-insect-pest-management-in-rice-accessed on 9/10/15

Indigenous Pest Management Practices Prevalent among Hill Farmers of Uttarakhand by Chandola et al.

http://nopr.niscair.res.in/bitstream/123456789/11510/1/IJTK%2010(2)%20311-315.pdf-accessed on 9/10/15



Himachal Pradesh

Getting Rid of Insect Pests with Ash

Sprinkling of *Chulah* (wood based cookstove) ash over and around the vegetable plants and in fields is effective against insect pests like beetles, leaf defoliating insects, leaf miners and aphids. Ash also serves as a soap or detergent for cleaning utensils. Due to the deposition of ash, chewing and sucking types of insects find it difficult to eat up the plants.

Sprinkling of ash is practised throughout the hilly areas of Himachal Pradesh. It is a simple, cheap and effective method to get rid of insect pests and has no side effects. Besides ash enhances crop productivity by providing nutrients.

Source: Use of Certain Bio-products for Insect-pest Control by Chaman Lal and L.R Verma

http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijtk/Fulltextsearch/2006/January%202006/IJTK-Vol%205(1)-January%202006-pp%2079-82.htm- accessed on 10/10/15

Kerala's Kudumbashree to Expand Organic Farming

Kerala's all-women network *Kudumbashree* has decided to expand organic farming extensively across the state and enhance participation of women in the state's agrarian sector.

Kudumbashree had been launched as the poverty eradication mission of the Kerala state government in 1998 to wipe out poverty through community action under the leadership of Local Self Governments. The 40 lakh-strong member outfit, which has successfully tried its hand in various fields, ranging from pickle making to IT business and palliative care, has been in the field of agriculture since 2004.

Being highly food deficit, Kerala is dependent on neighbouring states for grains and vegetables which have been found to contain pesticides beyond permissible limits by food safety authorities. This initiative is aimed to make Kerala free of pesticide-ridden vegetables and support the government's initiatives to achieve self-reliance in production and procurement of agricultural products. No chemical fertilizer or pesticide is being used in their farms. *Kudumbashree* is also trying to propagate the message of food security and food self sufficiency at the grassroots level of society.

Kudumbashree's initiatives to woo more women to farming is also significant on another count as men are largely moving out of agriculture and big farmers transforming their cultivation from food crops to cash crops which are more remunerative.

Kudumbashree volunteers are already cultivating all major food crops, including rice, vegetables and fruits in select areas through its more than 60,000 Joint Liability Groups (JLG). As part of expansion plans, Farmers' Facilitation Centres (FFC) have been formed in 978 panchayats which act as knowledge and service delivery points in rural areas. Seed banking, soil testing facility, credit flow through linking with banks and marketing facilities through creation of weekly and monthly markets are also being organised.

The Economic Times

All India

Simple Traps to Prevent Insects

A yellow sticky trap is used to trap the cotton whitefly, aphids and thrips because these are attracted to the yellow colour. Yellow colour is painted on tin boxes and sticky material like castor oil / vaseline is smeared on the surface. The insects are then attracted to yellow colour and trapped on the sticky material. The bait trap, like the fishmeal trap, is a trap where attractants are used to attract the insects and kill them. This trap is used against sorghum shootfly. The emergence trap is another trap where the adults of many insects which pupate in the soil can be trapped by using suitable covers over the ground. A wooden frame covered with wire mesh and shaped like a house roof is placed on soil surface. Emerging insects are collected in a plastic beaker fixed at the top of the frame. These traps do not require electricity as in case of modern traps.

Source: http://agridr.in/tnauEAgri/eagri50/ENTO232/lec14.pdf accessed 13/10/15

Himachal Pradesh

Insect Pests Management and Soil Fertility Upgrade through Application of Cattle Litter

It is a common practice in uplands (called BARI) of mid and high hills with low cropping intensity to shift farm cattle from one farm site / location to another after every two or three days. The cattle litter (dung + urine) gathered during these days add enough plant nutrients to soil to raise two or three bumper crops and also repel the insect pests and thus reduce their incidence in the crops. Animals kept in shed and tree canopy are moved from one place to another in rotation in order to manure the entire field. Depending on the season, the animals are kept in temporary sheds or in open fields. Cattle urine and dung gathered for three days on a spot of land is considered equal to a heavy dose of compost. This is commonly done in October / November i.e. after harvest of finger millets and before sowing next crop. The practice is repeated in March / April before maize or millet planting. Certain lands are manured intensively by keeping animals for longer durations. It is practiced in most of the villages in hilly mountain terrain of Himachal Pradesh. It is eco-friendly. It enhances crop fertility and helps in soil and water conservation. The practice is a cost effective, simple and easy method, making use of material which otherwise goes waste. No risk is involved and is widely accepted. Composting is a simple, easy, eco-friendly and risk free method.

Source: Use of certain bio-products for insect-pest control by Chaman Lal and L.R Verma

http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijtk/Fulltextsearch/2006/January%202006/IJTK-Vol%205(1)-January%202006-pp%2079-82.htm- accessed on 10/10/15

All India

Storage Structures Designed for Natural Pest Control

Kuthir

The cereal grains are traditionally stored in tall mud pots or bins popularly called *kuthirs*. These mud pots are made of clay, soil and fibres of plants. At times, the husk of cereal grains would be mixed with the clay to harden the pots. The height ranges from 1-3 m and it has a narrow opening at the top which is tightly closed with a fitted lid. By opening the lid, the grains could be drawn whenever needed. These are environmental friendly structures of storage safe from rodents and insects. They are made from locally available material and prevent grain spoilage.

Source: Seed Storage Techniques - A Primer

http://www.ciks.org/3.%20Seed%20Storage%20Techniques%20-%20A%20Primer.pdf- accessed on10/10/15

Tamil Nadu

Kodambae

Kodambae are grain storage structures found in Tamil Nadu. After selecting a suitable site for grain storage, big stones are placed in concentric forms at the base of the floor. Wooden sticks are placed above the stones to form a flat platform. The walls are raised to a height of 1 m using clay or red soil; nowadays cement and bricks are also used. The top portion of the structure is covered with bamboo sticks or with palm and coconut thatches to form conical roofs.

One side of the roof has a small door-like opening through which one can enter to collect the stored grains. A ladder is used to climb to the roof. A pot is kept inverted at the top of the roof to prevent the draining of water into the storage structure during the rainy season.

Source: Indigenous Storage Structures by Kartikeyan et al.

http://nopr.niscair.res.in/bitstream/123456789/3944/1/IJTK%208(2)%20225-229.pdf-accessed on 10/10/15

Madhya Pradesh

Madike

Madike are earthen pots used to store grains for the purpose of consumption. These small capacity containers are made from clay and have a small opening. The walls of the pots are coated with clay and the mouth of the pot is closed with stiff cow dung paste reinforced with cloth. The pots are arranged vertically one over the other depending upon their sizes.
Since they are stacked one over the other, this method is also space saving.

Source: Indigenous Storage Structures by Kartikeyan et al.

http://nopr.niscair.res.in/bitstream/123456789/3944/1/IJTK%208(2)%20225-229.pdf-accessed on 10/10/15

Tamil Nadu

Use of Bio-pesticides to Store Grains

In Tamil Nadu, the leaves of neem (*Azadirachta indica*) and *Pongamia glabra* are used for controlling pests in rice. Storage structures are usually filled with dried leaves of these two plants which contain various bio-active compounds. Other methods involve sun drying or solarisation of the grains. The grains are also stored by topping them with dry sifted red soil, which does not allow any infestation to reach the grains stored underneath.

Source: http://www.agriculturesnetwork.org/magazines/india/3-post-harvest-management/indigenous-practices-of-post-harvest-storage-among/at_download/article_pdf-accessed on 10/10/15

Grain Storage in India: An Overview by S. N Naik and Geetanjali Kaushik

http://www.vigyanprasar.gov.in/Radioserials/Grain%20Storage%20in%20India%20by%20Prof.%20S.%20N.%20Naik,%20IIT%20Delhi.pdf- accessed on 10/10/15

Karnataka

Hagevu

Hagevu is an underground structure that is used to store grains in Karnataka. It is a simple pit lined with straw ropes to prevent damage from moisture. In some cases, *hagevu* is constructed as an indoor structure (with stones). After filling the structure fully, the paddy straw is spread on top as a thick layer and the structure is sealed with mud plaster. In some cases a small square or circular opening is provided at the top. The inlet opening is above the ground level. The advantage of this structure is that fumigation is not required for disinfection and grain can be stored for a longer period. This storage method is suitable for dry agroclimatic zones.

Source: http://www.agriculturesnetwork.org/magazines/india/3-post-harvest-management/indigenous-practices-of-post-harvest-storage-among/at_download/article_pdf-accessed on 10/10/15
Grain Storage in India: An Overview by S. N Naik and Geetanjali Kaushik

http://www.vigyanprasar.gov.in/Radioserials/Grain%20Storage%20in%20India%20by%20Prof.%20S.%20N.%20Naik,%20IIT%20Delhi.pdf- accessed on 10/10/15

Gujarat

Storage Units of Tribal Communities

While the world today is struggling to find methods to reduce wastage of agricultural produce, especially of cereals and pulses, and maintain quality during storage, the local communities and tribes have some indigenous methods for the same. The storage methods range from mud structures to modern bins. The containers are made from a variety of locally available materials differing in design, shape, size and functions. The materials used include paddy straw, wheat straw, wood, bamboo, reeds, mud, bricks and cow dung. These storage units are often covered with the leaves of *sag* (*Tectona grandis*) or cow dung, which enables the grain to be stored without contamination for many years.

Moshti, *Kothi*, *Khotar*, *Porasi* and earthern pots are some of the traditional storage containers/structures.

Moshti is a grain storage container made out of bamboo. The base is usually round and it has a wide opening at the top. The height varies. Mainly Gamit, Vasava, Dholiyapatel communities in southern Gujarat use these storage containers.

The *Porasi* is plastered with mud and cow dung mixture to prevent spillage and pilferage of grains. The top is also plastered with the same mixture or covered with paddy straw or gunny bags. It is used by Nayaka community from Godhara and Panchmahal districts of Gujarat.

Kothi is used to store a variety of grains. It is a room constructed with a large door for pouring grains. A small outlet is made at the bottom for taking out the grains. It is being used mainly in Kutchh, especially among Rabari communities.

Source: Parampara Catalogue
http://www.paramparaproject.org/traditions_storage-units-gujarat.html

Meghalaya

JAM- Indigenous Storehouse of Grains

Harvested grains are stored in a specially designed granary called 'JAM'. The structure is built at a height of about 1 m from the ground. Wooden posts support it. Sheets of aluminum or 20 litre metalic oil containers made of tin are placed in between the floor of the structure and the ground. It is, however, ensured that there is no space left in between the post and the aluminum sheets or containers.

This process prevents the entry of insect pests as well as rats into the granary. As it is housed in an open place, chances of fungus development are also minimal.

Source: Traditional Practices in Pest Management: Some Examples from North-east India by B.Sinha, D.Choudhary and S. Roy

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1303383- accessed on 9/10/15

Agriculture

Tamil Nadu

Kalangiyam

For *kalangiyam*, rectangular brick walls are constructed with a strong concrete base inside the farmer's house. The walls are smoothly plastered to avoid the entry of insects and their larvae. The wooden lid at the top is used for loading and unloading of the storage materials. Dimensions and capacity of the structure may vary depending upon the farmers' requirement.

This practice has been adopted widely and shows good results when loaded with properly dried grains.

Source: Seed Storage Techniques - A Primer http://www.ciks.org/3.%20Seed%20Storage%20Techniques%20-%20A%20Primer.pdf

Maharashtra

Food Baskets to Tackle Drought

Pata is a small vegetable patch which is like an oasis in the middle of large cotton and soyabean farms in Yavatmal district of Maharashtra. It constitutes of leafy vines of long beans (*barbati*) climbing up tall sorghum plants, interspersed with okra, pale pink bells of sesame flowers and pendulous *waluk* melons giving off a musky aroma.

Traditionally the *Pata* signifies a woman's space in agriculture. Depending on the family needs, the women would plant small strips of land with vegetables, fruits and spices between the main crops like wheat, sorghum and pigeon peas. *Pata* would supply the family with fresh fruits and vegetables for about eight months in a year, and with pulses and oilseeds year round thus ensuring nutritional variety. Marigold plantation in the *pata* acts as a pest trap and yields fodder and compost. The best part of this is that the main crop production is not affected by the land diversion for *pata*.

Source: http://www.downtoearth.org.in/coverage/women-grow-food-basket-2683-accessed on 10/10/15

Uttarakhand

Sustainable Farming through Traditional Seed Preservation

Villagers in Uttarakhand preserve some of their harvested crops for use as seeds for the next season. The best crop in terms of productivity is preserved for the purpose. The crop is preserved in traditional storage houses. The seeds are first dried in direct sunlight and then tied together in a cloth. This prevents the seeds from decaying.

There is very restrictive use of pesticides and hybrid seeds, and methods of pest management used are indigenous. People sow the traditional seeds rather than using any commercial seeds. Farming is conducted manually and with traditional tools. Bullocks plough the farm-land.

Fodder for farm animals is also preserved in a similar manner for the winter months. The women gather fodder from the forest in the months before winter. This is tied and usually kept on a tree or open field. When the fodder dries it is kept aside in typical storage houses for winter.

Source: : Bawa, K. S., Joseph, G., & Setty, S. (2007). Poverty, biodiversity and institutions in forest-agriculture ecotones in the Western Ghats and Eastern Himalaya ranges of India. Agriculture, Ecosystems & Environment

Arunachal Pradesh

Grafting as a Method of Sustainable Agriculture

The Lisus live in the South-eastern periphery of Namdapha national park in Changlang district of Arunachal Pradesh. They spend most of their time in the forests where they practice *jhum* cultivation. The hilly terrain and inaccessibility have forced them to innovate things to save time and energy. They know the technique of grafting horticultural plants. Using this knowledge they get fruits they wish to grow in a short duration of time, e.g. *Diospyros Kaki* (*Thaj*) is a fruit tree commonly grown by the Lisus. Fruiting is made only when it is grafted with a specific wild plant, which is abundant in the *jhum* fallows. Most of the households in Arunachal Pradesh have the flowing-water operated gadget used for milling rice without applying manpower. Due to difficult terrains, consisting of mountains and rivers they have built hanging bridges completely made of wood, bamboos and canes to connect village to village and to the agricultural fields.

Source: http://www.paramparaproject.org/traditions_.indigenious-liscus-tripura.html, accessed on 9/10/15

Chattisgarh

Crop Diversity for Food Security

Farmers' groups conserve traditional rice varieties in the Bastar region of Chhattisgarh. Chhattisgarh is traditionally known as the Rice Bowl of India. Over 20,000 rice varieties have been recorded in the region. These are cultivated by indigenous communities through selection and adaptation to a variety of soil, water and micro-ecosystem conditions including predators.

Source: http://education-for-change.blogspot.in/2011/07/farmers-groups-conserve-traditional.html, accessed on 28/10/15

> "Gandhi's (1927) critique of Western industrialization has, of course, profound implications for the way we live and relate to the environment today. For him, 'the distinguishing characteristic of modern civilization is an indefinite multiplicity of wants;' whereas ancient civilizations were marked by an 'imperative restriction upon, and a strict regulating of, these wants.' In uncharacteristically intemperate tones, he spoke of his 'wholeheartedly detest[ing] this mad desire to destroy distance and time, to increase animal appetites, and go to the ends of the earth in search of their satisfaction. If modern civilization stands for all this, and I have understood it to do so, I call it satanic' (1927a). At the level of the individual, Gandhi's code of voluntary simplicity also offered a sustainable alternative to modern lifestyles. One of his best -known aphorisms that the 'world has enough for everybody's need, but not enough for everybody's greed,' is, in effect, an exquisitely phrased one line environmental ethic. This was an ethic he himself practised; for, resource recycling and the minimization of wants were integral to his life."
>
> ***Ramchandra Guha***

Assam

Dhuan Chang – The Smoke Rack

There is a unique culture among the Assamese people of storing seeds of fruits and vegetables for plantation somewhere in the rack above the cooking stove. This rack is traditionally called *Dhuan Chang* (the smoke rack). The etymology of this term is interesting as traditionally when firewood was used for cooking there would be this *Dhuan Chang* right above the cooking fire. The smoke emanating from the fire would keep the *Dhuan Chang* pest free leading to effective storage of seeds for future plantation. The cooking method has changed but the reference to *Dhuan Chang* is found in every Assamese home. Even today a rack is built above the stove in the kitchen and objects that can be spoiled by pests and termites are stored there.

Celebrating Good Weather – Harvest Related Festivals

India is predominantly an agriculture-based country, with the majority of the people dependent on farming and farm products. It is natural therefore to celebrate a good harvest. Harvest festivals are celebrated throughout the country in different ways. However, the essence is to express gratitude to nature for the timely monsoon and celebrate the yield of a good crop. Indian festivals are celebrated with traditional musical instruments, food and do not use modern energy consuming mediums of entertainment.

Kerala

Onam

In Kerala, Onam is celebrated as a harvest festival. People clean their homes, go to the temple and offer prayers for the harvest. Ten days of feasting, boat races, traditional songs and dances are part of the festival. Onam feast is marked by traditional dishes of Kerala served on banana leaves. An important part of this festival is the *Pookkalam*, flowers arranged in *rangoli* patterns in the courtyard of most houses. Being monsoon time, various kinds of flowers are available around this time and these are used to create beautiful patterns.

Source: www.onamfestival.org › About Onam accessed 11.9.15

West Bengal

Nabanna

Nabanna literally means 'Nobo-Onno', or New Rice. This is a Bengali harvest festival usually celebrated with food, dance and music.

The festival of Nabanna in the Bengali month of Agrohyon (November) is an important event in the agrarian calendar of Bengal, and is a form of thanks giving for prosperity. Nabanna is celebrated by worshipping the *Golaghor* (storehouse). Festivities include making traditional cakes named *pitha*. It honours the Goddess Lakshmi, who symbolises wealth and fertility. According to folk custom, a community cannot enjoy the new rice crop until Lakshmi is first offered nabanna ("new food" or "new rice"). Farmers will cut and husk a special variety of rice, prepare porridge with it and offer it to the goddess. In some cases, ancestral spirits and local deities are also the intended recipients of the offering. Other customs during the festival include greeting the moon with lamps, giving children gifts and sweetened milk, and offering rice and other types of food to crows.

Source: www. paramparaproject.org accessed 12.9.15

Punjab

Baisakhi and Lohri

Baisakhi is celebrated across northern India, especially in the state of Punjab. Considered a holy day, Baisakhi celebrations for Sikhs begin with a dip in the holy rivers at the break of dawn. Farmers celebrate by distributing sweets and dancing *Bhangra* and *Gidda*, which are two popular Punjabi dances.

The other significant harvest festival of northern India is *Lohri*. It is celebrated by lighting up a bonfire followed by traditional Punjabi songs and dance. People feast on seasonal food *sarson ka saag* (vegetable preparation made with mustard leaves) and *makki ki roti* (bread made from cornflour) on this day.

Source: https://www.ixigo.com/which-are-the-harvest-festivals-celebrated-in-india-fq-2011124 accessed 11.9.15
http://www.baisakhifestival.com/baisakhi-festival.html accessed 11.9.15

Agriculture

Rice Cultivation in the Mangroves

The Sundarban lands in West Bengal are mangrove lands that have been used for centuries for the cultivation of salt-tolerant rice. In fact, cultivating this land from the first year is the system of land management here. According to a text of 1874, "*so great is the fertility of the soil, that claimed land neglected for a single year will present to the next year's cultivator a forest of reeds, (nal). He may cut it and burn it down, but it will spring up again almost as thick as ever, and it takes about three eradications to expel this reed once it has grown. The soil too must be cultivated for ten or twelve years before it loses this tendency of covering itself with reed jungle*." The three main farmers' rice varieties that are grown here in tidal waters are *matla*, *getu* and *Hamilton* (named by the local people in the 19th century after a British philanthropist who lived there), which can tolerate up to 14% salinity. These varieties need no attention from the farmer, who after transplanting the crop, leaves for his home, abandoning the crop till harvest time.

Source: Biopiracy of Climate Resilient Crops - Navdanya

Karnataka

Community Directed Rice Production in Drylands

In dryland Karnataka, where rainfed agriculture predominates, water prudence is the key to food security. Thus, decisions regarding cropping patterns of individual farmers are not left to them individually, but are taken by the community so as to maximise the productivity of the scarce resource of water. In Nallur and Kappalmadu of Mulabagal taluk in Tumkur District, the Panchayat (community leaders in the traditional systems of village governance) decides on the nature of rice to be sown. As rice is staple, and one crop of paddy has to be cultivated in the area. The panchayat has decided that a traditional drought resistant variety - *Baira nellu* - rather than a high yielding variety will be grown. It can withstand droughts of two or three months, and it requires fewer rounds of watering.

In these areas, as well as in GG Halli (where High Yielding Varieties are allowed), the Panchayats have banned puddling, insisting instead upon dry sowing. This saves water, as the crop can be grown as rainfed for at least two and a half to three months. Such ecologically sound water and agriculture management has enabled the farmers of these regions to raise at least one crop a year, even during severe drought conditions and stave off famine conditions.

Source: Biopiracy of Climate Resilient Crops - Navdanya

Kerela

Kakkoor Kalavayal

Kakkoor is a village located in Ernakulam district of Kerala and is famous for the *Kalavayal* (the market place for cattle)[1] .

The century old Kakkoor *Kalavayal* is a post harvest festival celebrated here and in adjoining villages. It is held in the Malayalam month of *Kumbham* between February and March. Some of the major attractions of this agricultural festival are the exhibition of agricultural implements, cattle market and animal processions. Beauty contests of oxen and exhibition of chickens and dogs are also held. The four day long festival culminates with the *maramadi* or bullock race.

The race is conducted on the muddy tracks of paddy fields in Kakkoor village where bullocks show their raw strength, stamina and skills. It is believed that the race brings good rainfall and harvest in the forthcoming agricultural season. The oxen participating in the race come from different regions of Kerala and are specially fed and trained for this.

Source: http://www.webindia123.com/city/kerala/kochi-ernakulam/destinations/fairs-festivals/kakoor-kalavayal.htm accessed 11.9.15

http://halokerala.com/picnic-spots/ernakulam/kakkoor/ accessed 11.9.15

Orissa

Bakula Amabasya

Bakula Amavasya is observed during the month of December and January in Odisha. The festival is primarily dedicated to the mango trees, as this is the season when the mango blossoms. The new fruits are called *baula* in Oriya. Special food is prepared on this day and offered in temples as well as to the mango trees. The ritual is performed to invoke a rich mango harvest during the season.

Source: www.paramparaproject.org, accessed 12.9.15

Tamil Nadu

Pongal

Pongal is said to be a festival of farmers, especially those farmers who are dependent on rice and sugarcane cultivation. It is a festival dedicated to rice since it is the staple food of the community. It is also a time to venerate the cow that is an integral part of the Indian agriculture system. The three elements - the sun, water and earth - are also acknowledged, since all these are part of the making of a good harvest of rice.

On Pongal day, freshly harvested rice is boiled with fresh milk and jaggery in new pots early in the morning. The preparation is topped with brown sugar, cashew nuts and raisins and allowed to boil over. This preparation, called *pongal*, is offered to the sun at sunrise, a gesture which symbolises gratitude to the sun and nature for providing prosperity. It is later served to the people present in the house for the ceremony.

Source: http://www.pongalfestival.org/pongal-festival.html accessed 11.9.15

All India

Basant Panchami

Basant Panchami falls on the first day of spring. It marks the celebration of the onset of spring. The festival is dedicated to Goddess Saraswati, who is the deity of knowledge, art and music and is also known as the Saraswati Puja day.

Yellow is a colour significantly used during Basant Panchami. It is said that the mustard fields in North India bloom during this season giving a 'yellow coat 'to nature. People wear yellow clothes to celebrate the abundance of nature and use yellow extensively in food served. It is believed that yellow is used to represent both the ripening of fruits as well as spiritual knowledge and is associated with this festival.

Source: http://festivals.iloveindia.com/basant-panchami/basant-panchami-significance.html#ftYJvt0zXH1OROeJ.99

Assam

Magh Bihu

Magh Bihu, also called Bhogali Bihu or Maghar Domahi, is the harvest festival of Assam. The name Bhogali Bihu itself signifies food (*bhogali* comes from *bhog* – the Assamese word for food) and its connection to a good harvest. It is also the Assamese celebration of Sankranti and is observed on January 14-15 every year.

The first day of the Magh Bihu festival is known as Uruka. On this day, people construct *mejis* (*mezi*) or *bhelaghars* with bamboo and pieces of wood in open spaces. A typical *meji* is a conical hut made of bamboo, wood and dried leaves often built to heights as tall as 40 feet. The young men who spend their nights in specially built hay structures called *bhelaghars* guard these enthusiastically while they cook for the feast. A *bhelaghar* is made out of wood, twigs and hay like a house, and the feast on Uruka night is held in them. Both the *bhelaghar* and the *mejis* are then burnt early in the morning and their ashes scattered over the fields to enhance the soil's fertility.

The next day is the Magh Bihu - a day of feasting. It is a day to visit relatives and relish specially prepared Bihu food like *pithas* (sweet rice cake), *chira* (puffed rice), *chungapitha* (rice cake in bamboo tubes) and curd served with jaggery.

The aim of the Magh Bihu celebrations is to thank Mother Nature for the rich harvest.

Source: https://www.ixigo.com/which-are-the-harvest-festivals-celebrated-in-india-fq-2011124 accessed 11.9.15

"God is omnipresent. Hence it is that He speaks to us through stones, trees, insects, birds, beasts, etc."

Mahatma Gandhi

असंबाधं बध्यतो मानवानां यस्या उद्वतः प्रवतः समं बहु।
नानावीर्या ओषधीर्या बिभर्ति पृथिवी नः प्रथतां राध्यतां नः।।

(Salutations to Mother Earth) Who extends Unimpeded Freedom (both outer and inner) to Human Beings through Her Mountains, Slopes and Plains,

She bears many Plants and Medicinal Herbs of various Potencies; May She extend Her Richestous (and make us healthy)

यस्यां समुद्र उत सिन्धुरापो यस्यामन्नं कृष्टयः संबभूवुः।
यस्यामिदं जिन्वति प्राणदेजत्सा नो भूमिः पूर्वपेये दधातु।।

(Salutations to Mother Earth) In Her is woven together Ocean and River Waters;
in Her is contained Food which She manifests when ploughed,
In Her indeed is alive all Lives; May She bestow us with that Life

यस्याश्चतस्रः प्रदिशः पृथिव्या यस्यामन्नं कृष्टयः संबभूवुः।
या बिभर्ति बहुधा प्राणदेजत्सा नो भूमिर्गोष्वप्यन्ने दधातु।।

(Salutations to Mother Earth) In Her resides the Four Directions of the World; in Her is contained Food which She manifests when Ploughed,

She sustains the various Lives living in Her; May She, the Mother Earth, bestow on us the Ray of Life present even in Food

Bhumi Suktam, Atharvaveda 12.1

Biodiversity

Climate is one of the major determinants of biodiversity of a given region. Similarly, biodiversity influences climate of a region. Plants, particularly forest, being one of the major carbon sinks, its conservation is vital to the maintenance of the balance of carbon levels in the atmosphere. Other important ecosystem services rendered by the diverse life forms such as ground water recharge, soil water conservation, have direct implications on the impacts of climate change.

Biodiversity in India supports livelihoods of millions of people. More than 70% of the Indian population depends on crops, forests, wetlands and marine resources for food, fuel, fodder, fibre, fertiliser, medicine and housing needs. Besides, biodiversity is important from the point of religion and culture in India. Some plants and animals are worshipped such as the pipal (*Ficus religiosa*) tree, snake, and such others.

Recognizing that biodiversity is the lifeline, the basis of very existence of life and its important role in balancing climate, the Atharvaveda which is one of the earliest bodies of Indian scripture has stated thus:

> **"Whatever we take from you, O Earth, may that quickly regenerate again; may we not damage thy vital habitat and heart"**
>
> Atharvaveda (12.1.35)

Traditional societies in India have incorporated conservation in their religion, traditions and culture for their sustainable lifestyles. Forests and tree groves and wild animals are considered sacred. Certain keystone plant species like *Ficus religiosa*, *Ficus bengalensis* (the Banyan tree) and animal species such as the black buck, lions, monkys, snakes receive special reverence. Proclaiming these species as sacred, the communities have ensured their protection. Sacred groves (patches of forests dedicated to a deity) have been responsible for preserving pockets of biodiversity in various parts of the country. Certain tribal communities invoke customary laws to prevent any product extraction by the community from the forests and groves thereby ensuring protection.

Selective breeding has evolved over generations with farmers and livestock keepers developing and improving diverse varieties of crops and domesticated animals from their wild relatives for different agro climatic situations resulting in 50,000 rice varieties, more than 1000 mango varieties, 30 breeds of cattle and many others. India's rich and wide range of domestic diversity, well adapted to various climatic conditions and with the ability to withstand climatic variations has contributed to food security, local economies and ecosystem services across the country from time immemorial. Traditional societies have been using diverse plants and animals as climate indicators. For instance, the tribes of the Andaman and Nicobar islands used their ancestral wisdom, which has evolved over the centuries, to sense the approaching tsunami in the Indian Ocean in 2004 through observing the behaviour of birds, smaller mammals, and marine life. These lifesaving skills enabled them to quickly move to the safety of higher grounds.

These rich traditional beliefs and practices have found representation in specific provisions for biodiversity protection in the Constitution of India. For instance, Article 48A in the "Directive principles of the State Policy" declares that the State shall endeavour to protect and improve the natural environment and to safeguard the forests and wildlife of the country. Article 51A (g) in "Fundamental duties" imposes a similar responsibility on every citizen - "to protect and improve the natural environment including lakes, rivers and wildlife and have compassion for living creatures."

The Indian subcontinent is one of the greatest repositories of ethnobiological knowledge (knowledge acquired by local communities overtime and is passed down from one generation to the other). Realising the significance of this knowledge and the value placed by traditional societies on biodiversity conservation, the National Biodiversity Action Plan (NBAP 2010-2020) has included it as one of the 12 National Biodiversity Targets to be achieved in the UN Decade on Biodiversity.

> National Biodiversity Target 11: By 2020, national initiatives using communities' traditional knowledge relating to biodiversity are strengthened, with a view to protecting this knowledge in accordance with national legislations and international obligations. (India's Fifth National Repot to the connection on Biological Diversity 2014)

Biodiversity is one of the important drivers of climate mitigation and adaptation. Traditional knowledge in India is being used as a critical tool in addressing the challenges posed by climate change.

Biodiversity

All India

Creating Carbon Sinks with Sacred Groves.

Sacred groves are patches of forests left untouched and allowed to grow naturally. As the name suggests, the groves are mostly dedicated to deities that the local community of that particular area worships and thus the grove is said to be an abode of the deity. Every leaf, branch, twig, water source and anything within the grove is considered as sacred. Considering that sacred groves are large areas with trees, these are also large carbon sinks.

These groves are known by different terms in different parts of the country. One of the earliest colonial reports on forests in India was written by the first Inspector General of Forests, Dietrich Brandis. He writes about the *Devera Kadus* of Coorg in 1879 and about visiting sacred groves in Rajputana, Garo and Khasi Hills. Other terms used for sacred groves include, *Devrai* in Maharashtra, *Orans* or *Vani* in Rajasthan, *Sarna* in Bihar and *Devban* in Kullu district of Himachal Pradesh.

The flora and fauna within scared groves consists of a wide variety of indigenous species. Madhav Gagil and Chandran have found *Gurjan* tree or *Dipterocarpus indicus*, in the Western Ghats. Two scared groves in Manipur house vulnerable trees like *Phoebe haisana* and endangered ones such as the *Rhus hookeri* and *Flacourtia cataphracta*.

Sacred groves help in recycling the nutrients back to the soil thus making it highly fertile. Another reason for its high fertility is that species that grow within the grove are ideal for that soil type. Thus, sacred groves are known to help in the natural productivity. For example, some sacred groves in Manipur house species of trees like *Albizia lebbeck* and *Ficus glomerata* which contain large amounts of nitrogen, phosphorus, calcium and magnesium in their leaves. The nutrients from the plant litter dissolve into the soil and this is why it is believed that soil in the sacred groves are much more fertile compared to other forests.

Devabans

The *devabans* or scared groves of the Kullu district in Himachal Pradesh have a unique system of preserving the grove, which is known as the *devta* system. Devaban literally means abode of the God. The rules to maintain and protect the grove that are decided by the community are as follows:

There is a ban on using the resources of the *devaban*. Access is granted depending on the use for which resources are being taken from the *devaban*. For example, wood can be taken to make tools for agriculture but not for fuel. Restrictions are based on how communities are placed geographically. People who do not belong to the community concerned with a particular *devaban*, will be treated as an 'outsider' and thus will not be allowed access to the forest. In sacred forests, where certain species are considered to be endangered, their harvest is completely banned. There are restrictions to access the resources of the *devaban*, which are seasonal in nature. For example the grass in certain *devabans* is allowed to be cut only in some months of the year. In the case of timber trees, they are allowed to be cut in July and August which are the months of the *Mela* held for the *devta*.

Bani

In Manger Bani village the sacred grove is called *bani*. Religious and social taboos are enforced by the community to restrict access to the *bani* in order to protect it. The myth associated with the grove here, is of a baba called Gudadiya Baba who was believed to be meditating in the temple inside the grove but when the villagers went to see him the next morning, all that remained were his clothes (known as *gudad* in the colloquial language), and the people believed that he became one with god. The community protects the *bani* for Baba who is believed to have preached its protection.[6]

For this nomadic and pastoral community, animals and the forests were important for their livelihood and hence worshipped them. The people knew that if the forest was not protected by them they would have nothing to feed their animals and thus lose their livelihood itself.

Sources: Brandis, Dietrich, Indian Forestry, Oriental University Institute, 1897.

Gadgil. Madhav, and Subhash Chandran, 'Sacred Groves', In Geeti Sen (ed.), Indigenous Vision, People of India Attitudes to the Environment, India International Centre Quarterly, New Delhi, 19(1-2), 1992.

Malhotra, K.C., Cultural and Ecological Dimensions of Sacred Groves in India, Indian National Science Academy, New Delhi and Indira Gandhi Rashtriya Manav Sanghralaya, Bhopal, 2001.

Vasan, Sudha, 'Indigenous Community Forestry', In Living with Diversity; Forestry Institutions in the Western Himalaya. Indian Institute of Advanced Studies: Shimla, 2006.

The Spirit of the Sanctuary', in Down to Earth, Vol. 2, No. 17, Centre for Science and Environment, 1994, retrieved from http://www.downtoearth.org.in/content/spirit-sanctuary

Personal interviews with the inhabitants of the Manger village and the help of activists like Chetan Aggarwal, Tykee Malhotra and Pradip Krishen.

Chattisgarh

Sargi-Chapda and Man: A Case for Harmonious Co-existence

The *Sargi* tree is used in Bastar, Chattisgarh for a variety of purposes. Gum is extracted from the trunk, twigs are used as *datun* or toothbrush, and the wood is used to make utensils, household products, beams for homes, raw material for carts and fencing. In the rainy season a mushroom called *boda* grows abundantly under this tree. It is not only tasty but is known for its high nutritious quality.

The *sargi* tree is also home to the *sargi* ants who build their nests in the leaves of the trees using their saliva as an adhesive. These leaves are used to make *chapda* - a delicacy for the tribes living in the area. It is believed that *sargi chapda* protects the eye from ailments. *Sargi chapda* is consumed during the months of April-May when the summer is at its peak and winds blow strong, and possibilities of eye diseases are high.

Source: Parampara Catalogue, Report to Ministry of Culture, 2012 developed by CEE

Chattisgarh Biodiversity Board Strategy and Action Plan Document

Rajasthan

Ecosystem Management by the Bishnois

Bishnoism was founded solely on the principle of conserving nature. The religion is over 500 years old, and has a following of over one million.

Bishnoism is said to have started in 1485 AD by Saint Guru Jambheshwar in the Thar Desert of Rajasthan, India. Much before the dialogue on environmental conservation began, the Bishnois have recognised the importance of balance in man's relationship with nature.

For the Bishnois, while trees are sacred, the entire ecosystem itself needs to be protected. A Bishnoi village is home to blackbucks and chinkaras, vultures, partridges, peafowls and even the endangered Great Indian Bustard. Not only do the Bishnois protect them from poachers, they also actively participate in helping them lead a life of plenty. Animals are allowed to graze freely in their farmlands. Stone vessels filled with water are placed near homes or hung from trees for the animals and birds to drink from. One of the principal tenets - *Amar Rakhave That* – means to provide shelter for abandoned animals so that they can live the rest of their life with dignity.

Bishnoi homes are made from material gathered locally and built in an eco-friendly way. Bishnois do not cut trees and only collect dead wood. It is said that even a carpenter waits patiently for the tree to fall. To prevent the cutting of green trees they use cow dung cakes as fuel for cooking.

Much before the dialogue on rain water harvesting began, the Bishnois built water storage tanks to collect and store rain water to combat the severe drought and water shortage. This water is not only for humans but for animals too.

Source: http://www.thebetterindia.com/5621/the-land-of-the-bishnois-where-conservation-of-wildlife-is-a-religion/#sthash.A0FYJFBu.dpufA accessed 12.9.15
http://treesouls.com/eco-conservation/bishnois-the-sacred-environmentalists/ accessed 12.9.15
http://www.bishnoivillagesafari.com/bishnoi_history.html accessed 12.9.15

Uttarakhand

Chipko: A Movement for Saving Forests

The original 'Chipko movement' was started around 260 years back in the early part of the 18th century in Rajasthan by Bishnois. A large group of them from 84 villages led by a lady called Amrita Devi laid down their lives in an effort to protect the trees from being felled

Later, led by Sunder Lal Bahuguna, this became a symbol of environmental conservation leading to the cancellation of logging licenses and the declaration of a decade long moratorium on logging.

The first Chipko action took place in April 1973 in Mandal village in Uttarakhand (then part of Uttar Pradesh), and in the next five years spread to many districts of Uttar Pradesh, in the Himalayan region. It was triggered by the government's decision to allot a plot of forest area to a sports goods company. The women of the area, under the the leadership of an activist, Chandi Prasad Bhatt, went into the forest and formed a circle around the trees preventing the men from cutting them down.

The success achieved by this protest led to similar ones in other parts of the country. Supporters of the Chipko movement, many of them village women, have successfully prevented the felling of trees in a number of regions and influenced natural resource policy in India.

Source: http://edugreen.teri.res.in/explore/forestry/chipko.htm accessed 13.9.15
http://www.yourarticlelibrary.com/essay/chipko-movement-in-india-useful-notes/32984/ accessed 13.9.15
Standing up for the trees: Women's role in the Chipko movement by Shobhita Jain
http://www.fao.org/docrep/r0465e/r0465e03.htm accessed 13.9.15
http://www.ecoindia.com/education/chipko-movement.html accessed 13.9.15

Gujarat

Building Climate Resilience through Conservation of the Banni Buffalo

Over the years, the *Maldharis* have played an important role in the conservation and improvement of the Banni Buffalo. *Maldharis* of Banni came together to form "*Banni Pashu Uchharak Maldhari Sangathan*" (Banni Breeders' Association) with membership of more than 970 animal breeders. The main objectives of the association are: conservation and improvement of the Banni breed; recognition of Banni breed as a distinct buffalo breed of the country; conservation of grasslands on which animals are grazed; establishment of organised milk market for the region; creation of backward integrations like availability of water, animal feeds, value addition and systematic animal marketing.

Banni, a natural grassland covering around 4600 sq. km, is one of the most beautiful landscapes with ecological diversity, both flora and fauna. The pastoral community called *Maldhari* (traditional breeder) lives in this region with their animals, mainly Banni buffalo and Kankrej cow. Geologically, the Banni region had emerged out of sea due to tectonic activities several thousand years ago. Soils deposited in this area from the rivers and rivulets helped in pushing sub-surface salinity downward as well as flushing out surface salinity towards the sea and the Greater Rann of Kutch.

Source: Parampara Catalogue, Report to Ministry of Culture, 2012 developed by CEE

North & Central India

The Agaria Technique – Ecofriendly Ore Processing

The traditional Agaria technique involves processsing iron ore in a low shaft furnace built of clay. Agarias are a community of producers of iron and iron objects found in the states of Uttar Pradesh, Bihar, Odisha and Madhya Pradesh.

Verrier Elwin points out that the Agarias use low quality ore preferring it over rich ore which may be available. He also states that the Agarias can identify the ore by its colour, appearance and density.

The ore is usually collected from the surface and never by digging. In case of digging, the shaft is no deeper than two metres. Other important sources of iron are the ore-bearing sand washed up by rivers and streams. The ore is separated from the sand of the river bed by a unique gravitational process. A sloping pan is made on the river bank slightly above the water level and the sand is laid on it. Water is poured into it repeatedly to wash out the lighter siliceous particles, leaving the heavier black ore particles. This ore is then collected and dried in the sun. For the Agarias this is a better and more preferred metal than quality iron.

The Agaria process of iron smelting is charcoal based unlike modern fossil fuel based technology. Wood of sal and teak are preferred and usually the wood is obtained from dead trees, which ensures that indiscriminate cutting of trees is avoided. A shallow pit of dry twigs and branches is prepared and logs piled on it. This is then set on fire and allowed to burn until it forms charcoal.

Source:http://www.downtoearth.org.in/coverage/a-dying-craft-23952 accessed 4.9.15

Women and Ecology

"Indian women have been in the forefront of ecological struggles to conserve forests, land and water. They have challenged the western concept of nature as an object of exploitation and have protected her as Prakriti, the living force that supports life. They have challenged the western concept of economics production of profits and capital accumulation, with their own concept of economics as production of sustenance and needs satisfaction. A science that does not respect nature's needs and a development that does not respect people's needs inevitably threaten survival. In their fight to survive the onslaughts of both, women have begun to challenge the most fundamental categories of western patriarchy - its concepts of nature and women, and of science and development. Their ecological struggle in India is aimed simultaneously at liberating nature from ceaseless exploitation and themselves from limitless marginalisation. They are creating a feminist ideology that transcends gender and a political practice that is humanly inclusive; they are challenging patriarchy's ideological claim to universalism not with another universalising tendency, but with diversity; and they are challenging the dominant concept of power as violence with the alternative concept of non-violence as power."

Vandana Shiva

Jammu & Kashmir, Himachal Pradesh

Climate Adaptation through Transhumance

Transhumance is the seasonal movement of people with their livestock between fixed summer and winter pastures. In the mountain regions, this implies movement on foot between higher pastures in summer and lower valleys in winter. The herders have a permanent home, usually in the valleys. In the Indian Himalayan region, the Gujjars and Bakarwals of Jammu and Kashmir (J&K) and the Gaddis of Himachal Pradesh are amongst those communities who practice transhumance.

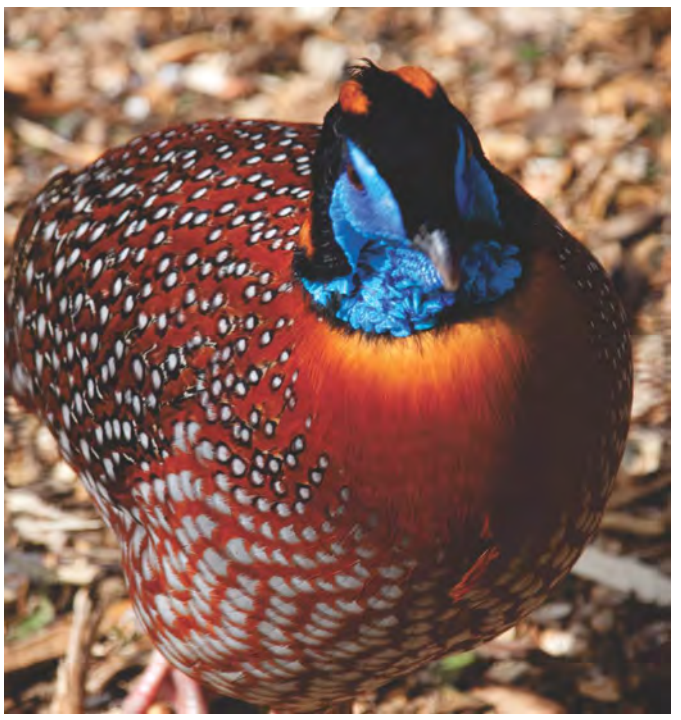
The Gaddis are a semi nomadic tribe of Himachal Pradesh. They usually construct two sets of houses. During summers, these people move to the higher areas in Lahaul and Spiti. With the onset of winter, the Gaddis, along with their families and their animals, migrate to the Kangra valley. The Gaddi dogs that protect the flock always accompany the herd. After migrating to the foothills, the Gaddis engage in agricultural activities, with the main crop grown being millets. Women engage in the weaving of wool.

The Gujjars of J&K are pastoral nomads, simple, sturdy and hardworking people, who move to high alpine regions in search of good pastures during summer, a practice known as *behak*. They carry all essential household items and travel on horseback. By September, the Gujjars start moving towards the plains, where they spend the winters. These great herders of sheep and goat carry the kids or lambs around their necks or in their arms.

The Bakarwals, also from J&K, are mainly goatherds and shepherds. Along with Gujjars, they constitute about 30 per cent of J&K's population. Bakarwals lead a lonely and tough life in the high altitude meadows of the Himalayas and the Pir-Panjal. Every year, they take their sheep high into the mountains, above the tree line, to graze in the lush meadows. It may take them as many as sixty days to reach these meadows. During the summer, they move from one meadow to the other. They generally travel in pairs; they may also go alone or in larger groups including the whole family (depending on the number of sheep/goats to be taken care of). Their dogs, the *bhotia* or *bakarwal* dogs, and their pack animals always accompany them.

Source: Parampara Catalogue, Report to Ministry of Culture, 2012 developed by CEE

Customary Laws for Biodiversity Conservation and Sustainable Livelihoods



Nagaland

Blyth's Tragopan Conservation

Khonoma in Nagaland is an Angami Naga tribal village about 20 km south-west of the capital town Kohima. Khonoma is the site of a unique conservation endeavour, the Khonoma Nature Conservation and Tragopan Sanctuary. This 70 sq. km reserve is the fruit of a predominantly local initiative to preserve the endangered pheasant, the Blyth's Tragopan, as a flagship species, along with the ecosystem as a whole. The sanctuary has a variety of ecosystems ranging from semi-evergreen forest to savannah grasslands and is ideal for trekking and research work. Conservation had little place in people's lives when CEE began its conservation education initiative in Khonoma. Much of the change was due to CEE's awareness programme. But the real impetus came from the village council, which passed a rule to regulate hunting in 70 sq. km of forests near Khonoma. The implementation of customary laws also helped the conservation effort. Some examples include: limited hunting of crop-destroyers like wild boars and deer; a ban on the sale of wild meat; imposition of fines on violators; a ban on hunting during mating and breeding season; a ban on hunting juveniles and pregnant animals; the rationing of timber and firewood extraction based on family size and requirement.

Village youth were trained in wildlife management and protection, and were then deployed to guard the forest and wildlife. This community-managed wildlife sanctuary was linked to tourism through the Khonoma Green Village project supported by the Ministry of Tourism, Government of India. The Khonoma Tourism Development Board was constituted to implement this project. The agency encourages youth in the village to work as tour guides, tour operators, and interpreters. It also provides equipment to wildlife wardens. Infrastructure such as a circular road, solar street lights, toilets for each household, community toilets, improved water supply and sanitation and waste disposal have been supported to further encourage tourism. Select houses in the village, which has adequate infrastructure and facilities, were identified for home stays. Attention was given to hygiene and sanitation, and people were trained in housekeeping and hospitality. Handloom handicrafts were promoted as souvenirs and village troops were trained in cultural performances and practices. The Khonoma Nature Conservation and Tragopan Sanctuary and the Khonoma Green Village initiatives serve as successful role models not only for other Naga villages but for the entire community.

Source: Innovation in Local and Global Learning Systems for Sustainability: Traditional Knowledge and Biodiversity – Learning Contributions of the Regional Centres of Expertise on Education for Sustainable Development, UNU-IAS, Yokohama, Japan

"The earth, the air, the land and the water are not an inheritance from our forefathers but on loan from our children. So we have to handover to them at least as it was handed over to us."

Mahatma Gandhi

Meghalaya

Kharshati Community Conservation

Kharshati Wildlife Sanctuary is a community initiative and an informal sanctuary, declared and managed by the local people of Ri-Bhoi district of the Khasi Hills, Meghalaya. This 1,000 acre land belongs to a clan of chieftains of the Kharsit Community. Rapid environmental degradation is a challenge in this region. In response, the enlightened and environmentally conscious clan gave away their land for free, for the purpose of environment and wildlife protection. The Meghalaya Environment and Wildlife Society (MEWS) showed a keen interest in the initiative and took up the task of managing the wildlife sanctuary. The sanctuary is now provided with social fencing. MEWS promotes the rehabilitation of wild animals in this area. Injured, stray animals caught elsewhere are released in the area and are taken care of. Because of this protection, regeneration has begun at a good pace. Presently dominated by pine trees, the habitat type is that of a moist evergreen forest, with species of *Eugenia, Quercus, Castanopsis,* and *Mitchellia* emerging as the climax species when full regeneration is attained. Birds, reptiles, rodents and other smaller animals have been reported since regeneration. Hunting is totally discouraged in the area by the local people. All efforts are being made to protect the area with voluntary help to allow for regeneration.

Source: Innovation in Local and Global Learning Systems for Sustainability: Traditional Knowledge and Biodiversity – Learning Contributions of the Regional Centres of Expertise on Education for Sustainable Development, UNU-IAS, Yokohama, Japan

All India

Monsoon Prediction in India

Kerala welcomes the monsoon into the Indian mainland. The state flower of Kerala is Amaltas (*cassia fistula*) which is commonly known as the Indian laburnum (Golden Shower tree). It is believed that the Amaltas blooms in abundance, about 45 days before the onset of monsoon.

In Saurashtra, farmers anticipate a drought if 'the velocity of wind is low during Mrigshirsh constellation and is accompanied by absence of high heat during Rohini.

The Bhil tribes of Rajasthan prepare for a drought when 'extra bushy Khair trees and the wild cucumbers sprout everywhere'.

On the other hand, farmers in the dry lands of Andhra Pradesh observe that good foliage of the tarmarind (*Imli*) trees (*Tamarindus indica*) indicates good monsoon while rich foliage of mango tree warns of an upcoming drought.

In Uttar Pradesh, as the flowers of *palash* tree (*Butea monosperma*) fall, people prepare for the monsoon, and 'it's time to go to the field (raining time)' when the fruits of *Jammun* (*Syzygium cumini*) are ripening'. In most of northern India, the interpretation of the direction of wind during Holi and Akshaya Tritiya can foretell monsoon - 'wind from north or west suggests good monsoon while wind from east indicates drought'.

There is a saying in the state of Assam, '*aameaanebaan, kothaleaanedhann*' meaning abundance of mango brings flood (very heavy rain), that of jackfruit indicates good production of rice, meaning good monsoon. There are other sayings like when 'sparrows bathe in dust' or 'many bees enter the hive and none leave', one could expect rain in a couple of days. Similarly, it is said that 'a crow crying during the night and an owl crying during the day time', will bring drought. If dragon flies fly in a group at three-four metres above the ground, it is a sign of rain. Goats flapping their ears restlessly, sheep huddling, owls hooting and frogs croaking are signs of the arrival of rain.

Source: Bhuyan, B (2014) Monsoon Prediction: the Use of Traditional Knowledge, Sai Om Journal of Science, Engineering & Technology, A Peer Reviewed International Journal, Volume 1, Issue 7.

Tripura

Night-Flowering Jasmine and Weather Prediction

Rain fed farming communities in Tripura often rely on the behaviour of the night flowering jasmine (*Nyctanthes arbor-tristis*) to forecast rainfall intensity. It has been documented through discussion with local people that flowering is a good indicator for prediction of long and short range precipitation.

Source: Acharya S, (2011) Prediction of Rainfall Variation through Flowering Phenology of Night-flowering Jasmine (Nyctanthes arbor-tristis; Verbenaceae) in Tripura, Indian Journal of Traditional Knowledge Vol.10 (1), January, pp 96-101.

Madhya Pradesh

Baiga Weather Science

The Baiga tribals of Madhya Pradesh have a well developed system for rainfall prediction, according to which they alter the timing and composition of their crops. In *bewar* cultivation, sowing has to be done just before the first gentle showers of early monsoon. This makes accurate prediction of these first showers crucial. Baigas in Dindori district do it with the help of a local tuber known as *baichandi kanda*. They plant it in *badi* (vegetable garden) in summer, and when it sends its first shoots up through the ground, they know that rains will be here in a week or 10 days. That is the signal for them to start burning the undergrowth to prepare for sowing.

Another signal for the coming monsoon is the *peepul* (*Ficus religiosa*) tree. When the tree has shed all its old leaves and the process of sprouting new leaves is complete, the Baigas know that rains are about two-three weeks away. These two nature signals taken together usually give a sufficiently accurate estimate, according to the local farmers.

The proportion of different millets to be sown in the *bewar* is decided through weather prediction too. In late summer, a tiny insect called *ghunghuti* appears in droves in the open spaces. When there are too many of those, they get in the people's eyes. This is believed to be an indication of a heavy rainfall that year, and they plant more *kutki*, according to the people of Bhalu Khodra village in Mandla district of Madhya Pradesh.

Source:http://www.downtoearth.org.in/news/how-central-indian-tribes-cope-with-climate-change-impacts-43226, accessed 13.9.15

Mizoram

Bio-indicators for Weather Forecast

In Mizoram, people who believe that some living organisms are able to predict the weather ahead have carefully selected fifteen bio-indicators. The bio-indicators are based mainly on the recognition of unique situations: the behaviour of insects, birds and mammals; characteristics of plants; location, timing and patterns of clouds; lightning, wind, moon, sun and stars. The successful application of this forecasting knowledge is based on comparison with past events, good prognosis, close observation and a thorough understanding of the local environment. In recent times, based on such indicators, community members, cultural leaders and local elders have observed anomalies in the weather, with unusual rains and abrupt changes in temperature.

Source: Chinlampianga, M , (2011) Traditional knowledge, weather prediction and bioindicators: A case study in Mizoram, Northeastern India,Indian Journal of Traditional Knowledge Vol. 10(1), January, pp. 207-211, accessed 13.9.15

Manipur

Weather Forecasting with the Help of Plants by the Meiteis

About ten plant species of different families are said to be used by the *Meitei* community of Manipur to forecast weather, to predict natural calamities and as taboos to help avoid negative events in agriculture. Out of these ten, four species namely *Alocasia indica*, *Brassica campestris*, *Hibiscus cannabinus* and *Mangifera indica* are used in their food while *Platycerium wallichi* is cultivated as a decorative pot plant. One of the species, namely *Quercus serrata,* is not cultivated in private lands.

Source: Singh, H B (2011): Plants Associated With Forecasting and Beliefs with in the Meitei Community of Manipur, Northeast India, Indian Journal of Traditional Knowledge, Vol. 10 (1), January, pp. 190-193.

All India

Local Products from Local Material: The Broom

The traditional Indian broom is made from a grass plant that grows in abundance as a weed all over India. The grass's stem hardens up when it dries. The women bind the grass with a twine as a bunch and the result is what has kept Indian homes clean for centuries. Brooms can be used manually by everyone, and are available in different sizes.

It is low cost and does not require electricity like the vacuum cleaner. The relevance of the broomstick remains, be it in the rural lifestyle or the urban.

Brooms used in indoor spaces tend to be made out of tender leaves and delicate fibres, including the flowering ends of the *panni* grass called *sirki*, and the thin stems of the *daab*, *kaas* and *jeniya* grasses, among other varieties. Brooms are even made of coconut leaflets.

Source:http://www.deccanherald.com/content/214618/time-groom-grass-brooms.html- accessed on 14/9/15
http://www.arnajharna.org/English/Broom_Types_of_Brooms.aspx, *accessed 23.9.15*

All India

Biodegradable Leaf Plates

Leaves of *Butea monosperma*, *Butea superba*, sheets of *Arecca palm* - *Shorea robusta* and *Bauhinia vahlii* - are used to make plates for serving food as well as packaging in different parts of the country like Madhya Pradesh, Odisha, Jharkhand, Kerala and Chhattisgarh. These plates are eco-friendly and are easily disposable. They are dried under the sun and then sewed together by hand. They are biodegradable; so even if thrown away after use, they do not generate a problem with disposal.

Banana leaves are used in southern India as plates and for packaging as these are considered a healthy alternative to paper or plastic packaging. Banana leaves contain antioxidants like polyphenols which are believed to fight cancer. Packing eatables in a banana leaf also adds a natural flavour to it.

Sources: http://www.nird.org.in/RuralTechnologyPark/RTP%20Technology%20Leaf%20Cup%20&%20Plate.html- accessed on 14/8/15

http://www.quora.com/Why-is-traditional-food-served-on-a-banana-leaf-in-the-states-of-South-India- accessed on 17/8/15

http://www.leafplate.com/about-us.html- accessed on 17/8/15

Kerala

Best Out of Waste: Charcoal from Coconut Shells

Shell charcoal is an important product obtained from the coconut shell, which is often considered a waste product. It is also used to make big spoons with bamboo handles.

Shell charcoal is used widely as domestic and industrial fuel. It is also used by blacksmiths and goldsmiths and in laundries. Shell charcoal is also used to produce activated carbon. Activated carbon produced from coconut shell has specific advantages as the raw material can absorb some inorganic and organic compounds, such as hydrogen sulfide (H_2S), ammonia (NH_3), formaldehyde (HCN), mercury (Hg), and the radioisotope iodine-131 (^{131}I).

Source: http://www.coconutboard.nic.in/charcoal.htm-accessed on 20/9/15

"Every tree
in the forest was the All-Giving Tree,
every bush
the life-reviving herb,
every stone the Philosophers' Stone,
all the land a pilgrim's holy place,
all the water nectar against age,
every beast the golden deer,
every pebble I stumble on
the Wishing Crystal:
walking round
the Jasmine Lord's favourite hill."

Mahadeviyakka

Meghalaya

The Living Root Bridges

The living bridges of Meghalaya epitomise the true spirit of sustainable living. Meghalaya is one of the world's wettest regions, receiving some of the highest rainfall ever recorded. One of the challenges that rears-up every year is that of the raging rivers. Crossing these rivers becomes a near impossibility due to the intense rains and wild torrents. However, the people of Meghalaya have been practising a centuries-old tradition of coaxing tree branches and roots to form natural bridges to overcome these torrents.

This epic project of building 'natural' bridges is too big for any one generation to complete on its own. Therefore the knowledge of building these bridges is traditionally passed on to successive generations by the elders.

Source: Parampara Catalogue, Report to Ministry of Culture, 2012 developed by CEE

All India

Natural Colours in Art and Dance

India has the long tradition of using diverse natural colours in different art forms. These colors were mainly processed from plant and mineral products. From the second century BC onwards, plant and mineral products have been used in the murals of Ajanta. The artists of the murals of Ajanta painted the roofs and walls of dark caves to perfection.

Even today mural artists in India use natural colours in their work. Blue came from Indigo, green from Indigo mixed with plant gum, black from burnt wicks soaked in oil, yellow came from the *rubia* plant and red from mineral earth. What is important is that people relied on natural resources for the realization of their art forms.

Dance forms like Kathakali and Theyyam also used mainly plant based colors (green and blue) for their facial make up. These are still used today. The *solanum* plant is used to decorate the eye so as to match with the color scheme of the costumes.

Kerala

Natural Fibre from Coconuts

Plastic ropes which are widely used take years to degrade. Coir, a natural fibre that is extracted from the husk of the coconut, is extensively used for making products like doormats, brushes, mattresses and other items in Kerala and other parts of India. Coconut fibre is found between the hard, internal shell and the outer shell of a coconut. It makes up one third of the coconut pulp which would have otherwise been considered waste and thrown away. Coir can rightly be called an example of best out of waste!

Coconut fibre ropes have been used in ancient times by Indian navigators who used to sail their ships to different countries. There is more lignin (a complex woody chemical) in mature coir fibres, but less cellulose than fibres such as flax or cotton. This makes coir much stronger, although coarser and less flexible.[1]

The benefit of using coir rope is that it is relatively waterproof and its natural fibres are resistant to damage by seawater.

Source: Ladders: The History and Science of Elevation by Robert D. Cohen https://books.google.co.in/books?id=yksnCAAAQBAJ&pg=PT33&lpg=PT33&dq=coirs+are+waterproof&source=bl&ots=pLRIzLSm2E&sig=54oj1y_zi6k8b_RZsA8hhUPE5Y&hl=en&sa=X&ved=0CE0Q6AEwCGoVChMIkfehiL34xwIVgQOOCh2MMgkA#v=onepage&q=coirs%20are%20waterproof&f=false-accessed 17/8/15

http://onevillage.org/coirsociety.htm-accessed 10/9/15

Biodiversity

Celebrating Biodiversity

Orissa

Chhadakhai

Chhdakhai is celebrated by the people of Odisha when the holy month of Kartik (October-November) has ended. Since Kartik holds great significance for Lord Vishnu and Shiva devotees, it is celebrated with great enthusiasm and devotion. People fast and go without food, and also hold and/or attend religious functions during this month. Abstinence from meat and fish is part of the fasting during this period. Abstinence from meat and fish is rooted in the fact that, during this month, fishes are in gravid stage or spawning their eggs. Not disturbing them shows a deep rooted respect for biodiversity.

The day after Kartik Purnima, that is, full moon, people free themselves from this religious practice.

Source: http://blog.onlineprasad.com/kartik-month-2013-rituals-and-significance/ accessed 12.9.15

http://incredibleorissa.com/chhadakhai-today-odisha-celebrates-eating-non-veg/ accessed 12.9.15

www.paramparaproject.org accessed 12.9.15

Uttarakhand

Khatarua

Khatarua is the special festival of the pastoral-agricultural Kumaon community in Uttarakhand and is observed annually on the first day of Ashvin, the seventh month of the Hindu calendar. The festival is celebrated to acknowledge the role of farm animals and is believed to protect rural livestock from all evil.

Khatarua heralds the arrival of autumn, an important harvest season for the agriculture dependent community. During the festival, villages are aglow with bonfires, as people believe that fire has the capacity to put an end to evil forces.

Khatarua marks the onset of winter in the cold mountain villages of Kumaon. It reminds people of the necessity of gathering firewood and fodder, which is required for the winter months. Animals are taken special care on this day. According to native elders, the heap of grass should be up as high as the head of the cow, a metaphor meaning that cows must be fed to the maximum. This relates to the importance of cows in celebrating Khatarua.

Source: www.paramparaproject,org accessed 12.9.15

Deccan Region

Mobile Biodiversity Festival

On 14th January 2011, women from 70 villages where the Deccan Development Society (DDS) is active, vowed to guard their traditional wealth of biodiversity farming. This was at the 13th Annual Biodiversity Festival organised by DDS - a festival organised to celebrate the return of local seeds into active farming systems and a time for the farmers of the Deccan dryland region to celebrate their food systems, seed sovereignty and rich biodiversity. The Festival not only symbolises the celebration of the agri-biodiversity of the region but also the way the poor and the women have retrieved their dignity and autonomy.

Since 1999, the annual Mobile Biodiversity Festival of DDS has made its presence felt as a unique festival of rural communities, dialoguing with fellow farmers and citizens about ecologically sustainable agriculture, community-seed sovereignty and the ideas of local production, local consumption and local markets.

A colourful caravan of tastefully decorated bullock carts, heralding the joys of food sovereignty, journeys across villages in a selected area. It symbolises an agrarian system which is capable of sustaining the lives and livelihoods of the entire rural community. Hundreds of traditional varieties of seeds (of the Deccan dryland region) are displayed in the caravan, which is welcomed by the people of all the villages it passes through.

Source: www.paramparaproject,org accessed 12.9.15

Rajasthan

Pushkar Mela

The Pushkar Mela is held in the town of Pushkar in Rajasthan. In this annual five day camel and livestock fair, over 25,000 camels are traded each year. The fair draws thousands of tourists, camels, camel traders, camel racers and locals, besides religious leaders who come to bathe in the sanctified Lake Pushkar on the final auspicious day which falls on Kartik Poornima, or the full moon day of the month of Kartik. The camels are decorated with jewellery to fetch a better price. Camel races are organised to showcase their prowess in darting across the deserts. The cattle fair at Pushkar has a long history, believed to date back to the time of Emperor Jehangir. Traditionally a camel trading event, the Pushkar Mela has now become an international tourist attraction.

Source: http://www.paramparaproject.org/rajasthan-social-rituals-festivals.html

Sustainable Future: Perspectives from Ancient Indian Wisdom

Sustainability is a highly discussed topic these days. Much of these discussions revolve around *economic sustainability* and *environmental sustainability*. But even in these two dimensions, the conversations as well as policy initiatives seem inadequate, even though heads of governments, regulatory agencies and businesses are in the fray.

Let us look at the issue of global sustainability. There is a widespread fear that if economic sustainability is not restored, economies will stop growing, jobs will be lost, earning potential will come down and people will have to do without necessities. The solution to this problem is one that arises out the dominant American prescription: 'shop till you drop'. Though it may solve the issue of economic sustainability temporarily, it may open up fault lines in the dimension of environmental sustainability. Shopping more will re-prime the consumption engine, leading to increased manufacturing and distribution of goods and services. The economy will flourish and lost jobs will resurface.

Economic Sustainability Vs Environmental Sustainability

In order for the consumption engine to run full steam, we need to create conditions to discard items and buy new ones – what is called obsolescence. Until a few years back, the prevailing idea was *planned obsolescence*. This translates to designing equipment or a part such that it cannot be repaired after a certain time period, it has to be replaced.

But today the trend is perceived obsolescence – an item should be thrown away even when it is in good working condition and a new model favoured!

This idea works on the assumption that Mother Nature is an endless bounty especially created for ruthless and mindless exploitation by the human kind. The major flaw in this model is that while economic sustainability may be resolved, the environmental sustainability becomes a serious issue. To counter this, another set of prescriptions is being contemplated, which in broadly terms is called 'protecting nature'. Little do the promoters of this idea realise that it is we who need to protect ourselves. Nature does not need any helping hand from mortals like us. When Nature invokes its in-built mechanisms for self correction, our existence will be in question! Recent catastrophes involving earthquakes, tsunamis and flash floods bear testimony to this.

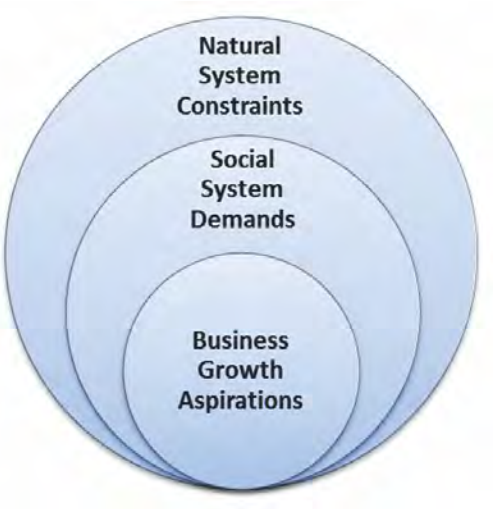
Economic Sustainability Vs Social Sustainability

There is a third aspect of sustainability that is recently receiving some attention – social sustainability. Reducing the gap between the rich and the poor, raising the standard of living are some of the issues being discussed to address social sustainability. But the intricate connection between the three types of sustainability is still elusive. The Occupy Wall Street movement and the globalisation issues in developing countries do point to the interplay between economic and social sustainability. The positions taken by leaders of various countries in the multi lateral negotiations on emission control and pollution also indicate the linkages of social sustainability with economic and environmental sustainability.

Ancient Indian Wisdom Perspectives on Sustainability

Despite these experiences, much of the current efforts to address the issue of creating a sustainable future have treated these three dimensions either independently or in a serial fashion. Unless we are able to step out of this paradigm, creating a sustainable future will continue to remain like the mirage in the desert. Ancient Indian wisdom provides alternative perspective to address this issue. Some of the salient aspects of this are as follows:

- Recognising the overarching role of natural systems in all matters of sustainability: This is well documented and articulated in the numerous hymns in *Rig Veda* on several aspects of nature.
- Understanding the critical role of *mutual dependence* between the natural systems and the living and non-living entities in the Universe. There are numerous references in the *vedic* lore that conveys this idea. For example, in *Shanti Suktam*, the well-being of not just the living entities, but also of all natural systems is sought through the prayers.
- Rain was considered the key performance index (KPI) for a sustainable system. The, quantum of rain obtained was directly linked to prosperity of the universe in its entirety. Therefore several parts of Rig Veda focused on the Sun, climatic aspects and rain.



A closer scrutiny of ancient Indian literature points to a different paradigm for creating sustainable systems as illustrated in the figure. The figure points to a key transition that we need to make in creating a sustainable future. Natural system constraints are to be recognised and honoured at any cost even before other dimensions of sustainability are addressed. Once the environmental sustainability issues are recognised, the focus must shift towards creating social sustainability. Only when these two are addressed, the economic sustainability issues stand a greater chance of succeeding.

In order to understand the usefulness of Ancient Indian Wisdom to address the issue of sustainability, we shall look at a few ideas emerging out of the *Bhagavad Gita*, one of the most celebrated works in India dated much before the Christian era.

Yajña: A Model Code of Living for Social Sustainability

Yajña is a grand concept and Krishna has dealt with it in specific details in Chapters 3 and 4 of Bhagavad Gita. He mentions that when *Prajāpati* created the human beings and other living organisms (*prajas*) in the universe, He also co-created the concept of *Yajña*. He said that by honouring the principle of *Yajña*, the living beings can milch their cow of desires (*istakāmadhuk*).

सहयज्ञाः प्रजाः सृष्ट्वा पुरोवाच प्रजापतिः ।
अनेन प्रसविष्यध्वं एष वोऽस्त्वष्टकामधुक् ।। 3.10

The term *Yajña* typically invokes in our mind an altar in which offerings are made to a deity with an expectation of certain benefits. This does not convey the full spirit of *Yajña* unless we contemplate on it more deeply. The critical aspect of *Yajña* is giving (or sharing) without a sense of attachment. That is why symbolically at the end of each offering the *mantra* ends with "not mine" (न मम - *na mama*). The other aspect of *Yajña* is giving back to the system. Lord Krishna says in *Gita* that consuming oneself the endowments received without a spirit of offering back amounts to behaving like a thief (*stenaevasah*).

तैर्दत्तानप्रदायैभ्यः यो भुङ्क्ते स्तेन एव सः ।। 3.12

Lord Krishna further says that one who cooks for oneself (*ye pacanti-ātmakāranāt*) eats only sin (*bhunjatetvagham*).

भुञ्जते ते त्वघं पापाः ये पचन्त्यात्मकारणात् ।। 3.13

Three conditions emerge from the above *ślokas*. *Yajña* is about (a) sharing, (b) giving back to the system, and (c) not organising life in a pure "selfish" or "what is in it for me to enjoy" mode. These three together play the central role of ensuring sustainability in the long run. It will ensure that milching one's cow of desires will be a controlled exercise.

Yajña and Sustainability

This provides a perspective for our life along with broad guidelines to make many choices in life. We need to imbibe the value of peaceful coexistence in our daily life. This can happen only when we are able to put in place a larger framework of give and take. Ancestors in India therefore instituted the concept of *Pañca Mahā Yajñas* (Five Great Sacrifices) as our duty in order to practically implement the idea of peaceful coexistence.

- By offering *Bhūta Yajña*, we take care of small living beings around us (such as birds, domesticated animals, worms, insects). By being very conscious of the environment we can extend this idea to plants, rocks and rivers. This is the extended version of *Bhūta Yajña*. What more do you need to address the vexing ecological problems that we face today?
- By *Manusya Yajña*, we derive the joy of helping destitutes, orphans, unexpected guests, the poor and needy, by offering whatever we can (in cash, kind or food) to them.
- By offering *Deva Yajña*, we express our thankfulness for what the Gods have blessed us with (in terms of rain, and other bounties of nature) and continue to receive them in an overarching framework of mutual dependence.
- By *Pitr Yajña*, we offer our respects and deep sense of gratitude to the departed souls in our family who are responsible for what we are today.
- By *Brahma Yajña* (reciting the *vedic* hymns, *Upanishads* and other scriptures and teaching them to others), we show our enormous respect to the great seers and *rsis*, who gave us the greatest piece of wisdom that we can ever have. We also assure them by this act that this great knowledge is being handed down the generations with reverence and a sense of responsibility.

Developing a culture of sharing and giving back to the system will ensure sustainability at two levels. Sustainability of the natural systems will be a logical outcome of this process. This is because the one-way ruthless exploitation of Mother Nature will be a blatant violation of the spirit of giving back to the system. Resources will be consumed in a carefully thought out manner. Whenever natural resources are consumed, efforts will be made towards replenishing them in some manner. Even the resources will be consumed with minimum amount of wastage. All these practices were followed by our ancestors and these principles shaped their living style. A simple illustration is how every conceivable part of a plantain tree (the leaves, the stem, the flower, the fruit and even the dried part of the outer layers of the stem) are put to use in our daily life.

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पूजयेदशनं नित्यमद्याच्चैतदकुत्सयन्।
दृष्ट्वा हृष्येत् प्रसीदेच्च प्रतिनन्देच्च सर्वशः।।

Food should always be worshipped and taken with the utmost reverence. The sight of food should delight one's heart and fill it with joy. It should always be cherished whatever the situation.

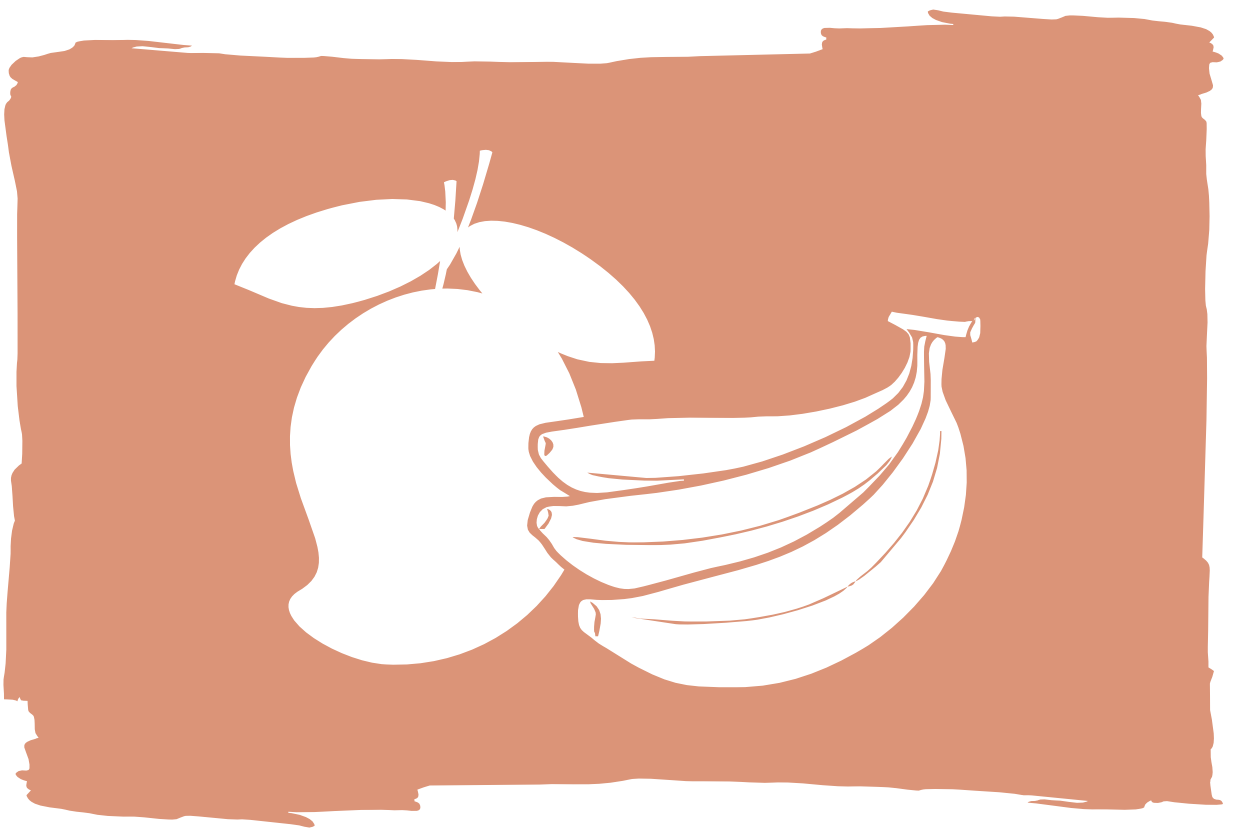
पूजितं ह्यशनं नित्यं बलमूर्जं च यच्छति।
अपूजितं तु तद् भुक्तउमुभयं नाशयेदिदम्।।

Food thus honoured gives one strength and energy. Food taken irreverently destroys both strength and energy.

अनारोग्यमनायुष्यमस्वर्ग्यं चातिभोजनम्।
अपुण्यं लोकविद्विष्टं तस्मात्तत्परिवर्जयेत्।।

Over-eating is unhealthy, shortens one's life and is an impediment to swarga meaning it prevents you from achieving higher levels of happiness and joy. It is a sin and looked down upon by people. It is therefore good to abstain from over-eating.

Pujaye & Pujitham hyasanam, Manusmriti, 2.51-52, 57



Food

Traditionally it has been an Indian way of life to revere food (Annam Brahmam or Food is God). Eating locally grown seasonal produce as well as being resourceful and preventing the waste of food has been an accepted practice . Indian societies have numerous examples of the creative use of extra food thereby minimizing the waste of prepared food thus promoting sustainable consumption. In Eastern India for example, any cooked rice that is not consumed is often left to ferment overnight to be had as breakfast the following day. In North India, leftover lentils are mixed with wheat flour to prepare breads for breakfast. In Western India, leftover *rotis* are roasted into a snack which can be preserved without refrigeration and consumed over several months without refrigerators.

The Indian diet is primarily plant-based (grains and vegetables). This in itself decreases the carbon footprint. Also, this rich plant-based diet ensures popular demand for the conservation, and continued protection of the complex and rich biodiversity of India which has over 1000 varieties of mangoes and over 50,000 varieties of rice. These food varieties are grown in different climatic conditions thus ensuring food security and increasing India's adaptive capacity.

Indians also have environment friendly ways of preserving food for days and sometimes even months or years, without the use of fossil fuel based energy. Sun drying, pickling and fermenting are ways in which food is preserved for longer periods. These processes also help in extending the availability of seasonal food while preventing waste and saving energy. For example, mangoes are available round the year as mango bars (Aam Papad) or pickles.

The Indian way of life has been to eat seasonal food, a principle encouraged by traditional Indian medicinal systems. This decreases the ecological footprint by reducing the energy requirements involved in the processing, packaging, storing and transportation of food which is non local and non seasonal.

The carbon footprint of food wastage is estimated at 3.3 billion tonnes of CO_2 equivalent of GHG released into the atmosphere per year. According to the Food and Agricultural Organisation (FAO), 1.3 billion tonnes of food which is estimated to be a third of all food produced for human consumption, is lost or wasted every year around the globe. Food losses represent a waste of the resources used in production such as land, water, energy and other inputs thus increasing greenhouse gas emissions.

Food

All India

Naturally Fermented Food for Healthy Living

Fermentation inhibits the growth of food spoiling microorganisms. In India, many snacks are prepared through a process of natural fermentation where yeast is captured from the atmosphere rather than added specially. *Leuconostoc mesenteroides*, *Streptococcus faecalis* and *Pediococcus cerevisiae* are the significant microorganisms involved in the fermentation process. The batter becomes leavened by CO_2 gas which also enhances its flavour.

Idli is one of the most popular traditional fermented foods, prepared and eaten all over India, particularly in the southern parts of the country. *Idli* is an leavened steamed cake made from rice and unhulled black gram *dhal* and is a good source of protein. Since it is easily digestible, it is also used as food for infants and convalescents. Traditionally *idli* fermentation is a natural process where yeast and benign bacteria are captured from the atmosphere when the batter is left overnight to ferment before being cooked the next morning. Sometimes, sour buttermilk or yeast is added to speed up the fermentation.

The fermentation process fortifies *idli* with proteins and vitamins, especially B complex vitamins, *Idli* fermentation is accompanied by an increase in total acids, batter volume, soluble solids, reducing sugars, non-protein nitrogen, free amino acids, amylases, proteinases and water soluble vitamins.

Dhokla and *Khaman* eaten in Gujarat are also made by fermentation. *Dosa* batter is the same as *idli* but made thinner by adding water.

The leavened *dosa* batter is baked on a hot pan as thin, crisp pancakes while *idli, dhokla* and *khaman* are steamed as soon as the batter is leavened and acidified.

Health benefits of this process include a combative role against lactose-intolerance, high cholesterol level, cancer and diabetes. Valuable enzyme-producing microorganisms have also been isolated from the traditional fermented foods. The acid content in these fermented foods retard the growth of food poisoning and food spoilage organisms.

Source: http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijtk/Fulltextsearch/2007/January%202007/IJTK-Vol%206(1)-January%202007-pp%20111-120.htm accessed 10.8.15

http://www.yogahealer.com/ayurveda-and-fermented-foods/accessed 10.8.15

https://www.academia.edu/8906832/Future_of_Idlis_A_Scientific_Assessment_A_Study_on_South_India_s_Most_Preferred_Breakfast_Cereal accessed 23.9.15

All India

Minimising Energy Consumption for Food Preservation by Fermentation

Fermentation is a valuable indigenous food preservation method. It not only preserves foods, but also creates more nutritious and palatable foods from simple ingredients. Species of bacterial genera like *Lactobacillus* and *Pediococcus* produce organic acids such as lactic acid and acetic acid during fermentation which reduce the pH level. This inhibits the growth of food spoiling microorganisms.

Arunachal Pradesh

Gundruk

The Adi tribe of Arunachal Pradesh converts leafy vegetables into a fermented acidic product for long term use and preservation. Leaves of Lai *saag* (mustard greens - *Brassica juncea*), mustard and cauliflower are wilted, shredded, crushed mildly and pressed into an air tight earthen jar or container and fermented naturally for 7-10 days. The freshly fermented *gundruk* is removed from the jar and sun dried for 3-4 days.

The mixture can be used for over two years without refrigeration. This is a very popular product and is sold in all local markets. It can be used to make soup or as a pickle.

The traditional process of *gundruk* fermentation results in a loss of 90% of the carotenoids. *Gundruk* has high concentrations of calcium and magnesium, thus acting as a source of minerals to people during off season. *Gundruk* soup has appetizer qualities in an otherwise bland and starchy diet. One of the main advantages of fermentation is extending the shelf life of foods while retaining their wholesomeness, acceptability and overall quality.

Source: Knowledge of Traditional Fermented Food Products Harbored by the Tribal Folks of the Indian Himalayan Belt by Nazish Nehal

http://www.ripublication.com/ijafst_spl/ijafstv4n5spl_03.pdf-accessed on 8/9/15

http://www.bdu.ac.in/schools/biotechnology/industrial_biotechnology/sekardb/pdf/food/5.pdf, accessed 8.9.15

http://www.ripublication.com/ijafst_spl/ijafstv4n5spl_03.pdf accessed 8.9.15

http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijtk/Fulltextsearch/2009/January%202009/IJTK-Vol%208(1)-%20January%202009-%20pp%2089-95.htm accessed 8.9.15

Himachal Pradesh, Punjab

Chemical-free Leavened Breads

Bhatooru, marchu and *chilra* are leavened breads or *rotis* that constitute the staple food of people in rural Himachal Pradesh. The best part about these breads is that they do not require the addition of any chemical additive as leavening agent. Thus, these breads come across as environmental friendly options for food. These are made out of wheat/ barley/buckwheat flour and are rich in lactic acid bacteria as the dough is set aside for fermentation.

Bhatoora of Punjab and *marchu* of Himachal Pradesh is deep fried in oil. *Marchu* is usually the food served during festivals, religious and marriage ceremonies, while *bhatooru* and *chilra* are eaten regularly, served with coriander chutney, potato and mutton soup.

Source: http://www.ripublication.com/ijafst_spl/ijafstv4n5spl_03.pdf accessed 8.9.15

All India

Energy Saving Milk Preservation Techniques

Dahi is a lactic acid fermented product of cow or buffalo milk. *Rabdi* is a milk-cereal based fermented product made from cooked maize flour and buttermilk. Other fermented milk products like *paneer, shrikhand, mistidahi* and *chhurpi*, are used all over India. All these foods are milk products made by fermentation, which creates a healthier, palatable and value-added dish.

In Himachal Pradesh, milk is fermented to make a variety of products some of which have a very high shelf value. *Churpa* or *churpe* is made by boiling buttermilk, and discarding the water. The solids are then dried and made hard, and are used to make soups called *churpa* or *churpe*. *Nudu* is a ceremonial food prepared by cooking wheat flour in milk with a small amount of salt and is eaten with ghee. As fermentation does not require any energy input, it is a low-energy method of production.

Kadi is prepared by simmering a mixture of buttermilk, *besan*/gramflour and spices. it is consumed during summer. It is known to be a great appetizer and helps in digestion because of good bacteria in the *dahi*.

Source: http://www.ripublication.com/ijafst_spl/ijafstv4n5spl_03.pdf

http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijtk/Fulltextsearch/2007/January%202007/IJTK-Vol%206(1)-January%202007-pp%20111-120.htm accessed 10.9.15

South and East India

Banana Leaf Plate for Healthy Eating

In many parts of the country food is served on the banana leaf plate since it is considered healthy. When the hot food is placed on the leaf plates, nutrients emanate that further enrich it and adds aroma to the food. Natural antioxidants called polyphenols found in many plant based foods is abundant in banana leaves.

As an act of purification, before serving the food, water is sprinkled on the leaf. The use of banana leaf has been prevalent since ancient times because it is considered hygienic and is easily disposable. Banana leaves are preferred over other leaves since they are big, thick and can carry dishes easily. Banana leaves just need to be rinsed with a little water, and do not need to be washed with soap, so the food stays chemical-free. Moreover, sitting on the floor was recommended as the repeated bending of spine was known to improve the blood circulation.

Source: http://food.ndtv.com/food-drinks/a-bite-at-a-time-foods-traditions-from-ancient-india-1206447 -accessed on 20/10/15

All India

Winter Foods for Warming

Winter chills often lead to mineral deficiencies in the body that can be only replenished by a proper diet. Winter is also the best time to binge on seasonal delicacies that helps you keep warm and strengthen the immunity. Different communities have their own delicacies for winter. In Punjab *Sarson da Saag* (Mustards Green) is a popular traditional dish which is made in winter. *Sarson* is abundantally available in this period and has multiple nutritional benefits. It is packed with iron and protein and also has anti-inflammatory and anti-oxidant properties that make it a beneficial vegetable for the winter months.

In Gujarat *undhiyu* is made with flat beans (*papdi*) available in this area during winter. *Papdi* is made with heat generating spices along with brinjal, sweet potatoes and peas to make a fiery dry vegetarian stew. *Methi* or Fenugreek is an important ingredient since it contains abundant of minerals, vitamins, fibre and phytonutreints that help keep the cold at bay.

Source: http://www.healthbenefitstimes.com/health-benefits-of-mustard-greens/ -accessed on 20/10/15

All India

Forests as a Resource for Local Food

A large deciduous tree, usually with a short bole, spreading branches and a large rounded crown, it is one of the most important forest trees of India. Women collect the fleshy corollas of its flowers which are eaten raw or cooked, or dried, ground and mixed with flour for making cakes, or distilled into spirit. A thick white oil extracted from the seed is used by tribals for cooking and burning, and is sold for the manufacture of margarine, soap and glycerine. The tree is never felled owing to the value of its flowers and fruits. Even when forest land is cleared for cultivation, the *mohwa* trees are carefully preserved and are found scattered over cultivated lands long after clearing has taken place. Trees bear crops of flowers and fruit when about ten years old and yield about 40 kgs. of flowers per year. In 1897 and 1900, serious famine years in Central India, the profuse blossoming of *mohwa* flowers was a famine insurance for the tribals. It is not surprising then, that to the forest dwellers of Central India, the *mohwa* is the tree of life.

In non-tribal areas, too, forests provide food and livelihood through critical inputs to agriculture, through soil and water conservation, and through inputs of fodder and organic fertilizer. Indigenous sylvicultural practises are based on sustainable and renewable maximisation of all the diverse forms and functions of forests and trees. This common sylvicultural knowledge is passed on from generation to generation, through participation in the processes of forest renewal and of drawing sustenance from the forest ecosystem. In both forest and agriculture based economies, it is primarily women who use and manage the produce of forests and trees. In the Himalaya, where tree fodder is predominant in the agricultural economy even today, older women train the younger ones in the art of lopping (pollarding) and of collecting forest produce. In other regions also, lopping cycles and practices had evolved to maximize fodder production. Since food gathering and fodder collection has been women's work, primarily, women as foragers were critical in managing and renewing the diversity of the forest. Their work was complementary to that of men. The public and common domain of the forest was not closed to women - it was central to supporting life in the 'private' domain, the home and community.

Source: Shiva, Vandana. Staying Alive, London: Zed Books, 1988. pp. xv-xvi. Print.

All India

Manual grinding for Added Nutrition

Traditionally, *atta* or wheat flour in India is obtained by grinding with a stone grinder. Since the flour stays cool during the grinding process, the flour created by stone grinding is more nutritious. Electric grinders heat up the flour, which denatures most of the vitamin content. It also spoils faster than the manually ground wheat which has a higher shelf life.

Source: Himalayan Fermented Foods: Microbiology, Nutrition, and Ethnic Values by Jyoti Prakash Tamang, CRC Press, 2009, pp. 98-accessed on 20/10/15

Assam

Grinding Rice with *Dheki*

A dheki is an household tool in Assam used for threshing. It is used to separate rice grains from their outer husks, while leaving the bran layer, thus producing brown rice. It was generally operated by two or three women and consists of a heavy wooden lever, supported on a pedestal which provides a fulcrum. It is operated by stepping on it and does not require fossil fuel generated energy. At one end of the lever is a vertical wooden cylinder which functions as a pestle. It is raised by the lever, and that falls down by its own weight. The fulcrum of the lever is placed at five-eighths of the length of the lever from the pestle.

Source: https://en.wikipedia.org/wiki/Dheki,accessed on 20/10/15

All India

Thaali: A Wholesome Meal for Healthy Living

"Thali" literally means a round plate. It is a typical wholesome meal which is served in each part of the India and is region specific. Arranged on a thali are multiple saucers of varied items with different tastes which are organized in a particular order. The dishes are slow-cooked and the organization in the plate is such, that digestion is optimized and one receives right combination of nutrients. The thali usually comprises of light curries, lentils, rice and Indian breads. Accompaniments like homemade chutneys, pickles and crisp papadums also form an integral part of the thali.

The thali being a significant part of the Indian culture and heritage also offers a scientific approach towards nutrition. In accordance with the traditional systems of medicine, when proceeding around the plate one will eat proteins, carbohydrates and fats- the three important elements for sustenance. It represents the food pyramids of today with carbohydrates in the form of grains, fruits and vegetables for fibre and dairy product like yoghurt for nutrition. It's a balanced diet where variety is at its best.

Source: http://food.ndtv.com/food-drinks/a-bite-at-a-time-foods-traditions-from-ancient-india-1206447-accessed on 20/10/15

http://vashiva.com/thali-the-perfect-south-indian-meal/-accessed on 20/10/15

Food

Preservation by Pickling

Long before the use of refrigerators, ancient civilizations had discovered the secret of storing perishable food for longer periods. It was also a method of storing fruit and vegetables to be eaten off-season. The method involved sun drying the fruit or vegetable or fish/meat and storing it in a salt/lemon/sugar solution.

Making pickles does not require fossil fuel based energy since it involves sun-drying and uses solar energy. Almost all vegetables are pickled depending on the cuisines of the communities. Commonly pickled food includes raw mangoes, lemons, carrots, jackfruit, garlic and chillies. Meat, fish and prawns are also pickled in some parts of the country.

Pickling in India is considered an ancient art in which food is preserved by treating it with salt, sugar and other spices. No Indian meal is considered complete without pickles. Every state of India has its own set of pickles made out of locally available fruits, vegetables, fish or meat.

Lactic acid is produced as a by-product of pickling which gives the pickle its characteristic sour taste and tanginess. This acid acts as a natural preservative to the food and prevents any microbial growth. Pickles are also good appetizers and digestive agents.

Source: http://www.preservearticles.com/201105317287/5-self-tested-household-methods-of-food-preservation.html, accessed on 20/10/15

http://economictimes.indiatimes.com/articleshow/15547764.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst, accessed on 20/10/15

http://www.agriinfo.in/default.aspx?page=topic&superid=2&topicid=2082 , accessed on 20/10/15

Preservation by Salting

This is a good method of preserving vegetables and fruits like tamarind, raw mango, *amla*, and also fish and meat. Salt is used in dry and brine form. Not only does it prevent spoilage of foods, but also, more importantly, serves to inhibit or prevent growth of food-borne pathogens such as *Salmonella* or *Clostridium botulinum* when properly applied.Salt binds with water molecules and thus acts as a dehydrating agent in foods.

When vegetables or fruits are dried, cured with salt in airtight jars and left out in the sun, halophilic or salt tolerant bacteria naturally present on their surface digest the sucrose in the fruit or vegetable matter to produce byproducts such as carbon dioxide, acetic acid and lactic acid. It also helps in the preservation process as the vegetables and fruits can be stored without refrigeration.

Source: http://www.preservearticles.com/201105317287/5-self-tested-household-methods-of-food-preservation.html-accessed 10/9/15

http://www.scientificamerican.com/article/how-do-salt-and-sugar-pre/-accessed 6/10/15

http://www.encyclopedia.com/topic/food_preservation.aspx-accessed on 6/10/15

"May the axe be far away from you;
May the fire be far away from you;
May there be rain without storm;
Lord of Trees, may you be blessed;
Lord of Trees, may I be blessed."

Atharvaveda

Gujarat

Athana

Spicy, sweet and sour, Gujarati pickle or *athana* are made from vegetables and fruits. *Athana* are an integral part of the Gujarati meal. These pickles are usually made using oil, spiced with mustard seeds, fenugreek seeds, salt, asafetida and red chilli powder, and are usually sun-dried for some time for a longer shelf life.

Well known pickles of Gujarat include *chhundo* which is a hot, sweet and sour grated mango pickle. Raw mango *chhundo* is considered good for digestion and is enriched with vitamins. *Gor Keri* is another sweet mango pickle where raw mangoes are chopped into slices and combined with sugar, jaggery and spices.

Source: http://www.whatshot.in/cities/spicing-it-up-with-pickles-c-476, accessed on 25.10.15

https://madteaparty.wordpress.com/2007/08/02/green-chilli-pickle/,accessed on 25.10.15

http://www.tarladalal.com/Quick-Mango-Chunda-3429r, accessed on 25.10.15

https://jikoni.wordpress.com/2013/09/23/gor-keri-nu-athanu/, accessed on 25.10.15

Kerala

Unakkameen Achar

Kerala has a large variety of pickles that are made by pickling tuna and prawns. These may be mixed with fruits, vegetables, salt, spices and oil and set to mature.

For the *Unakkameen achar* or dry fish pickle of Kerela the fish is sun dried to get rid of the impurities and is then fried till it gets crisp. The dried fish is added to a jar containing a variety of spices, vinegar and water. The jar is then heated and the fish pickle is stored in the bottle till it cools down. Pickling the fish would thus make it available during the lean periods. The process also removes its strong odour.

Source: http://secretindianrecipe.com/recipe/onakkameen-achar-dry-fish-pickle, accessed on 25.10.15

http://pachakam.com/Recipes/Fish-Pickle-1109, accessed on 25.10.15

http://www.vahrehvah.com/meen-achar-fish-pickle-1, accessed on 25.10.15

Orissa, Assam, West Bengal

Recycled Recipes for Minimising Food Waste

Fermented rice food is prepared by adding water to left-over cooked rice and incubating the mixture overnight. The water is drained the next day and used to cook vegetables or mixed with buttermilk and salt for direct consumption. The fermented rice is eaten differently in various parts of India. In Orissa and Assam, it is normally eaten for breakfast. The lightly fermented rice is eaten the following morning with salt, lime and chillies. Consumption of *Pakhal*a, as it is known in Odisha has been known to prevent heat stroke in hot weather. It is a popular dish in Bengal, Chhattisgarh and Assam as well and is known as *Poita Bhaat* or *Ponta Bhaat*. In southern India, the fermented rice is eaten with salt, curds and pickle.

Eastern India grows a lot of rice and this forms the staple diet of people living in this area. Transforming the leftover rice into *Pakhala Bhaat* by a process of natural fermentation reduces the need for refrigeration, eventually saving energy. The recycling of rice also reduces the need for the consumption of fresh raw materials and minimises waste. Even the water that is poured into the rice prior to fermentation is consumed. It is also popularly believed that *Pakhala* in daily meals has health benefits: it helps to prevent heat stroke in summer which makes it the right diet before a hot day of farming in the sun. *Ambali* is similar to *Pakhala* but is a fermented product from ragi.

Source: http://homeoriyafood.blogspot.in/2010/07/summer-feast-with-pakhala-bhata.html accessed 13.8.15

http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijtk/Fulltextsearch/2007/January%202007/IJTK-Vol%206(1)-January%202007-pp%20111-120.htmaccessed 13.8.15

http://www.ripublication.com/ijafst_spl/ijafstv4n5spl_03.pdfaccessed 13.8.15

South India

Curd Rice

Much before the refrigerator was invented, South India had a system for preservation of leftover cooked rice.

Traditionally most South Indian households reared cows, which provided milk to the family and neighbourhood, and was also a source of income. Curd was readily available in most of the households. The left over rice would be mixed with salt and curd and kept in earthen pots. Curd rice (or *thairusadam* as it is known in Tamil) with pickle used to be a much sought after staple dish that could be used the next day. Curd rice is thus a food item which can be made with leftover rice and preserved without a refrigerator.

Lime rice is another way of preserving leftover rice since lime has been traditionally used as a preservative. It is also an easy recipe to serve to unexpected guests since the available cooked rice could be whipped into lime rice and served with *papad* and pickle without taking much time.

Even today, South Indians carry lime and curd rice for long train journeys, and avoid buying lunch and dinner at railway stations. This rice is usually packed in banana leaves which when heated can be folded like paper. The leaf when discarded after a meal does not create waste as it is biodegradable.

Punjab

The Art of Using Leftover Food – Dal Paratha

It is an Indian way of life to not throw away leftover food, but rather make use of it and come up with an entirely new recipe. Extra food is never thrown away. There are examples of food left over from dinner being eaten as innovative breakfast recipes or leftover lunch being used to make an entirely different dish for dinner. Each region has its own unique recipe for transforming the food. Waste food has a huge impact on our wallets and the environment. Transformation of the leftover into a new recipe minimises food wastage and the costs that go into producing it.

Lentils and legumes are an everyday source of vegetarian protein in the Indian cuisine. Very much a part of the Indian lunch or dinner, *dal* or cooked lentils is often left over. This is never thrown away and instead knead together with wheat flour to make *chapatis*/*paranthas* the next day for breakfast. *Dal paranthas* are healthy, give a nice flavour to the bread which is otherwise plain and also prevent food waste.

Source: http://showmethecurry.com/breads/missi-roti-aka-daal-roti.html, accessed on 18.10.15

Gujarat

Khakhra – The Leftover Chapati

Chapati is part of every meal of Indians, especially in the north. Throwing away the leftover *chapati* would lead to a large amount of food waste. Transforming the *chapati* to a *khakhra* not only minimises waste but also reduces the refrigeration (energy) and storage costs.

Khakhra, a very popular Gujarati snack today, was originally a way of recycling the lefover *chapati* or *roti* (Indian bread), which was dehydrated and dried to be later consumed as *Khakhra*. *Khakhra* is thus a recycled *roti*.

Pastoralists and travelers usually carry *khakhra* as it has a longer shelf life after dehydration, and can be consumed during their travels. It can be stored without refrigeration.

Source: http://www.vahrehvah.com/indianfood/khakhra/, accessed on 25.10.15

North India

Paneer

Hot Indian summers often cause milk to curdle in the absence of refrigerators. Rather than throwing away curdled milk, in many parts of India, women squeeze lemon into it to get cottage cheese or *paneer*. The milk is then boiled and passed through a muslin sieve to drain the excess water. *Paneer* is an example of converting what would have been waste into a new product.

Since *paneer* is made of protein, it releases energy slowly in the body because of which it does not cause a rise in one's blood sugar levels, nor does it give an instant boost which drops soon. *Paneer* also contains calcium which helps in building stronger teeth and bones. Though it is a milk product, it is better than milk when it comes to nutrition. Home-made *paneer* is a good low cost alternative that saves a lot of energy and electricity in comparison to the production of processed cheese, which is a huge energy and water consuming industry.

Source: http://www.thehealthsite.com/fitness/health-benefits-of-paneer-or-cottage-cheese/, accessed on 25.10.15

North-East India

Vegetable Peel Chutney

Green vegetables like bottle gourd, ridge gourd and bitter gourd are considered nutritious but often the peel is not eaten but thrown away. In north eastern India and in parts of southern India, peels are cut and ground into a vegetable chutney with spices and eaten with rice, *idli* or *dosa*. This way the vegetable is consumed entirely including the skin. The tasty chutney which is an accompaniment in a meal, also reduces waste at source.

Source: https://spicyrasoi.wordpress.com/2013/01/08/chayote-peel-chutney-seema-vanakaya-thokku-pachadi/, accessed on 25.10.15

http://indianhealthyrecipes.com/peanut-ridge-gourd-skin-chutney-heerekai-sippe-chutney/, accessed on 25.10.15

http://www.hindustantimes.com/brunch-stories/why-fruit-vegetable-peels-are-good-for-you/article1-826255.aspx, accessed on 25.10.15

http://www.dnaindia.com/analysis/column-thought-for-food-why-waste-it-1924612, accessed on 25.10.15

Food

Sikkim

Eating Local for Low Food Miles

Bamboo is grown extensively in the north eastern part of India and forms an essential part of the diet, be it as a condiment or as main course. The communities have devised several methods for its preservation to increase shelf life so that it is readily available.

Bamboo shoot is a popular food item of Sikkim and Darjeeling. It is prepared from fermented bamboo shoot. *Mesu* is prepared in the months of June to September, when the bamboo shoots sprout and is usually made from locally available bamboo species, which makes it a climate friendly option. The soft shoots are defoliated, chopped and pressed tightly into a hollow green bamboo stem. The tip of the stem is then covered tightly with leaves and left to ferment for 7-15 days. *Mesu* is mostly consumed as pickle and can be used for a long time without refrigeration.

Source: http://www.ripublication.com/ijafst_spl/ijafstv4n5spl_03.pdf, accessed on 25.10.15

Nagaland

Enhanced Nutrition from Local Food

The Colocasia is extensively available in Nagaland and is one of the important staple foods after rice. The leaves, petioles, corms and cormels are all edible and rich in carbohydrates, starch, dry matter, minerals and vitamins.

Anishi is made from edible Colocasia leaves by the Ao tribe of Nagaland. The fresh mature green leaves are washed, staked one above the other and wrapped in a banana leaf. The packet is then sun dried until the leaves turn yellow. The leaves are then ground into a paste, and chillies, salt and ginger added to it for flavour. The paste is made into cakes and the cakes are dried over the fireplace in the kitchen. *Anishi* is eaten cooked with dry meat, especially with pork, which is a favourite dish of the Ao tribe. It is liquid in nature, sour in taste and also used as a condiment. In some cases, microorganisms responsible for fermentation can produce vitamins during the process. This results in a more nutritious end product from the ingredients.

Source: http://www.ripublication.com/ijafst_spl/ijafstv4n5spl_03.pdf accessed 8.9.15

Maharashtra

Ambil

Ambil is a slightly fermented product made with Ragi (finger millet) or Jowar (Sorghum). Ambil is a nutritious summer drink preferred both for breakfast and lunch. It is known to be a very filling drink and is said to release energy slowly into the body. Since it is filling it delays hunger and keeps one active. The 'magic potion' made of ragi, jowar and any other millets is also considered the " best" drink to beat the heat as well as to protect oneself from dehydration.

Maharashtra

Maadaga

Maadaga is a a hot liquid drink made from *Hulaga/ Kulthi* or horse gram (*Macrotyloma uniflorum*) which is said to have properties of keeping the body warm and provide energy. It is a monsoon drink in Maharashtra and the adjoining region, especially hilly areas which experience incessant rains for days together and weather is quite cold. Horse gram is grown all over Deccan region and is suited for cultivation in regions with dry climate and low soil fertility.

All India

Naturally Produced Fruit Products for Good Health

Amla (Phyllanthus) enhances food absorption, balances stomach acid, fortifies the liver, nourishes the brain and mental functioning, supports the heart, strengthens the lungs, helps the urinary system, increases skin health, promotes healthier hair, acts as a body coolant, flushes out toxins, strengthens eyesight, improves muscle tone and acts as an antioxidant.

Amla is the Indian name for the fruit of the gooseberry tree that is native to all parts of India. It is also known as *amlakka* or *amlakai* in Hindi, which means the "sustainers" or the fruit where the "goddess of prosperity resides". The fruit is round and greenish yellow when ripe. It has a hard seed inside and the pulp is the edible part.

Since the fresh fruit is somewhat sour, *amla* is often used to make a *murabba*, a sweetened preserve, to be eaten in all seasons. *Murabba* can be preserved for longer time periods. Some prepare *murabba* by soaking the *amla* overnight while others dry the *amla* prior to making the *murabba*. The soaked or dried *amla* is then simmered in a thin sugar syrup and kept aside for two days so that the sugar syrup slowly and gradually soaks into the fruit. On the third day, the *amlas* are boiled in the syrup to get a a thick honey like consistency. The entire process takes about three days.

Amla has several medicinal benefits and so *murabba* is traditionally used as a general health tonic to sharpen the mind and relieve fatigue.

Source: http://www.livestrong.com/article/271882-what-are-the-benefits-of-amla-murabba/accessed 15.8.15

http://www.tarladalal.com/Amla-Murabba-(-Rajasthani-Recipe)-3903raccessed 15.8.15

http://www.stylecraze.com/articles/amla-history-how-to-use-benefits/accessed 15.8.15

https://www.organicfacts.net/health-benefits/fruit/indian-gooseberry-amla.htmlaccessed 15.8.15

Traditional Recipes for Adapting to Harsh Weather

Bihar

Sattu

Sattu is very popular in the heat of summer as it has a natural taste and is easy to digest. In Bihar and Jharkhand, where summer temperatures rise to unbearable heights, *sattu* is consumed as a nutritious indigenous drink which has a cooling effect on the body.

Since it is prepared by roasting gram flour, it is healthy and has a high shelf life. Its high fibre content makes it healthy for the intestines. As it has a low glycaemic index, it is also a good food for diabetics. It is also used as a baby food since it is easily digestible but can be consumed by all age groups.

Source: http://zeenews.india.com/news/health/healthy-eating/health-benefits-of-sattu-drink-in-summer-season_1606834.htmlaccessed 15.8.15

http://www.thehealthsite.com/fitness/health-benefits-of-sattu/accessed 15.8.15

http://www.tourismandfood.com/dishes/shake/refreshing-summer-drink-of-india-sattu-drink/#sthash.BqJhh6ex.dpbs accessed 15.8.15

All India

Aam Panna

Aam Panna is a traditional refreshing cooler made from raw green mangoes and jaggery, and consumed during the hot summer months when mangoes are in season. This sweet and sour summer drink, also known as *Kairi Panha*, works as a digestive and helps build resistance against summer ailments related to digestion. It is said to keep the stomach cool. It prevents loss of sodium chloride and zinc from one's body due to excessive sweating.

Aam Panna has a high iron content and so it helps fight diseases associated with iron deficiency. It is rich in vitamin C and in antioxidants which help in fighting cancer.

Source: http://www.dnaindia.com/health/report-five-reasons-why-you-should-try-aam-panna-this-summer-1827309- accessed on 23/9/15

http://www.skymetweather.com/content/health-and-food/aam-panna-health-benefits-of-this-desi-tangy-drink/#sthash.cGOb1JrM.dpuf- accessed on 23/9/15

Gujarat

Varu - A System of Sharing Food

Varu is a concept practised in Gujarat where poorer people who provide a service to a neighbourhood, go door to door at night collecting leftovers.

In traditional habitats like *pols*, there are two basic approaches to symbiotically turn a problem of food waste into a virtue. Post dinner, the poorer sections who work in the area would go through the neighbourhoods and collect surplus food from the households. Families set aside extra *rotis*, *dal* and vegetables so that it can be given away as *varu* and is never wasted. This means no waste generated and no hungry person.

Similarly, vegetable peels, spoiled food and other organic waste are left at a street junction on a 'chat stone' to feed cats, cattle and dogs.

Source: https://khichdi.wordpress.com/category/food/, accessed on 25.10.15

Punjab

Panjiri

Gaund ke Laddu or *Panjiri* is a popular North Indian sweet made from whole-wheat flour and edible gum fried in clarified butter. The chief ingredient of this sweet is *Gaund,* an edible gum extracted from the bark of a tree, which is added to the above mixture. It is known to provide heat to the body; hence is usually consumed in the winters.

As a tradition, *panjiri* is used all over Punjab to feed women after childbirth. This rich food helps in restoring lost strength and tones abdominal muscles, apart from increasing milk production in the lactating mother. *Panjiri* is traditionally an energising and warming food. It helps to promote circulatory and lymphatic flow. *Panjiri* also helps to clear the uterus and drain away excess fluid from the mother's body after birth.

Source: http://www.thehealthsite.com/fitness/what-is-glycaemic-index-how-does-it-affect-my-health-diet-query-of-the-day/accessed 15.8.15

http://www.manjulaskitchen.com/whole-wheat-gaund-panjiri/

http://www.viratseeds.co.in/blog/panjiri-ingredients.htmaccessed 15.8.15

http://www.wellbeingwithnutrition.co.uk/index.php/blog/blog-recipes/32-blog/recipes/255-panjeeri-a-traditional-healing-food-for-new-mothersaccessed 15.8.15

http://indiatoday.intoday.in/story/Reader+radar/1/93746.htmlaccessed 15.8.15

All India

Mandaan

Mandaan is an earthen pot used for collecting waste. The *mandaan is* kept in homes to collect raw vegetable waste, leftover food and other stale food suitable for animal feeding. To this water used for washing hands and dishes is added along with special feed like rice or wheat husk powder. Sometimes *pend* or press cake residue that was left over after groundnut oil extraction is added. The mixture is then used as cattle feed.

"Gandhi spoke of the first verse of the *Isha Upanisad* as containing the essence of Indic civilisation. The verse tells us that the universe is permeated, is imbued with the presence of god. The second line of this verse teaches us the mode of being in the world that is so imbued. It teaches us to be in the world without any sense of 'mineness.' As long as any 'mineness' is ascribed to any object it cannot be pervaded by god.

This mode of being in the world, which is non-acquisitive, non- possessive and emptied of 'mineness', is the essence of being one with Nature. It is the ecological mode of being. Gandhi derived the concept of Trusteeship from this ideal. The essence of trusteeship lies in two concepts: non-covetousness and *seva* (service). This idea of trusteeship is at the heart of the current ecological thought. Only if all of us were to cultivate the attitude of trusteeship towards Nature and her bounty, could we secure an equitable access to her resources not only for us, but also for the future. Without care for the future it is not possible to be ecological in the present. *Seva* teaches us that our being in the world with others who may have competing needs has to be informed by the ideal of service to the fellow being. Service allows us to make sacrifice, allows us to share. This attitude of *seva* is possible when we are filled with *karuna*, empathy. Only those who are capable of sharing the pain of others can care for their deprivation and act in a mode of sacrificial service. This is also Gandhi's favourite hymn, *Vaishana Jana to Tene re Kahiye je pidparayijane re.* (A true devotee is one who empathises with the pain/suffering of others.) *Karuna* is the root of non-violence, including towards Nature and our shared futures."

Tridip Suhrud
Director, Sabarmati Ashram

All India

Nutrition of Groundnuts Blended into *Chikki*

Chikki is a traditional Indian sweet prepared with groundnut and jaggery. Unlike chocolates, it is prepared without adding preservatives or food colour or artificial flavours. *Chikkis* have a positive impact on health due to their high nutritive value from the proteins in groundnuts and the iron in jaggery. As a sweet, *chikki* recharges body glucose and increases energy instantly[1].

Source: http://www.gujaratirecipes.in/sing-chikki-peanut-chikki/ accessed 18.8.15

[1]http://www.gururajachikki.com/index.php?option=com_content&view=category&layout=blog&id=4&Itemid=5 accessed 18.8.15

Food

Punjab

Madani – An Energy Efficient Tool

The wooden hand blender used to make buttermilk is called *madani* in Punjabi language. An integral part of Indian culture, the *Madani* which requires no fossil fuel generated energy is an energy efficient tool. It is a simple tool that can be used for whipping and churning by hand.

Churning the fresh homemade curd with the traditional Indian hand blender has its own charm and tastes different too. Buttermilk or *chaas* as it is called, is an ideal drink to beat the heat in summers. Traditionally, in Indian villages, it is made by whipping yoghurt and water in earthen pots. The butter which floats on top is removed and the remaining milky liquid is the *chaas* or buttermilk.

Source: http://www.indiaonplate.com/soups-drinks/beverages/181-masala-chaas - accessed on 17/8/15

http://www.vegrecipesofindia.com/sweet-lassi-punjabi-lassi/- accessed on 17/8/15

[1]Madani is a Punjabi word for the traditional hand blender

Manthani – A Process of Non-mechanised Butter Making

The process of making butter from curds/yoghurt is called *manthan*. The industrial process of making butter is highly mechanised and uses energy generated from fossil fuels. Also processed butter usually consists of emulsifiers and extra salt which have adverse effects on health.

The *manthani* (Punjabi word for a churning stick made of wood) is tied by a rope to a fixed post which is usually the leg of a cot. A wooden churner stick called *phirni* is inserted into the pot containing the yoghurt. One rope holds the *phirni* to the post. Another rope is wrapped around the *phirni,* about three times. The *phirni* is rotated back and forth by pulling on the rope wrapped around it. In about 10 to 20 minutes of continuous churning, the butter-fat 'breaks' from the yogurt as butter-globules. The butter-globules clump together to make lumps of *makhan* (butter) that floats on the top. Butter can thus be made at home using only one's physical energy.

Source: www.indiacurry.com/dairy/d004makhan.htm -accessed on 17/8/15

All India

The Energy Saving Traditional Grinder

The mortar and pestle is a device used since ancient times to prepare ingredients and accompaniments by crushing and grinding them into a rough paste or powder. The mortar is a bowl, typically made of hard wood, ceramic or stone. The pestle is a heavy club-shaped object, the wider end of which is used for crushing and grinding. The substance to be ground is placed in the mortar and ground, crushed or mixed using the pestle. Traditional cooking involved stone grinding chutneys and spices instead of using the electric mixer. Grinding chutney, batter and powders in a stone grinder makes the mixture much tastier as it is uneven and coarse compared to the fluid mixture from the electric mixer. Grinding is also an exercise that strengthens the muscles of the arms!

Source: http://www.dsource.in/resource/kitchen-products/kitchen-helpers/mortar-pestle/index.html - accessed on 17/8/15

"In every part of the world we must work to evolve a new value system which dissolves the disastrous divisions between the worlds of waste and want, preserves the identity of peoples and attends to the priority areas of need for the vast majority of humankind."

Romesh Thapar

All India

Ready Juice without an Electric Juicer: India's Manual Juicer

Juice sold by local vendors in the markets or localities is popular in every state of India. Such vendors visit the residential areas with fresh, local and in-season fruits and sell juice that is extracted using a manual juicer. These juicers do not require electricity; instead the vendor rotates the machine manually and extracts the juice.

Fresh juice from seasonal fruits readily available at one's doorstep is a healthier alternative to the packed juice we buy in supermarkets. Most packed juices are stuffed with sugars that add extra calories. The packed fruit juices are filtered to remove the pulp before they are boxed to maintain fluidity of the juice. The pulp contains most of the antioxidants and fibre and to throw it away is to rid the juice of valuable nutrients. Many fruit juices are boiled before packing to kill bacteria and in the process important vitamins and natural elements essential to the body are destroyed.

Source: http://www.myfitnesspal.com/blog/diethack/view/why-you-should-avoid-packed-juices-211- accessed on 17/8/15

Food

All India

Traditional Knowledge Behind Eating Food with Hands

In Vedic tradition, the hands are said to be the conduits of the five elements-space, air, fire, water and earth. It is believed that the five elements within begin to transform food and make it digestible even before it reaches the mouth. This transformation of the food, also heightens the senses so that we can smell, taste and feel the texture of the foods we are eating. One can also hear the sounds of eating. All of these sensations are necessary to kick-start the digestion, since the body gets itself ready for the meal to come. Ayurveda tells us that disease takes hold in the body when the digestive fire is awry.

Eating food with the hands feeds body, mind and spirit. Humans eat food not only to sustain the body, but to assimilate the universe's elements and energies within the physical and emotional body.

It also protects the mouth from getting burnt. The hands act as a very effective temperature sensor. So, when one touches it, it becomes easy to gauge how hot it is and its prevents scalding of the tongue. In addition it reduces the cost of production of forks and spoons.

Source: http://www.sanskritimagazine.com/vedic_science/the-vedic-science-behind-eating-with-your-hands/, accessed on 20.10.15
http://www.thehealthsite.com/diseases-conditions/why-eating-with-your-hands-is-good-for-health/, accessed on 20.10.15

"In the beginning was He alone, sufficient unto Himself: the formless, colourless, and unconditioned Being. Then was there neither beginning, middle, nor end;

Then were no eyes, no darkness, no light;
Then were no ground, air, nor sky; no fire, water, nor earth; no rivers like the Ganges and the Jumna, no seas, oceans, and waves.

Then was neither vice nor virtue; scriptures there were not, as the Vedas and Puranas, nor as the Koran.

Then was there no activity: the Supreme Being remained merged in the unknown depths of His own self."

Kabir

Food Festivals of India

South India

Bhoomi Utsav

Mahatma Gandhi once said, "We must be a part of nature and not apart from nature". He believed in and advocated an organic way of life, and the *Bhoomi Utsav* is held every year on his birthday (2 October). The folks behind the festival want to redefine the way we not only buy or sell food but our entire relationship with food and farmers.

The festival incluudes: stalls selling organic cereals, millets, lentils, vegetables, cold-pressed oils, pollinated seeds and saplings; workshops and talks with specialists in organic farming, composting; workshops and talk sessions are held through the day on composting, renewable energy, guerilla gardening, indigenous foods, solar energy, bamboo construction, waste recycling et al. Local farmers and organic food suppliers discuss aspects of green living including the importance of organic foods, how it is grown, and how pesticides slowly poison us.

Avid urban gardeners can pick up pollinated seeds and saplings. Various makeshift café stalls sell hard-to-get traditional cuisine from all over India – like *nochundae* (a delicious steamed vada) served with doddapatre chutney (doddapatre or sambara bally is a small herb used as remedy for cold and cough, and also in South Indian cuisine); *kara kozhakattais* (spicy dumplings made out of dal); millet *dosas* with drumstick leaves; soft *idlis* made with unpolished red rice; and gut-friendly, fermented drinks. Kids can have fun at the crafts and painting corners. The main stage features entertainment throughout the whole day with folk dance and music performances as an integral part of this unique experience. The festival is organised every year by Bhoomi Network, an NGO focused on awareness and action for sustainable living.

Source: http://www.lonelyplanet.in/articles/7305/indias-best-indigenous-foods-festivals, accessed on 25.10.15

Orissa

Living Farms Adivasi (Tribal) Food Festival

The idea behind this festival is to exhibit the traditional food cultures of the *adivasis*, including their age-old agricultural practices that have provided them with food and nutritional security for centuries. This unique festival has different tribes coming together to share food wisdom, traditional know-how and recipes. It was held for the first time in February 2014 in Bisamcuttack, Rayagada, Odisha. The tribes (Kondh, Koya, Didai, Santhal, Juanga, Baiga, Bhil, Pahari Korva, Paudi Bhuiyan and Birhor) were from more than 300 villages in Odisha, Jharkhand, Chhattisgarh, Madhya Pradesh and Maharashtra. Traditional foods made from locally cultivated crops and uncultivated, forest produce were on display, served in bowls and plates made from leaves.

The event highlights sustainable methods of growing food and the *adivasis'* relationship with the environment – the forest, seeds, land and food. At the 2014 event, tribals played host, talking to visitors about the 1600-odd foods that were showcased. Of these, around 900 were uncultivated – foods found in the forest, and not grown through farming.

Source: http://www.lonelyplanet.in/articles/7305/indias-best-indigenous-foods-festivals, accessed on 25.10.15

All India

Jaggery Made from Date and Sugarcane

Jaggery, made from sugar cane juice or palm sap, reserves a distinct place in Indian culture and is used in many religious activities, rituals and customs. The sugarcane jaggery is considered sacred and is consumed before the commencement of a new venture, journey, or business endeavour. It is customarily consumed after child birth, after attending a funeral, and to celebrate any good news.

Jaggery is an integral part of almost all harvest festivals celebrated in India. In southern India, rice is cooked in sugar cane jaggery to make Pongal, a dish offered to the gods after the harvest. Similarly, in western and northern India, sweet dishes are made from sugarcane jaggery and newly harvested crops like sesame, groundnuts, rice, and wheat flour to celebrate the harvest.

In eastern India, fabulously tasty sweet dishes like rice cakes, rice puddings, porridge, milk and coconut sweets are made using rice flour, milk, coconut shredding and date palm jaggery. Date palm jaggery is also offered to gods and goddesses.

The benefits of jaggery include its ability to cleanse our body, act as a digestive agent, sweeten our food in a healthy manner, and provide good amounts of minerals.

Source: https://www.organicfacts.net/nutrition-facts/others/what-is-jaggery.html
http://www.thehealthsite.com/fitness/7-health-benefits-of-jaggery-or-gur/-accessed on 20/9/15

इन्द्रियाणां विचरतां विषयेष्वपहारिषु ।
संयमे यत्नमातिष्ठेद् विद्वान्यन्तेव वाजिनाम्।।

The five senses chase the objects of their desire which powerfully attract them.
Wise men should endeavour to keep them under control like a horseman controls his horses.

इन्द्रियाणां प्रसंगेन दोषमृच्छत्यसंशयम्।
संनियम्य तु तानेव ततः सिद्धिं नियच्छति ।।
न जातु कामाः कामानामुपभोगेन शाम्यति ।
हविषा कृष्णवर्त्मेव भूय एवाभिवर्धते ।।

There is no doubt that, ultimately, only something bad comes out of the attachment of the senses to their objects. By controlling the very same senses one is able to achieve the ultimate goal of one's life.

Desire itself never subsides by enjoyment of the objects of desire. It only flares up again like a fire into which ghee is poured while performing havan.

वेदास्त्यागश्च यज्ञाश्च नियमाश्च तपांसि च ।
न विप्रदुष्टभावस्य सिद्धिं गच्छन्ति कर्हिचित् ।।

Study of vedas, sacrifices, performance of yagnas,*niyamas* (*ahimsa*, truth in thought word and deed, non-stealing, non-acceptance of gifts etc)*and*penances cannot lead one to the ultimate goal of one's life if the mind is polluted by uncontrolled desires.

Manusmriti, 2.88, 2.93-94, 2.96

Health

The traditional health care system of India has its roots in the Vedic period which prevailed around 3000.

The uniqueness of the Indian medical heritage lies in two streams of knowledge, 'Folk' and 'Codified' streams of knowledge. The folk systems prevail in the cultural and tribal knowledge of people which has been passed down from person to person as folk knowledge. The codified system has more than 3000 years' written history of documented knowledge. Indian systems of medicine have flourished as different branches of medical knowledge namely Ayurveda, Siddha, Unani, Naturopathy, Yoga, and Tibetan (Sowa-rigpa).

These traditional health rejuvenation systems have evolved from a deep understanding about the relationship between bio-resources and human physiology, including the influence of climate, seasons and weather and lifestyles on human mind-body.

The symbiotic relationship of nature, climate and the living organisms is the cardinal part of Indian medical heritage. It is evident from the use of bio-resources for health care, understanding the medicinal plants (more than 6500 species used in codified stream of knowledge) for human and animal health and diseases, and their physiology in relation with seasonal variations and changes in the climate. The use of natural food items in different seasons according to the environmental changes contributes yet another important theme of the Indian health systems.

The essence of India's traditional health care systems is in the use of the medicinal properties existing in natural products derived from bioresources, especially plants. These systems therefore promote conservation of important plant species and encourage knowledge about its medicinal uses within the local community. Often, Indian families can prepare medications at home for prevention and cure of daily health ailments like cold, cough, fever, headache etc. — a gift of this traditional knowledge base.

The scientific basis of using plants for health care is related to understanding the internal environment of the human body in relation with nature. It contains information of in vivo parameters (Rasa panchaka) as the pharmacological profile of plants understood by the Indian knowledge systems based on logical and deductive approaches. As a whole system approach, it has negligible amount of side effect (s) and the knowledge is part and parcel of the living community in their daily life. The self-reliance in health care has been achieved in the community by decentralizing this knowledge of using local resources in a better manner and in turn urged the community to conserve the local species for prevention and promotion of health.

There is also considerable health cost savings due to the use of natural products as medicines. Communities also actively conserve such biodiversity and habitats. These systems are the core enablers for providing health, security and livelihood needs to many of India's rural and tribal communities. There are thousands of housewives, birth attendants and vaid-hakeems. The local vaidyas and housewives look after the primary health care needs. The cultural dimensions and daily regimen are helping to prevent communicable diseases.

An important part of these systems is the emphasis on prevention of diseases through lifestyle practices and treating the root cause of the disease through careful diagnosis rather than treat just the symptoms. For example, following a daily regimen such as getting up early in the morning, performing yoga or exercise, performing cultural practices, taking care of fellow beings etc. improves the physical, mental and social wellbeing of the community.

Many homes in India have herbal gardens to grow plants which can be used for creating home remedies for simple primary health care problems like fever, upper respiratory tract infections, hepatitis, anaemia, arthritic conditions and gastro-intestinal problems such as diarrhoea, dysentery and worm infestations. Plant products have also been traditionally used to prepare cosmetics as well as domestic cleaning products. This reduces the use of chemical detergents, shampoos and other compounds which are today a huge pollutant not just in the production process but also in their consumption cycle, adding to greenhouse gas emissions. If traditional healthcare systems of India and other countries can be made part of a holistic system, acute and chronic needs can be dealt with using appropriate and suitable treatment options in a holistic manner.

Climate change results in intensification of natural calamities, wider spread of vector borne diseases like malaria and dengue, and increased frequency of heat and cold waves, all of which will considerably impact human health and increase health-related stress (INDC India, 2015). In this context, the traditional health systems of India will prove to be a key strength to enable low cost yet effective cure options to the large population. India is formulating a Health Mission under the ambit of National Action Plan for Climate Change (NAPCC). It encourages a healthy and sustainable way of living based on traditional health systems, values of conservation and moderation. The Ministry of AYUSH, Government of India has brought out a National Policy on Indian Systems of Medicine and Homeopathy to augment health care services and meet the challenges of health risk posed due to climate change.

Health

What is Parampara?

Parampara is a tradition, a continued row, a succession, a series or an order of precedence. It envelops all the traditions in continuation even with modifications. The word Parampara includes the continuation of time and space and focuses on an uninterrupted flow of behaviour of a particular group of people. Especially, in a country like India, where there are cultural, religious and linguistic diversities, a number of traditions prevail but this issue will concentrate only on those which are in conformity with preservation and conservation of environment.

How does a Parampara originate?

From the reading of Sanskrit literature, as it starts from the Vedas, one comes to know that the ancient Indians have understood well the wonderful properties of nature and her power to cause welfare or unfair to the sentient and non-sentient beings under her blanket. Therefore, the entire human life was whirling around nature-care. Thus, the thought originated *Nisargorakshati Rakshitah* i.e. Nature will protect if it is protected. The protecting powers of nature are called' Uti-s' and the power-holders i.e. the five primordial elements were invoked to attend with their '*utis*' at human abodes to bestow their blessings. It is quite interesting to note that the word Uti is accepted in the scientific terminology in the sense of cells full of energy. No doubt the ancient Indians composed hymns, prayers, eulogies to propitiate these elements and also to express their gratitude towards their benevolent nature and at the same time to offer prayers to them for not being malevolent. The Earth (land, soil- *Prithvi*), Water (*Aap*), Fire (*Tejas*), Wind (Air- *Vayu*) and the Sky (*Aakasha*) are the elements which are called *Panchamahabhutas*. When they are in the balanced state, the Environmental and Ecological balance remains intact and the human life becomes happy, healthy and contented. Keeping this in mind, generations after generations of Indians were taught that the Nature is always the object of worship and never the object of enjoyment. The natural objects are to be used on the condition of double deposit of them. The environmental values were inculcated in them from childhood not only through syllabus or lectures but by living them. To create and maintain this awareness various traditions, codes of conduct were created and followed. Here is the origin of Parampara.

Why Paramparas to be revived?

Indian cultural tradition dates back to ten thousand years. The danger of loss of environment was not that serious at that time as it is today. The sources were ample, the consumers were comparatively less in number and the enjoyment was controlled by self-discipline. The self-control on the use of natural objects has prevented excess use of Nature. The situation is exactly reverse today, limited resources and unlimited and undisciplined use of Nature have charged heavy toll on the survival of human race and other non-human objects. Thus, it is necessary to take resort to the simple traditions in day to day life which are helpful to preserve nature and helpful to mankind. Different states of India have their traditions, vows, cultural events, performances of various arts, folks and festivals. However, this article will focus on the traditions which have come in to existence with keeping eye on climate consciousness.

Parampara and climate-consciousness

In this article three different traditions exhibiting climate-consciousness are discussed and two of them facilitate individual health while the third one is from the folk-tradition. These traditions also focus on the knowledge of aerial surrounding, the properties of Sun-rays and the internal activities of the primordial elements. The last one exhibits some folk-belief for the rain-fall. 1. Early morning prayers 2. *Gayatri mantra* recitation at sunrise 3.The Frog-dance

1. **Early morning prayers**

   The earth, with its 70% of the area, is occupied by water and is surrounded by brilliance (fire), wind and the sky. All together these are the five basic elements, constituting the Universe and as these are called the *Panchamahabhutas* and the worlds is attributed as *Panchamahabhautik*. The human body is also formed out of these elements and is called *Panchamahabhautik*. The elements forming the Universe and the body are the same and thus they are associated with each other with 'Whole and Part' relationship. If the whole is in balanced state, then and then only the part can remain in the balanced state. It is called as Ecological balance. These elements are invoked in the form of Vedic prayer to keep their balance inside and outside and facilitate health of the body. The prayer runs thus –

   May there be peace in the Heavens and so too in the Space. May peace descend unto Earth and peace unto oceans. Peace be unto the plants and peace unto the trees. May the Gods be at peace and peace with Brahman. Let peace envelop all. Peace verily peace ! May peace embrace me, Om shantih, Shantih, Shantih !

   Yajurveda 36.17

   The battery of the body gets discharged by the activities it performs at day time. It remains in the composed state at night when it is at rest but for the next day activities it is to be recharged. The prayers in the early morning invoke the elements outside to get activated inside the body too and thus promote the working of the body. Indian mythology personified these five elements and the images of Gods were created. The earth as Mother-Goddess, Varuna as the God of Ocean, Indra as the God of rains, Agni as the God of Fire and Marut as the God of wind are praised. All of them are eulogized and those mantras in Sanskrit, seen by the sage. e. the suktas, became the prayers, entirely secular, for the benefit every human being. These elements with their activities promoted inside, keep balance with outside and help for smooth activities of the day, as the battery gets fully charged. Thus, the tradition of early invocations is to be revived by being climate-conscious.

2. ***Gayatri mantra* recitation at Sunrise**

   Many people face the problem of deficiency of Vitamin D and the number of such patients is increasing day by day. The simple solution is to stand in the open air at the time of Sun-rise when rays are tender and when the fresh air has ample oxygen to breath. One should stand erect with bathed body and most of the body-parts decently open near or in the flowing-water-source. One has to chant the Gayatri-mantra for 108 times (approximately 15 to 18 minutes) standing in the Sun-rays. These rays are low-intensity Ultraviolate rays that increase capacity of calcium absorption and other benefits which may be explained by medical professionals. At the same time, these rays activate the brain-cells as is evidenced by the Gayatri-mantra itself—w BaU: Bauva: sva: tata\ salvatau: vareNyaMBagaoRDevasyaWaimahIWayaoyaona: pa/caoDyaata\ ~(|gvaeD 3.62.10)— We contemplate upon thy divine light. May he stimulate our intellect. Thus this tradition on reciting Gayatri-mantra is in a way Sun-bath-therapy beneficial for body and brain at the same time. It is free of cost, beyond race and religion and thus universally acknowledged.

3. **The Frog-dance**

   Starting from Rigveda (7000 years back), the frogs are considered as the harbingers of rains. There is a Parjanya-sukta in which Manduka-s i.e. the frogs are praised. At the commencement of rainy-season they are very happy and croak loudly. This is the observation for centuries together. There is a tradition of frog-dance based on this observation. In Assam and West Bengal, at the end of harsh summer, children decorate themselves with frog-colors and multi-colored dots on the body. They dance and imitate frogs by croaking. They believe that this act can bring the frogs out from their hidden places and then the frogs will bring rains towards earth from the sky. It may be titled as rain-prediction activity in tribal areas in ancient times but one more point is to be noted. These frogs get their livelihood on various types of insects including the mosquitoes. Today people are suffering from different type of diseases from mosquito bites, etc. One reason may be that the number of frogs is decreased as they are exported for experiments to other countries and the natural control over mosquitoes and other insects is lost. The understanding of the natural food-chain as worded in Sanskrit, jivaojivasyajivanama\ (One life depends upon the other) is presented in this tradition. It is still prevalent at some places even today. It focuses on awareness about climate and surrounding change positively.

   Feed animals before one feeds oneself regularly. The Sanskrit teaching – 'Aatmavatsarvabhuteshu' stands as the best environmental value which teaches to treat all other creatures, human and non-human, as one's own self. It is totally beyond the religious boundaries as all the religions preach the value in similar words and thus becomes secular.

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"Earth, in which lie the sea, the river and other waters, in which food and cornfields have come to be, in which lives all that breathes and that moves, may she confer on us the finest of her yield. Earth, in which the waters, common to all, moving on all sides, flow unfailingly, day and night, may she pour on us milk in many streams, and endow us with luster,

May those born of thee, O Earth, be of our welfare, free from sickness and waste, wakeful through a long life, we shall become bearers of tribute to thee. Earth, my mother, set me securely with bliss in full accord with heaven, O wise one, uphold me in grace and splendor."

Hymn to the Earth
Atharvaveda, Kanda XII, Suktam 1

All India

Ayurveda: The Ancient Indian Science

Medical Science was highly developed in ancient India. Ayurveda is the indigenous system of medicine and one of the oldest holistic healing systems of the world. It is based on the belief that wellness depends on the delicate balance between body, mind and spirit. The primary goal of Ayurveda is to prevent a disease or ailment rather than cure it.

The word Ayurveda literally means the science of good health and longevity of life. Charaka is considered the father of Ayurvedic medicine. His renowned work *Charaka Samhita* is considered as the encyclopaedia of Ayurveda. In his book, the medicinal value of more than 10,000 herbs has been explained.

Treatment by ayurvedic medicine may not be possible in every medical emergency due to its slow action, and allopathy has to step in where required. But ayurveda is an ideal system for the long term as it treats not just the symptoms but also the root causes of diseases.

The two principal objectives of Ayurveda are:

1. *Swasthasya swasthya rakshanam* – To prolong life and promote perfect health (add years to life and life to years)
2. *Aturasya vikar prashamanamcha* – To completely eradicate the disease and dysfunction of the body.

Ayurveda is based on the premise that the universe is made up of five elements, namely, air, fire, water, earth and space. These elements are represented in humans by three *doshas* or energies: *Vata*, *Pitta* and *Kapha*.

The three *doshas*, or bio-energies found in our body are:

- *Vata* pertains to air and other elements. This energy is generally seen as the force which directs nerve impulses, circulation, respiration and elimination.
- *Kapha* pertains to water and earth elements. *Kapha* is responsible for growth and protection. The mucosal lining of the stomach and the cerebral-spinal fluid that protects the brain and spinal column are examples of *kapha*.
- *Pitta* pertains to fire and water elements. This *dosha* governs metabolism, e.g., the transformation of foods into nutrients. *Pitta* is also responsible for metabolism in the organ and tissue systems.

Ayurvedic Lifestyle or *Dinacharya*

Ayurveda, as part of its treatment, also suggests the lifestyle to be followed by a person which is further individualised according to their body type. This has added health benefits and the need for expensive medical treatments.

- Ayurveda recommends an early bird lifestyle: that is waking up at sunrise. The predominant element at this stage of the day is *Vata* (air + ether). *Vata* is light, subtle and clear and brings you in contact with the subtle messages Nature sends forth.
- Early morning exercise removes stagnation in the body and mind and allows your energy to flow. It also strengthens the digestive fire (*Agni*) which promotes better digestion of foods as well as emotions.
- Ayurveda recommends that lunch should be taken between 12 and 1 pm.
- Dinner is recommended to be taken between 6 and 7 pm.

Source: http://www.nios.ac.in/media/documents/secichcour/english/ch.15.pdf-accessed on 7/10/15
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All India

Turmeric or Haldi as a Preventive Medicine

Turmeric is the wonder spice of Ayurveda. It is used extensively in Indian households. Turmeric is added to almost all vegetables and curries cooked in India since it boosts the flavour of the food.

Turmeric, being an anti-viral, anti-bacterial spice, is consumed by Indians to ward off seasonal infections. A pinch of turmeric powder in a glass of milk helps in healing the wounds of the body and also keeps cold and cough at bay.

Turmeric is an important part of wedding rituals, where turmeric paste is applied on the bride and groom. It is also used as a cosmetic by Indian women to purify the skin. Various kinds of turmeric face packs can be made at home by adding rose water, yoghurt, raw milk, lemon and other substances. These face packs reduce pimples and acne in women and are also an eco-friendly substitute to harsh soaps and face wash. Most commercial soaps and face wash contain harsh chemical additives to make them lather well, while added perfumes and fragrances can cause irritation/allergy to sensitive skin. It contaminate the soil and water bodies including aquifers as the soapy water trickles down the soil.

Some of the medicinal benefits of turmeric (*haldi*) are:

- It is anti-viral, anti-bacterial and anti-parasitic.
- It is anti-inflammatory and antiseptic, and is therefore used to treat bronchial asthma.
- Applied topically, turmeric is useful in treating skin conditions; it relieves pain and swelling when applied to bruises.
- As a rich source of iron, turmeric is beneficial for anaemia.
- It lowers blood sugar level and is used in the treatment of diabetes.
- It relieves congestion of throat and inflammation of the tonsils.
- It turmeric is used to treat external ulcers, epilepsy, bleeding disorders and chest congestion.
- It is also used to relieve burns by external application.
- When mixed with mustard oil, relieves dental problems.

Turmeric contains beta-carotene, calcium, flavonoids, iron, niacin, potassium, zinc and other nutrients. In addition to its potential effectiveness in treating peptic ulcers and some forms of cancer, turmeric also has proven anti-inflammatory properties. Several studies have suggested that it may help reduce the symptoms of rheumatoid arthritis, according to the National Centre for Complementary and Alternative Medicine (NCCAM), a division of the National Institutes of Health (NIH).

Source: http://www.ayurvedicjunction.com/aayurveda.html-accessed on 7/10/15
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All India

Ashwagandha for Boosting Immunity

Ashwagandha is considered a very powerful medicinal plant and has been used in Ayurveda for more than 3,000 years. The roots and berries of this plant are used to prepare medicines. It can be consumed daily by adding it to milk in small quantities. It stimulates the immune system.

It has the ability to relieve stress and protect brain cells from the deleterious effects of modern lifestyles. Considered an 'adaptogen', *Ashwagandha* improves athletic ability and physical energy. It helps in regulating blood sugar and aids in suppressing sugar cravings. *Ashwagandha* is a herb that helps the body produces its own thyroid hormone. It has anti-inflammatory properties that help in dealing with a variety of rheumatological problems.

According to Ayurvedic medical texts, *Ashwagandha* is effective in controlling bacterial infections in humans. A study conducted at the Centre for Biotechnology at the University of Allahabad in India showed that *Ashwagandha* possesses antibacterial properties, thereby supporting this traditional belief. It also concluded that *Ashwagandha* was effective in urino-genital, gastrointestinal, and respiratory tract infections when consumed orally. It is a very good source of anti-oxidants and helps to strengthen heart muscles and control cholesterol.

Source: http://en.mr-ginseng.com/ashwagandha/-accessed on 7/10/15

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Manipur, Assam, Arunachal Pradesh

The Many Medicinal Properties of Bamboo Shoot

Bamboo is considered one of the most versatile plants in the world. India has large varieties of bamboos, most of which is grown in the north east, viz., Arunachal Pradesh, Assam and Manipur.

Bamboo has numerous health benefits which have been mentioned in the Ayurveda. Traditionally bamboo is used to treat bronchial and respiratory ailments. One of the earliest Ayurvedic practitioners, Charaka, made a paste of bamboo leaves to treat poisonous bites and kill intestinal worms. Bamboo is rich in minerals and is a useful source of vitamin B complex. The leaves of bamboo contain flavonoids which have antioxidant properties. These flavonoids are believed to promote blood circulation, reduce inflammation and inhibit allergic reactions.

Bamboo shoot also has high levels of acetylcholine that acts as a neurotransmitter in animals and humans.

In the ayurvedic system, the bamboo stems and leaves are used as blood purifier and to treat luecoderma. It is also given internally to treat gonorrhea and fever. To control ringworm, treat bleeding gums and painful joints, the burnt root is applied for relief.

Ayurvedic medicines, especially those derived from herbs, are considered eco-friendly since they are not manufactured in big industries. The pharmaceutical industries contribute to contamination of soil and water bodies as improperly disposed hospital waste, considered a toxic waste, find their way into streams and drinking water sources, negatively impacting humans, wildlife and agriculture.

Source: Utilization aspects of Bamboo and its market value by E. Dutta Borah, K.C. Pathak, B. Deka, D. Neog and K.Borah-accessed on 7/10/15

http://www.indiaenvironmentportal.org.in/files/Bamboo%20and%20its%20market%20value.pdf-accessed on 7/10/15

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All India

The Medicinal and Cosmetic Benefits of Amla or Indian Gooseberry

Amla is being extensively used by Ayurvedic practitioners since many years to treat ailments. It is yellowish-green in colour and has a sour taste. *Amla* is consumed in many forms like juice, powder or candy. *Amla* juice is the extract of the fruit and can be taken with water daily. *Amla* candy or *murabba* is consumed during winters to stay fit and healthy. Also, a tablespoon of *amla* powder can be taken daily since it improves digestion.

Many people make *amla* curry too, by cooking pieces of it with spices and water, to be eaten with *chapatti*.

Amla is also considered the super food for hair. Traditionally, it has been used for conditioning the hair since it has anti-dandruff properties. A paste of *amla* can be applied to the scalp and washed after half an hour for healthy hair. It is added to *henna* to tone down its red colour and give a shine to the hair. Regular application of *amla* reduces hair fall.

Charaka had mentioned that *amla* has anti-ageing properties and was added to water while bathing in ancient times. It is the richest source of Vitamin C and consists of bioflavonoids, flavones, polyphenols and carotenoids. *Amla* is a potent antacid which boosts the body's immunity and restores its vitality. Its regular consumption prevents common cold and facilitates absorption of iron and improves haemoglobin levels.

Amla is used in various gastro-intestinal inflammation disorders like gastritis because of its anti-inflammatory properties. It reduces serum cholesterol and high blood pressure. It also promotes healthy nails, eyes, teeth and skin. *Amla* enhances the metabolism and helps one lose weight faster. It is a remedy for hyperacidity, ulcers and blood impurities.

Amla juice mixed with water helps to lower the body temperature during summers. It helps in expelling toxins from the body and regular use in the form of powder helps in de-toxifying the liver. *Amla* has astringent properties and helps in closing pores and reducing wrinkles.

The rich vitamin C content of this fruit makes it one of the strongest immunity boosters. This implies that regular intake of *amla* prevents us from all kinds of bacterial, viral and fungal infections and a visit to a doctor. The benefits of *amla* are so many , that if you want to include just one healthy herb in your diet, it should be *amla*.

Source: http://easyayurveda.com/2013/01/17/amla-benefits-dose-usage-side-effects-complete-ayurveda-details/-accessed on 7/10/15

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Kerala

Ayurvedic Oils for Healing

Daily massage with ayurvedic oils is a way of revitalising the body and unlocking the body's innate healing ability. Massaging helps in maintaining the body's optimum health. Massage is a natural form of exercise in India that promotes a balance between the mind and body. These herbs provide medicinal properties to the cells of the body by penetrating them.

The act of touching through massage also balances the endocrine and nervous systems since it is therapeutic. Ayurvedic massage is known to balance the endocrine system, rejuvenating the skin and eliminating impurities. It promotes youthfulness and increases mental alertness. Ayurvedic massage stimulates the internal organs and calms the nervous system. It tones the muscles, lubricates the joints and increases longevity.

Source: http://www.oilsofayurveda.com/benefits.htm-accessed on 7/10/15

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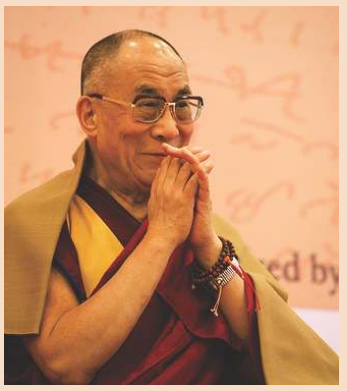

"It is not difficult to forgive destruction in the past which resulted from ignorance. Today however we have access to more information, and it is essential that we re-examine ethically what we have inherited, what we are responsible for, and what we will pass on to coming generations."

H. H Dalai Lama

All India

Staying Healthy with Neem in A Changing Climatic World

For centuries the *neem* tree has been considered as the wonder tree of India. In Ayurveda's prime text, *Charaka Samhita*, *neem* has been described as *sarva roga* ***nivarini*** which means that it keeps all diseases at bay. Its roots, bark, gum, leaves, fruits, seed kernels and oil all have medicinal properties and are used therapeutically. *Neem* leaves are chewed by people to regulate blood sugar levels and also for oral health. *Neem* is also used to preserve food grains and manage pest in agricultural areas.

Neem is beneficial for the skin - it makes the skin glow. *Neem* face packs rejuvenate the skin and prevent outbreak of pimples and acne. *Neem* has anti-fungal and anti-bacterial properties which help in treating dandruff.

Neem paste can be applied on the scalp. It relieves dryness and itching, strengthens hair and promotes its growth. It has de-toxifying properties and helps heal wounds when applied externally, without causing any infections or septic conditions.

Neem is a good cure for blemishes, acne and pimples. It is beneficial for skin disorders like eczema and minor skin infections. It maintains a glowing skin and balances the skin tone. *Neem* is considered a gastro-protective element and helps in healing of ulcers. Aqueous extract of *neem* leaves significantly decreases blood sugar level and prevents adrenaline as well as glucose-induced hyperglycaemia. The twig is used for cleaning teeth in India and is very beneficial in oral care. Its bark is recommended in cases of excessive stomach acid and premature falling and thinning of hair. In South India, a preparation of *neem* flowers is part of the feast on some holy days, and is considered a blood purifier.

Source: Medicinal properties of Neem: New Findings by D.P. Agrawal

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All India

Ginger as a Preventive Medicine for Winter Ailments

Ginger is one of the spices that is added to almost all food preparations in India. It is added to many vegetable and non vegetarian preparations for its strong taste while ginger tea is a most loved variety of tea in India. Ginger is used traditionally to make *kaadha* which relieves sore throat and cough. *Saunth* or dry ginger is consumed during winter months to keep the body warm. *Laddoo*'s of *saunth* are made and consumed along with milk in winters.

Ginger is also consumed just before lunch and dinner in Indian households to enhance the digestion process. Traditionally ginger is used to relieve joint pain, and motion or air sickness.

Source: http://www.shareayurveda.com/ayurveda-blogs/benefits-ginger/-accessed on 7/10/15

http://www.mapi.com/ayurvedic-knowledge/food-tips/the-healing-power-of-ginger.html-accessed on 7/10/15

All India

Orange Face Pack to Replace Commercial Face Packs

Orange is the best source of vitamin C, which is good for health and skincare. However, much of its benefits are in its peels. Orange peels, which are usually thrown away, can be sun dried, powdered, and used as a face pack with other ingredients like milk or rose water. Orange face packs lightens skin tone and complexion, reduces wrinkles and acts as an astringent to dry up pimples. Unlike conventional face packs, traditional face packs do not have carbon footprints.

Source: https://beautyhealthtips.in/orange-peel-usage-best-homemade-orange-peel-face-packs-for-the-glowing-clear-face/- accessed on 8/10/15

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Health

> "A physician who fails to enter the body of a patient with the lamp of knowledge and understanding can never treat diseases. He should first study all the factors, including environment, which influence a patient's disease, and then prescribe treatment. It is more important to prevent the occurrence of disease than to seek a cure."
>
> ***Charaka***

All India

Local food for less Carbon footprint

According to the ancient science of Ayurveda, eating local and seasonal food is beneficial to the body, the logic being that seasonal fruits/vegetables have more nutritional value, are fresher and have spent less time in storage. In Ayurveda, it is believed that certain foods are digested well in certain seasons. For example, a big bowl of salad with raw vegetables will be digested slowly during winters because our bodies store energy during the winter to stay warm.

Eating local has the following benefits:

- Aids digestion and immunity: The fresher the food is, the easier it is to digest it. Food that is imported is usually canned, frozen or packaged which can make the digestion sluggish. When the digestion gets slow, the toxic waste does not get fully flushed, thus decreasing the immunity of the body.
- Helps prevent allergies: Eating exotic food that has grown in different parts of the country or world can make one prone to food allergies.
- Strengthens the cycle with nature: Harvesting and eating what is in tune with season makes one connect with the environment. Eating locally would also increase the diversity of the food available every season.
- More nutritious: Food loaded with preservatives or those that are canned and frozen have less nutritional value in comparison to those available locally and are fresh.
- Ensures food safety: Eating locally available produce ensures food safety as it is fresh and uncontaminated.

Source: http://www.theblissblissbliss.com/ayurvedic-seasonal-eating/-accessed on 7/10/15

http://www.mapi.com/ayurvedic-knowledge/ayurvedic-diet/eat-local-for-better-immunity.html#gsc.tab=0-accessed on 7/10/15

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All India

Yoga

Yoga has been a part of the rich cultural heritage of India since time immemorial. Yoga is not just about exercising but adopting a healthy lifestyle. It is usually performed in open surroundings and is beneficial to the body if done in the right manner. Yoga techniques include breathing exercises or *pranayama* and meditation or *dhyana* to discipline the mind. It provides flexibility to the body and calms the mind and soul. Yoga rejuvenates the body and increases concentration.

The ultimate goal of yoga is, however, to help the individual to transcend the self and attain enlightenment. As the Bhagavad Gita says, "A person is said to have achieved yoga, the union with the Self, when the perfectly disciplined mind gets freedom from all desires, and becomes absorbed in the Self alone."

Yoga increases the flexibility of the body by acting on various joints which are usually ignored during exercising. Some yoga positions helps in lubricating the joints, tendons and ligaments. Yoga also ensures optimum blood supply to all the organs of the body since the muscles and joints are massaged well. It also improves respiration, energy and vitality. It relaxes the mind and relieves stress.

The westernizes concept of gym is a phenomenon catching up in India of late. While it is considered good for those who do not have time for regular exercise at home, it requires costly equipment and an air-conditioned environment. In the case of yoga, exercises undertaken in the open air coupled with a simple life and nourishing diet, have several benefits which help prevent lifestyle diseases and improve general health.

Practising yoga is a sustainable method of living in harmony with nature. For example, on the energy use front, gyms have facilities like pool heating, equipment, televisions, saunas all of which are energy intensive. The air we breathe inside the gym can be far more dangerous to our health due to poor ventilation and aero allergens in the close environment.

Therefore, yoga can be a better way of working out. It not only brings us closer to our traditional roots but is also an environmental friendly way to a fitter life.

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All India

Natural Shikakai (Acacia Concinna) Powder Instead of Shampoos

When it comes to hair care, herbs are considered the best. One such herb excellent for hair is *shikakai*. Traditionally, instead of shampoos, *shikakai* (fruits of *Acacia concinna*) fruit pods are powdered and used with *aritha* (soapnut) and *amla* to wash hair . This natural shampoo is environment friendly as it contains only bio-degradable materials and no harsh chemicals. The harmful and synthetic shampoos, when used regularly, can wreak havoc on our hair and can affect the skin. Some of these chemicals could be carcinogenic too. Ingredients in regular shampoos have been proven to reduce the size of hair follicles, irritate and disrupt oil glands and dry the scalp, which ultimately can result in hair loss.

Shikakai makes the hair longer and thicker, and adds shine to it. It has anti-dandruff properties. *Shikakai* shampoo can be made at home by adding *aritha*, *amla* and *shikakai* pods. It also contains vitamin C which prevents the scalp from getting dry.

Source: http://www.mindbodygreen.com/0-2794/Why-You-Should-Use-Natural-Shampoo.html- accessed on 7/10/15

http://tipsandbeauty.com/amazing-benefits-and-use-of-shikakai-for-hair/- accessed on 7/10/15

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All India

Importance of Tulsi/Holy Basil in Indian Culture

Tulsi is considered as a sacred plant by Hindus and is worshipped as an *avatar* of goddess Lakshmi. Many homes have *tulsi* planted in a special earthen pot or structure which is placed in the courtyard.

Tulsi has various medicinal properties. *Tulsi* in tea relieves soreness of throat. The juice of *tulsi* leaves provides relief from fever, cold, bronchitis and cough.

Tulsi helps in curing malaria. It is very effective against indigestion, headache, hysteria, insomnia and cholera. Its oil is used against insects and bacteria, and also as an ear drop. Chewing a few leaves of *tulsi* daily purifies blood. It is said the *tulsi* plants at home reduce stress, boost immunity, enhance stamina and promote healthy metabolism. The *tulsi* plant is also used as a natural mosquito repellent.

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All India

Chemical Free Cleaning Agents

Aritha or soapnut is extracted from the soapnut tree (*Sapindus mukorossi*) or *aritha*. Soapnuts are natural with no known harmful ingredients, and have been used for centuries.

Aritha is easily available and each berry can be re-used up to six times before it is spent. It is eco friendly and needs no processing. It is biodegradable and the used shell is compostable. In ancient medical records, soapnuts were listed as having skin care benefits.

Contrary to this, production of chemical soaps involves high GHG emissions from large manufacturing industry whose effluents pollute water sources and endanger marine life. Besides, the chemical additives added to commercial soaps are harmful to the skin in the long run.

Source: http://www.sustainablebabysteps.com/soap-nuts.html - accessed on 17/8/15

All India

Copper Vessels for Healthy Living

Copper and its alloys are ancient metals. Copper pots and pans are usually lined with tin or stainless steel so that there are no chances of copper toxicity.

Copper is also used for storing water. Scientists have found anti microbial properties in copper. According to the principles of Ayurveda, drinking water from a copper vessel reduces ageing by stimulating the production of collagen protein that helps in connecting tissues. Copper, when used for storing water, kills viruses and other micro-organisms, making the water fit for drinking.

Copper vessels are safer than non stick utensils which are manufactured using perfluorooctanoic acid or PFOA, a polymerisation aid which is a potentially dangerous chemical with carcinogenic properties.

Copper is a good conductor of heat and distributes it evenly. Copper pots and pans are used to prepare delicate sauces and dishes that need to be prepared at strictly controlled temperatures. These are also safer than the non stick cookware.

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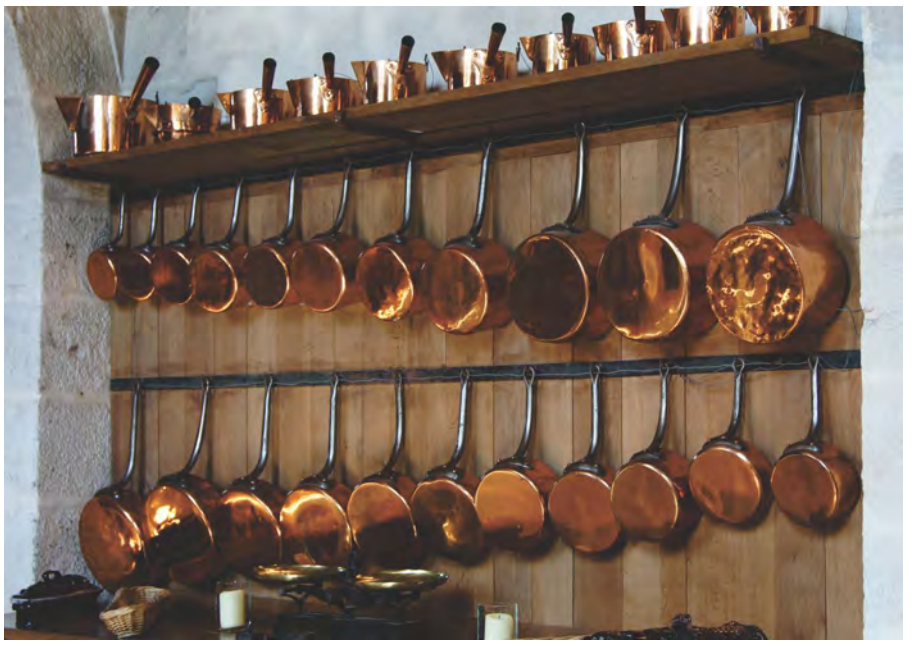

All India

Datun – A Healthier Option to Toothpaste

Datun (Hindi word for *neem* twig) is the twig of the *neem* tree (*Azadirachta indica*) which helps prevent tooth decay and gum diseases. *Neem datun* is chewed for a while in the mouth which converts it to a brush like stick that works as natural floss. Chewing releases an extract that is bitter in taste but is anti-bacterial. It protects teeth and gums by killing bacteria. It purifies blood and gets rid of bad breath. It has healing properties which cure ulcers in the mouth. Cavities, bleeding gums, plaque formation and discolouration of teeth can all be checked by *neem datun*. *Neem* can also protect from oral cancers. Some toothpaste advertisements now claim to keep the dentist away because *neem* extracts are a major ingredient of their product.

Scientific data reveals that dental products such as toothpaste, mouthwash and fluoride supplements have been identified as significant sources of fluoride. Excess fluoride affects health adversely. The prevalence of dental fluorosis is highly associated with the concentration of fluoride. Fluorides are also being proven as carcinogenic.

Traditionally, all over India, people used *datun* much before the toothpaste arrived. There is no “production process” involved in the *datun* as all one needs to do is to go to the nearest *neem* tree and pick up a twig. Nor is there a packaging process as with toothpaste which itself is a million dollar industry. The toothpaste industry also has an enormous market and is linked to the large advertising industry that promotes consumerism. Datun has little or no carbon footprint.

Source: http://kandmool.com/neem-twig-for-oral-health/- accessed 17/8/15
http://www.greenfacts.org/en/fluoride/index.htm#3- accessed 17/8/15
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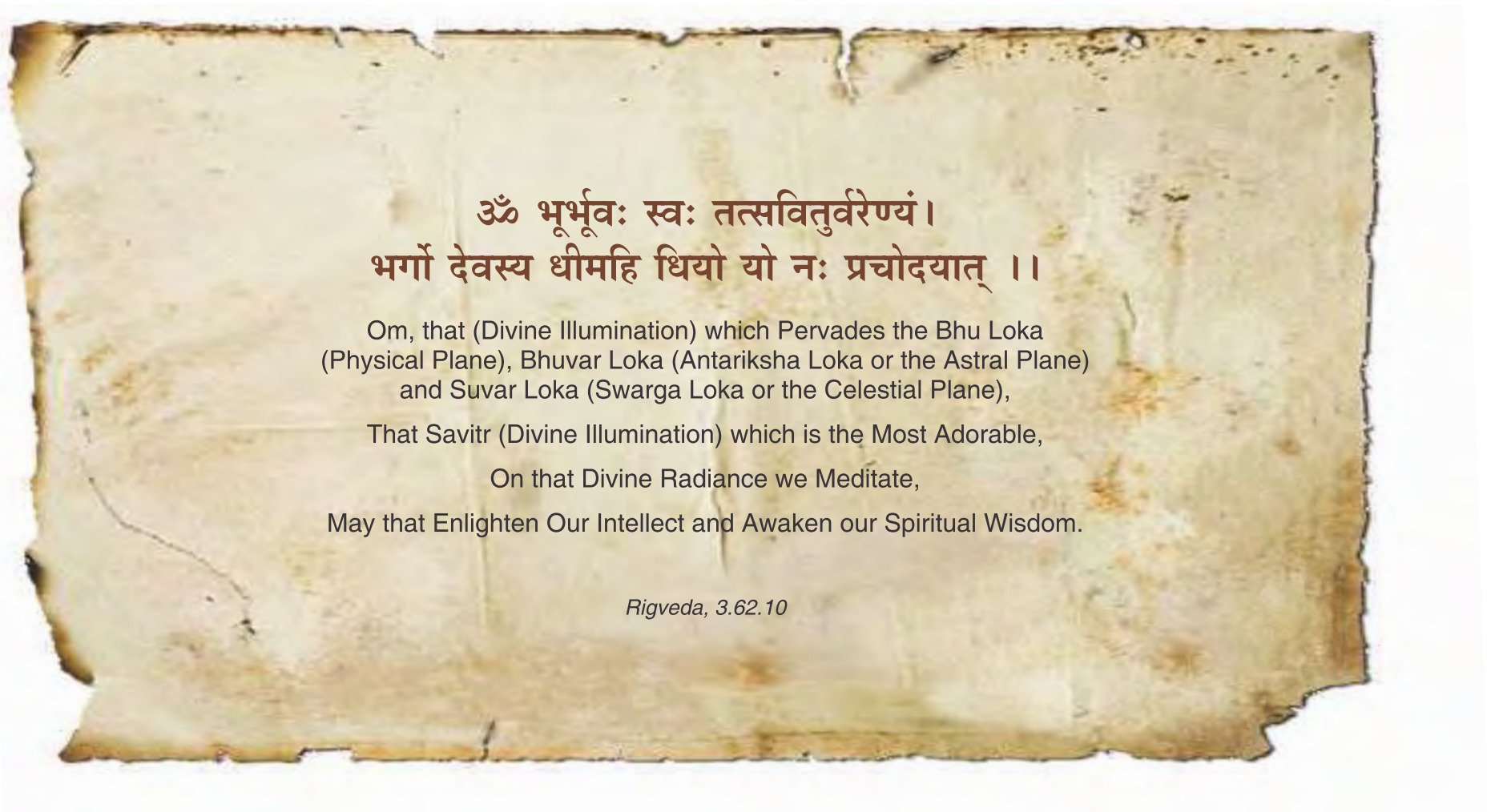


ॐ भूर्भूवः स्वः तत्सवितुर्वरेण्यं।
भर्गो देवस्य धीमहि धियो यो नः प्रचोदयात् ।।

Om, that (Divine Illumination) which Pervades the Bhu Loka
(Physical Plane), Bhuvar Loka (Antariksha Loka or the Astral Plane)
and Suvar Loka (Swarga Loka or the Celestial Plane),

That Savitr (Divine Illumination) which is the Most Adorable,

On that Divine Radiance we Meditate,

May that Enlighten Our Intellect and Awaken our Spiritual Wisdom.

Rigveda, 3.62.10

Shelter

The traditional practices of shelter building in Indian society has several features and processes that consider use of local eco-friendly building material, adoption of energy efficient process and design that is appropriate to the local weather and climatic conditions.

The basic principle in the traditional building design, construction, layout and settlement patterns of shelter or dwelling units in Indian context is that communities utilize sunlight, heat, wind, local materials and use bio-resources of their surroundings as important ingredients that make their shelter and habitation. Traditionally, and especially in the rural context, communities view their dwelling unit not only to provide their immediate shelter needs but also to share space for other living forms – especially plants, medicinal herbs, trees and domestic animals. This also creates a unique cultural identity and often creates energy efficient and peaceful living spaces, or the built environment.

Ancient forts and the traditional homes in different parts of India show how communities intelligently used sunlight and wind in their building design to provide comfortable heating and cooling as the seasons demand. The aim was to keep the occupants as well as the buildings thermally comfortable. The traditional science of architecture - Vastushastra - was sensitive to energy flow patterns – particularly of light and wind, utilization of shelter space for various activities like cooking, washrooms, living area, position of water source and overall people's lifestyle and occupation patterns. It took into account the five sacred elements - earth, wind, water, fire and space. Thus architectural heritage in India is based on sound principles embedded in man-nature relationships which made it the basis for comfort in day to day life.

Design laid emphasis on preparing a grid that worked around, rather than changed or disturbed, the natural topography, which is a climate change sensitive approach. The directions - be it north, south, east, west, northeast, northwest, southeast and southwest - were very important as they were considered as energy sources. Correspondingly the spaces in different directions were designed for specific purposes: for example, the east or north walls were kept more open to light and air, as the west was considered the heat absorbing side in the warm humid climate of India.

Learning from the traditional wisdom of previous generations, by exploring the knowledge that went into the making of traditional buildings, can be a very powerful tool for improving the buildings of the future and creating conducive conditions to meet the impact of climate change. Many of these buildings employ principles for reduced energy use while others have important disaster risk reduction lessons for modern architects by having withstood earthquakes and floods.

Building on traditional wisdom, the Government of India has launched several ambitious programmes – like Smart Cities Mission – to develop a new generation of cities that are energy efficient and offer public services that are low carbon intensive and encourage sustainable living. The National Heritage City Development and Augmentation Yojana (HRIDAY) has been launched to bring together urban planning, economic growth and heritage conservation in an inclusive manner. (pg.35, INDC 2015)

Shelter

Himachal Pradesh, Jammu and Kashmir

Earthquake Resistant Construction Technology

Traditional homes of the western Himalayan regions of Upper Kinnaur, Lahaul Spiti and Ladakh had inbuilt in them construction technology that made these stable to withstand the frequent earthquakes. Stability of the structures is a necessary quality, required for these areas that lie in the seismic zone 4 and partly in the high intensity seismic zone 5. Indigenous technology is an adaptation strategy to the extreme climatic conditions and steep hilly terrains.

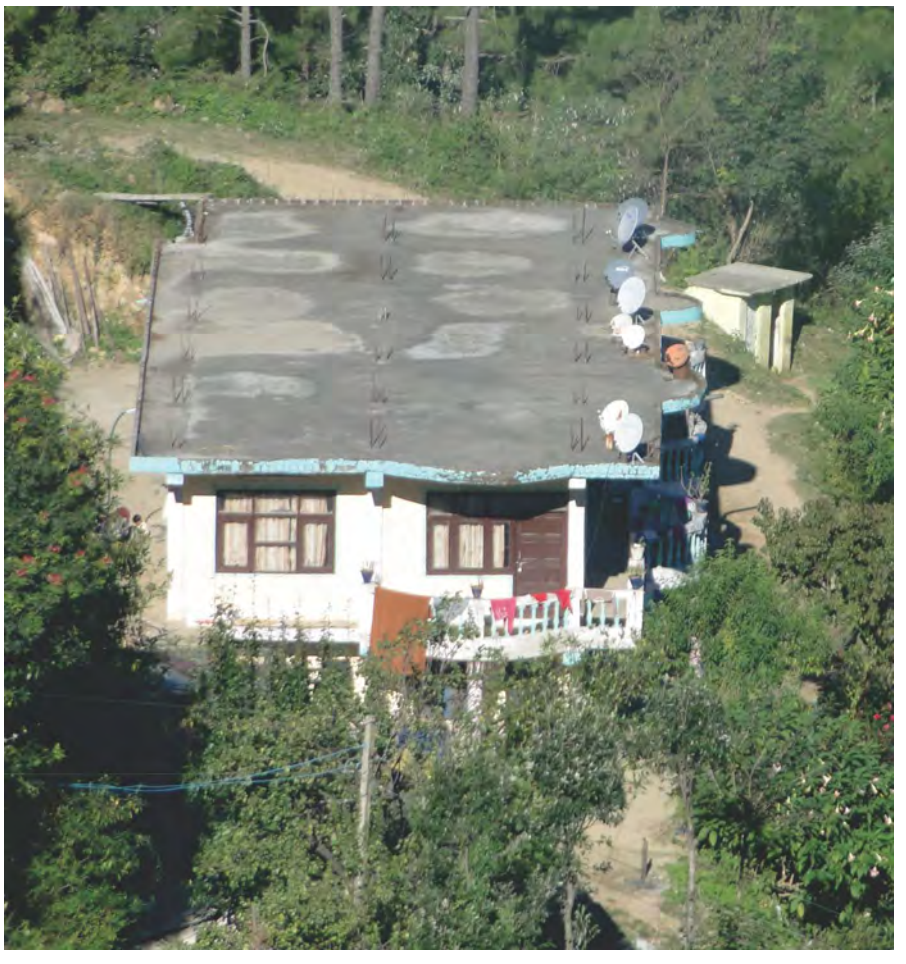
To meet the impact of the seismic forces, the traditional structures

usually stand on a high solid plinth, made up of dry dressed stone masonry. This reduces the impact of the earthquake while the dry construction of the homes allows for vibration and hence faster dissipation of the energy.

Locally available material is used in construction. Stone remains in use but its usage is restricted to the plinth. Mud is used on account of its easy availability, good insulation and the good binding properties. Houses are mostly constructed with the rammed earth technique. This is a style where the mud is filled into the wooden forms and rammed into the place slowly building up the wall. The other technique used is the adobe style construction where the sun dried mud blocks are used in the construction of the wall. The roof is kept flat and it is comprised of a closely packed layer of twigs supported on wooden beams and joists and resting onthe wooden columns.

Building with locally derived, unprocessed materials- materials as simple as soil beneath our feet- is a natural response to sustainable development. It significantly reduces the amount of energy and secondary resources needed for extraction, processing and fabrication.

Source: http://www.coa.gov.in/mag/july07/Sustainability-Minikshi%20Jain.pdf, accessed 10th October, 2015



Jammu & Kashmir

Traditional Green Buildings

Constructions today use up a lot of material much of which is brought from long distances. Concrete has become the major component of buildings giving rise to several factors that affect climate change. The cement industry causes severe pollution, sand mining affects rivers adversely, and the mining industry causes destruction of vast areas of forest land - all these pollute and create health risks.

The houses of the Gujjar community in Kashmir are constructed from locally available building materials - mud and stone - with animal dung as plaster.

The building is made by partially cutting into the mountain slope. The earth walls are raised to enclose a rectangular space. The plinth is constructed as a platform and the stone-work is coarse to create strong bonding. The flat roof is made of earth supported on timber beams. The *Dhajji Dewari* (timber wall) and Tak (a window element that connects one floor to another) allow ductility to control lateral displacement in case of earthquakes. *Dhajji Dewari* is derived from Persian meaning "patch quilt wall" due to its resemblance to the quilt patchwork of Persian weavers. The *Dhajji Dewari* is recognised worldwide as earthquake resistant architecture.

Modern constructions also require an enormous amount of energy to keep the interiors cool/heated/lighted depending on the local weather. In the traditional houses, very little electricity is used for light or heating. There is only a single opening in the form of a door to allow light and ventilation. Such buildings are well equipped to retain heat. The house is divided into three parts. The front is where there is light and all daytime activity takes place. This is a buffer that shields the inside from the outside. Cooking and sleeping are undertaken in the inner part. There is an exclusive part for the cattle. The doors to the two inner rooms are arranged in a way that the cold wind cannot enter. The heat from people, animals and the cooking stove keeps the living room warm.

Another type of rural houses is two or three floors high. Walls and floors are constructed from earth and timber, and the main sloping roof over the house is covered with paddy straw or mud. While the two lower floors have no windows, the second floor is open under the gable to allow light. The well-ventilated space under the gable is used for storage of fuel wood.

The first floor is the main living room for winter. The ground floor of the house is used for housing cattle and for storage of fodder. During winter, the house is kept warm by heat from the cattle that are housed in the ground floor. The heat of the cattle rises to the upper level living room. Along with this, heat from cooking keeps people warm.

The earth walls insulate the interior space and cold air is kept out by minimising ventilation. During summers, the household activities of cooking and sleeping shift to the second floor which is well lit and ventilated. This seasonal shift is necessary as the poorly ventilated first floor living rooms become quite uncomfortable in summer.

Source: http://www.iitk.ac.in/nicee/wcee/article/14_09-02-0008.pdf, accessed 11.8.15
http://www.space-design.com/upload/rs0008.pdf, accessed 11.8.15
http://www.isaet.org/images/extraimages/P913008.pdf accessed 11.8.15
https://penandfreedom.wordpress.com/2012/01/26/resilient-architecture-of-kashmir/, accessed 11.8.15
Tradiitonal Earthquake resistant systems of Kashmir-1023.pdf accessed 23.9.15

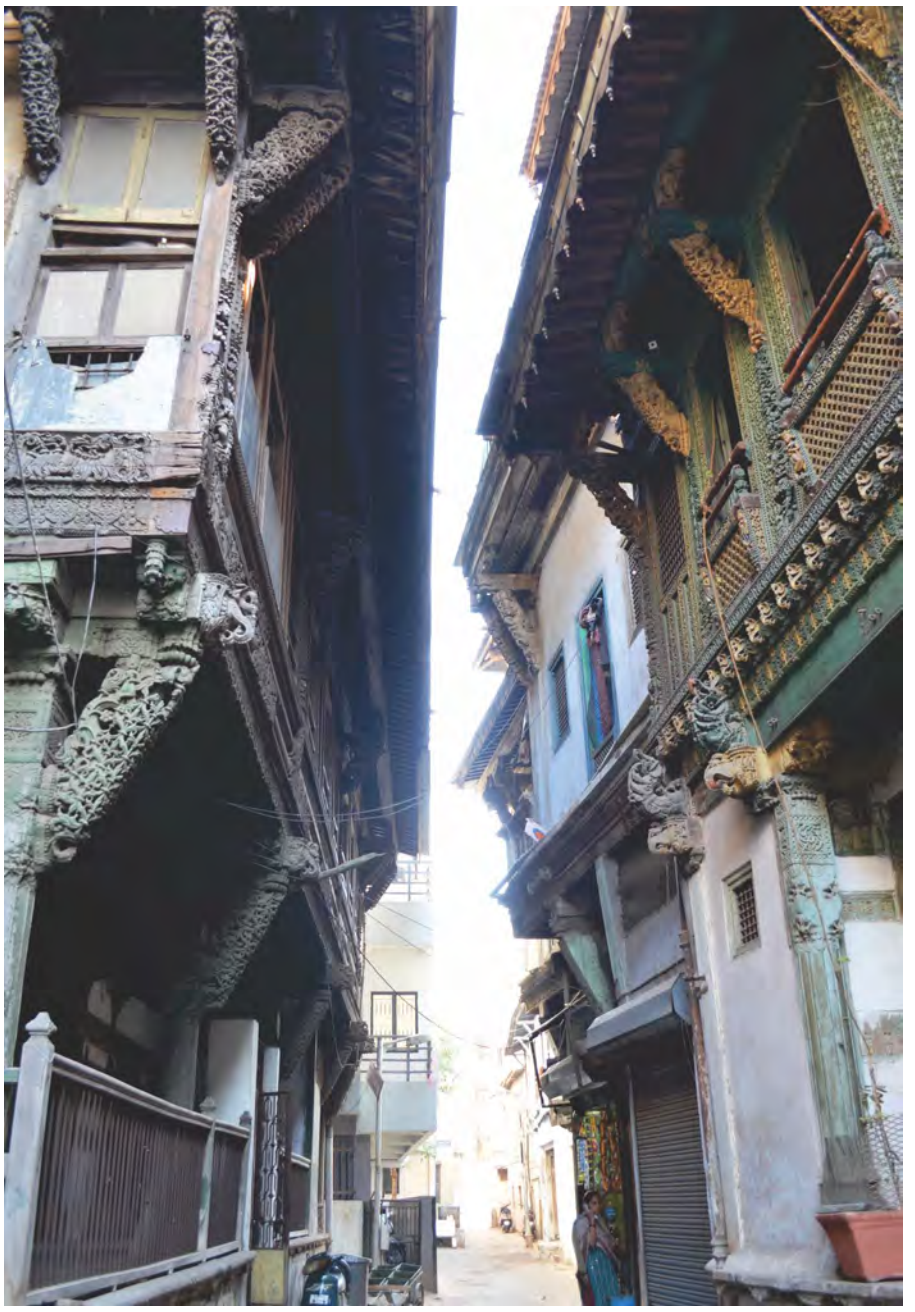
Kerala

The Traditional House: Nalukettu

Nalukettu (four blocks) is a typical Kerala mansion that houses a large joint family. The house, which is rectangular in shape, is built around a courtyard that is open to the sky and houses the *tulsi* and other plants. The four blocks are built around the courtyard and each block houses several rooms for different purposes like cooking, dining, sleeping, studying and storage of grain and other articles. Depending on the size of the family, the blocks could have two storeys instead of one. The sloping tiled roofs drain away the rain water as the state experiences heavy rainfall for 3-5 months in a year. The courtyard is used as a common area, by the family members, and also for religious purposes.

Doors, windows and granaries are made from the wood of teak which is abundant in the region. The *nalukettu* large verandahs in each block are supported by tall pillars and a gate house. The *nalukettu* is a self contained unit with tanks for bathing, wells for drinking water and irrigation, granaries, cowshed and farm buildings, and often kitchen gardens.

The compound houses several coconut trees since coconut is an important component of Kerala cooking. The fronds of the coconut leaves are used to make brooms. The fallen leaves are used as fuel in the *chulah*, thus saving on other sources of energy. *Nalukettu* means four blocks of structure. Its bigger varients are *Ettukettu* (eight blocks of structure) and *Patinarukettu* (sixteen blocks of structure).



Gujarat

Pols – Self-Sustaining Community Based Settlements of Ahmedabad

A typical *Pol* in the old city of Ahmedabad consists of densely packed clusters of rows of houses, joined by labyrinthine streets.

Each *Pol* was socially and architecturally homogenous and provided a territory for the interaction, co-operation and interdependence among people. It had homes, religious spaces and open spaces. Some *pols* were used for commercial activity. The houses of the *pols* were also self sufficient units. These had their own provisions for water, sanitation and climatic control. Rainwater was harvested from the rooftops and brought down in copper pipes. The water was filtered through a layer of charcoal, lime and pebbles and collected in a storage tank.

The upper floors of the '*havelis*' had overhanging balconies and windows that cast a shadow on the streets below, thus making it cooler for commuters using the streets. The old city also had a concealed drainage system which, in parts, is still in use. Several *Pols* formed a neighborhood. The historic city was a cluster of many such neighborhoods. Each neighborhood had its own urban structure which was self sufficient for the communities, just as each *Pol* was a self sufficient unit.

There are about 360 pols in the old city of Ahmedabad alone.

Source: http://whc.unesco.org/en/tentativelists/5616/ accessed 7/10/15
http://architectureindevelopment.org/project.php?id=492 accessed 7/10/15
http://www.dnaindia.com/lifestyle/report-pols-have-much-to-teach-new-ahmedabad-1469882

Rajasthan

Pearl Academy of Fashion: Lessons from Ancient Architecture to Make A Green Campus

The Pearl Academy of Fashion, Jaipur is built in the arid suburbs. It combines the modern exterior styling with ancient Rajasthan culture which is designed to keep the temperatures down without any artificial cooling system.

The interiors of the campus remains 20 degrees cooler inside than the outside even in the peak of summer. The building combines traditional architecture with modernity. A four metre deep pool of water is present at the base of the building while the exterior has more of contemporary design. The concept behind the vast pool of water is taken directly from the stepwell structures that provided refuge from the desert heat. The evaporation of water during hot months brings down the temperature of the space around it. This way the academy enjoys its own microclimate.

An airy and shaded pavilion further supports the passive cooling system, since the building is raised above the ground on pillars. The walls are also made from a heat-absorbing material which creates a "thermal-bank". This way the warmth is slowly released in the night when the temperature drops.

A *jaali* or latticed concrete screen runs throughout the length of the building to provide cooling.

The success of the academy's eco-design has had an impact. Regulations -- based on these passive cooling techniques -- were introduced last year for all new Indian government buildings.

Source: http://edition.cnn.com/2012/02/28/world/asia/ancient-air-conditioning-architecture/-accessed on 18/11/15

http://ehp.niehs.nih.gov/121-a18/ -accessed on 18/11/15

"The single most powerful tool used in traditional building design was the willingness and the ability of the users, to organise daily activities in space and time so that not all spaces had to be maintained at equal levels of comfort all the time. At any given time the active use of the building could be restricted to the areas most comfortable at that time. In practice this meant that people would not only take off or put on additional clothing as we do today, but that they would physically move from a less comfortable area of the building to a more comfortable one. Millions of simple residential buildings were designed and built to be used in this way. At times when the entire building became uncomfortably hot, they would move to another building or even to the outside. There are stepwells in Gujarat that were meeting and resting places for men on hot summer afternoons. In winter when the wells were uncomfortably cool, the same men would meet and rest in the open under the sun. In the rainy season the meetings and rest could take place in a verandah. In the Amber Fort there are many cooling devices used, but there is also a garden in the middle of a lake just outside the fort, that would be used for relaxation at uncomfortably hot times. In the houses of Shahjahanabad people spend the hot summer days in the lower floors of the buildings but the evenings and nights are spent on the roof-top fully exposed to the cool night sky. In winter the days are spent on the sunny terrace whereas people move into the house at night. The second important tool used was the ability to vary considerably the thermal characteristics of the skin of the buildings, the variations taking place according to the time of the day or according to the seasons. By this device it was possible to protect the building interior from solar radiation in summer, to retain warmth or cooling as required and even to cool the building interior by evaporation of water from the skin. The physical mechanism required for this purpose was a framework that defined the building exterior and within which suitable panel elements with different thermal priorities could be fixed at different times"

V. Gupta

Indigenous Architecture and Natural Cooling, Vinod Gupta

South India

Sustainable Design of Toda Homes

The Toda, a small pastoral community live on an isolated Nilgiri plateau of Southern India. They traditionally live in hamlets called munds consisting of three to seven thatched houses These are constructed in the shape of half barrel and is spread across the slopes of the pasture.

Huts of Toda tribe are in synchronization with their traditions and are made up of locally available material.Each hut is enclosed by a wall of loose stones which are mostly granite and has a small entrance (3 feet wide and 3 feet tall) that serves as a means of protection from the wild animals. To give the hut a basic tent shape, arch is provided by thicker bamboo canes. Thinner bamboo frames are tied together and are laid over. Also, the dried grass stacks are laid over the thatches.

Source: http://www.newworldencyclopedia.org/entry/Toda_people, accessed 7/10/15

Shelter

Spirituality and Design for Sustainable Living

We have one planet and one life. We human beings have always believed that three main components constitute a good life – being healthy, wealthy and wise. However, there is a fourth component which is the most important: happiness. The basic idea is that human progress needs to be about more than just growing the economy.

When we think of development, we usually think first of economic development to meet material needs, measured perhaps through growth in the Gross National Product (GNP). Yet is that all, to the development? Does economics measure everything? The answer is no. It is clear that development must include not only material progress, but social and cultural dimensions as well. When we measure how well our societies are doing, the focus should be on people's overall quality of life and not just their standard of living. Each society must define development in its own terms to reflect its underlying culture, values and goals. The economy eventually is a means to an end; the ultimate end is the happiness of the people.

This “happiness” has nothing to do with the common use of that word to denote an ephemeral, passing mood, but rather, it refers to the deep, abiding happiness that comes from living life in full harmony with the natural world, with our communities and fellow beings, and with our culture and spiritual heritage — in short, from feeling totally connected with our world.

And yet our modern world, and particularly its economic system, promotes precisely the reverse — a profound sense of alienation from the natural world and from each other. In the process of cherishing self-interest and material gain, we destroy nature, degrade our natural and cultural heritage, disrespect indigenous knowledge, overwork, get stressed out, and no longer have time to enjoy each other's company, let alone to contemplate and meditate on life's deeper meaning. We have created a god in materialism that gives no real satisfaction or purpose to our lives. It is an overall painful survival without celebrating the life.

Today, people have adopted a consumerist mindset where the predominant motto of life is to use and consume as much as possible. Everyone wants to change his/her mobile phones, cars and interiors every year, even if they have use-value, just to have one up-manship in the society. The 'use & throw' policy has become such a strong part of our life that it has extended to even human relationships. In response to this consumption, the GDP surely shows a great upward graph but the flipside is, are we really taking care for the next generation? The marketing strategy we employ today works on greed and fear – the desire to have more and the fear that tomorrow it may not be available. The outcome of the conflict between man and nature is the global ecological-moral-social crisis that has become one of the most crucial problems in the world requiring urgent solving. At present mankind's account is extremely meagre from the viewpoint of morality and values that can save the self as well as nature.

And yet, despite valiant efforts made by individuals, communities and certain nations, human society will continue to hurtle toward self-annihilation unless we act together. The time has come for a global effort to build a new economic system – a model no longer based on the dangerous illusions that irresponsible growth is possible on our finite planet and that endless material gain promotes wellbeing. Instead, it will be a system that promotes harmony and respect for nature and for each other, that respects our ancient wisdom and traditions and protects our most vulnerable people as our own family, and that gives us time to live and enjoy our lives and to appreciate rather than destroy our world.

The concept of sustainable development is the essential basis and most popular concept of economic development today. In this concept two immediate aims are related:

a. To ensure proper, safe and good life for all people – this is the aim of development, and

b. To live and work according to the biophysical boundaries of the environment – this is the aim of sustainability

Sustainability implies maintaining a balance, both in the present society and over time. It is not a destination to be reached, but a dynamic process requiring consideration both, of our present balance between parts of society and between society and nature, and of the future potential to maintain that balance.

Current approaches to economic and social development ignore mankind's need for spiritual development, and attempt to change almost everything in the external world except ourselves. Of course, the changes it brings to the external world generates more material wealth, but as the selfishness within us remains unchanged, we fail to generate wealth in an environmentally sustainable manner, to distribute the wealth equally and to deliver happiness to all. As we develop spiritually, selfishness is replaced by selfless love. Sustainable development is a challenge that begins internally, within the individual, rather than externally, in the environment or society. The internal challenge can only be met by developing the spiritual dimension of the individual or the spiritual self.

Gandhi famously said, “We must be the change we wish to see in the world.” That certainly means we must practise what we preach, but more deeply it suggests the possibility that if we can transform *ourselves* — our own consciousness and our personal relations with the environment and with each other — then we can tap the power of truth needed to overcome the obstacles to a sustainable future.

The requirement today is to search for a model where environment sustainability and human development go hand in hand, where we take care of the environment and the environment takes care of us. The need today is for inclusive development. It is after all basic human values that determine the social interactions and cohesion. In biological communities, it is genetic instructions and instincts that determine interactions, but in people these interactions are largely governed by values which we receive through education in the family, from religion, in school and by observation in society. If we need to restructure society to make it more sustainable, we must start with its basic values. Families here have a key role to play, because it is in the family that the education of each new generation begins, forming character and basic social and spiritual values. The transmission of culture, ethics and morality from generation to generation is an essential aspect of sustainability.

We need to redefine the measure of successful development not as the most efficient use of money or capital, important as that is, but as the maximum use of the available human potential in the community. This is the real wealth-generating capacity of society, if we consider wealth to include not only the material, but the social, cultural and spiritual dimensions of life.

Sustainability implies an obligation to conduct ourselves today in a manner that future human generations are not deprived by our actions of enjoyment of natural and social goods. This makes sustainability a fundamentally ethical notion - an obligation. We owe this obligation not just to people, but also to animals, plants, life systems and the nature that surrounds us.

We have one planet and one life. Everything is important and everything is valuable. Each one of us has a role to play and the planet can exist in harmony only if everything is given equal importance.

Pradyumna Vyas, Director NID

The Baul is so close to nature, considering himself to be a ‘Matir Manush’, or creature of the earth, that after the death of a Baul, his mortal remains are not consigned to flames as in Hinduism, nor interred in a coffin as in Islamic rites, but placed in direct contact with the earth. This, perhaps, imbibes the Christian philosophy—‘Dust thou art to dust returneth’—the earthly body that is moulded from the earth goes back to mingle with the soil, while the soul unites with God.

Arunachal Pradesh / Assam

Designs for Disaster Risk Reduction

Every year due to incessant rains and an over flowing Brahmaputra river, floods create havoc in Assam and Arunachal Pradesh in North Eastern India. While many homes are washed away, the stilted *chang* houses provide safe shelter to families.

The stilted *chang* houses are seen in areas where there is high moisture content both in the air and the soil. The stilted houses are designed to keep out the impact of heavy monsoon. The floor and wall inlays are usually made of woven bamboo. The sloping roof allows rainwater to run off and not soak through. A bamboo loft below the roof allows for storage of goods in case of floods.

The *Chang* is generally rectangular in shape with linear planning. The houses are constructed over bamboo posts and bamboo diagonal bracings are tied to form the stilt areas. The stilt height is typically 1.50 to 2.00 metres above the ground level. The space below the stilt is often used to store a canoe for emergency usage during floods, which points to a longstanding tradition of disaster preparedness among the local people. Needless to say that such construction is highly energy efficient, resource efficient and space efficient.

There is a natural cooling system since bamboo is a bad conductor of heat and keeps the interiors cool. Adequate ventilation through the permeable floors and walls keeps the moisture content inside the houses low, making it comfortable in spite of the sultry and humid climate.

Source: Nag Subhankar, Gondane Amol, Architecture of North East India: Vernacular Typologies
https://pasighat.wordpress.com/2012/07/31/house-of-adi-tribe-arunachal-pradesh- accessed 5/9/2015
http://dhemaji.nic.in/flood/chang_concept.htm - accessed 5/9/2015

"I'm concerned about surroundings that already have controlled their own pattern of buildings in the neighbourhood. The various styles of architecture are all the result of thousands of years of ordinary people trying to make buildings that keep out the rain and wind and sun by using whatever materials there were, lying around or growing in the place where they live. So I see what principles have developed over centuries - in other words, I see what has resulted in this particular area from their forefathers' study of local conditions and materials - and then apply these principles to what I want to do for my client. Sometimes, the local architecture is so beautiful and so apt that I feel it would be foolish and an affront to try and design in any other way."

Laurence Wilfred Baker

Gujarat, Rajasthan

Chabutara - a Place to Feed Birds

Chabutara, also known as *chabutaro,* is found in Gujarat and Rajasthan, and is a place where birds are fed and provided water. The bird feeding table is kept in homes and gardens and reflects the sharing attitude of the people. Built from stone and bricks these are elevated platforms which provide refuge to a variety of birds, ranging from the small sized sparrows, mynas and pigeons to large ones such as peacocks.

The most commonly seen type is the *ek-dandia chabutaras* which is essentially a platform covered with a dome or hood and mounted on a 5-6 feet high pole. On the platform a dish of water and some food is kept for the birds.

Although *chabutaras* are commonly seen all over Gujarat, similar bird feeding tables are also seen in Rajasthan and Maharashtra. Indeed, the hood of the *chabutaras* is believed to have been influenced by the *chatri*, a common feature in Rajasthani architectural design.

The *chabutara* has a deep sociological and religious significance in Gujarat. Although the form of the *chabutaras* incorporates the influences of Hindu, Muslim and Jain architectural designs, the practice of putting up these bird feeding tables is undoubtedly linked to the Jain faith which preaches non-violence and humanity. This is yet another example of our rich heritage of co-existence with all forms of life.

Source: http://www.indiaprofile.com/religion-culture/gujarat-culture.htm, accessed 7/10/15

Andhra Pradesh

First LEED Platinum Rated Building of India

CII Sohrabji Godrej Green Business Centre Hyderabad is the first LEED Platinum rated building of India. It is based on the Pancha Bhutas belief system and "that what derives itself from nature returns to it", thus reducing the ecological carbon footprint. This is an excellent example of materializing the traditional belief and practices in modern context.

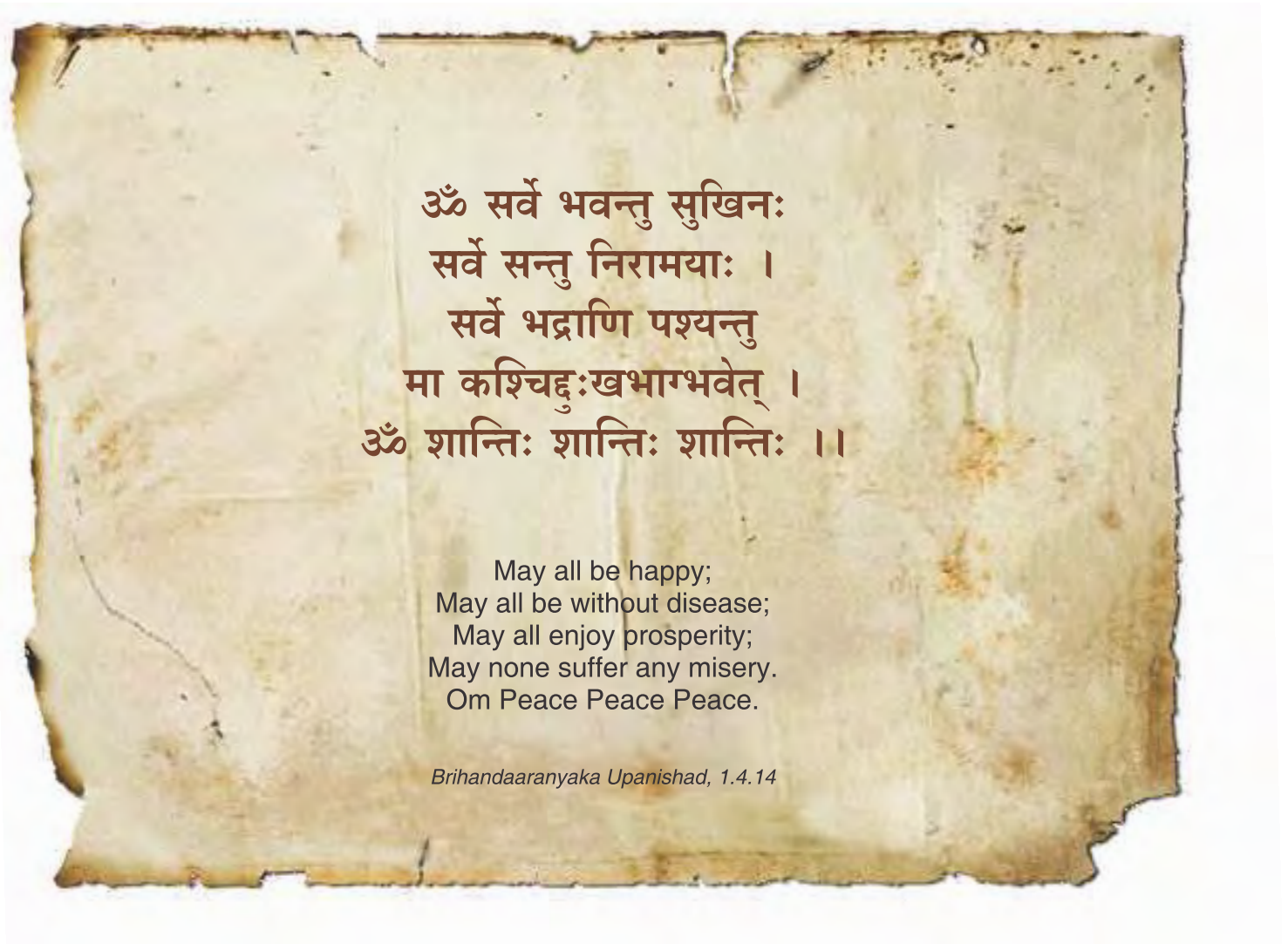
Source: http://www.indiaenvironmentportal.org.in/files/file/CII_Sohrabji_Godrej_Green_Business_Centre-Case_Study.pdf, accessed 7/10/15

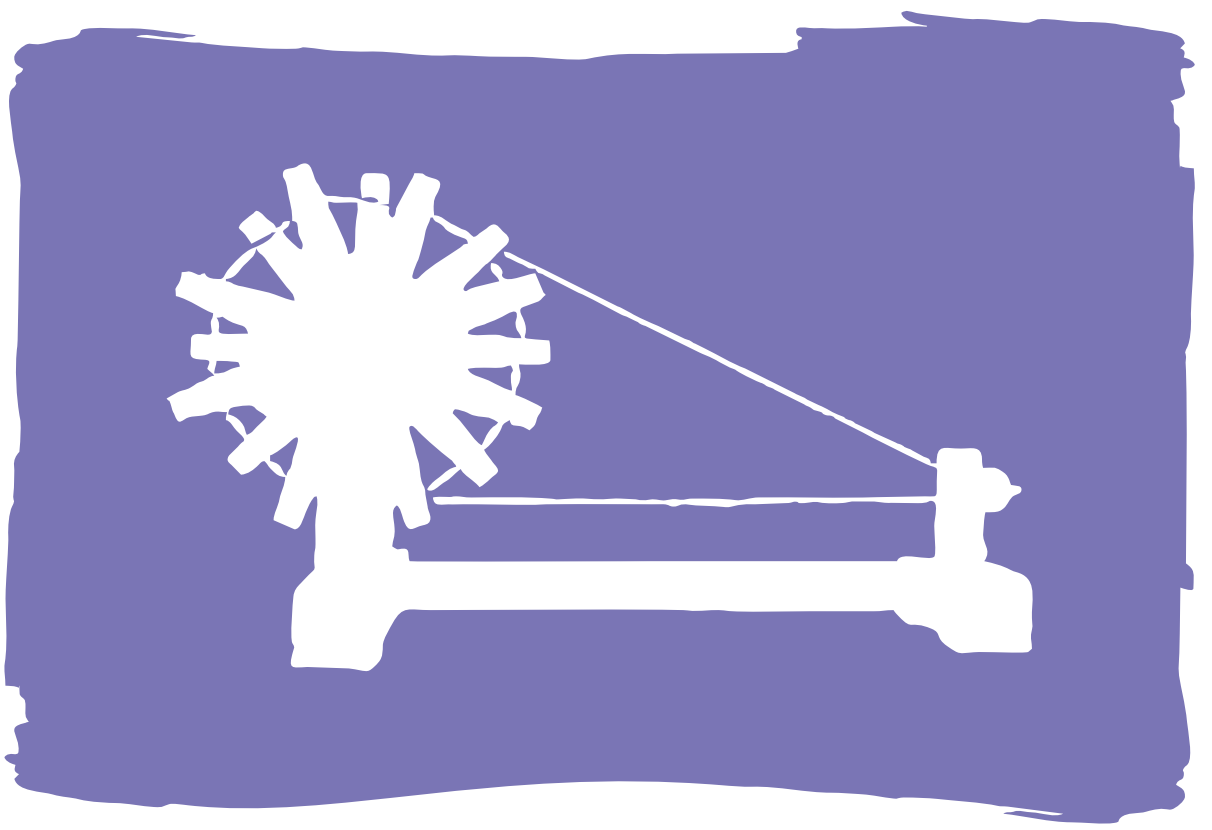
Punjab

Eco-Sikh Gurdwaras

EcoSikh is supported by Alliance of Religions and Conservation (ARC), the Norwegian Government, the Sikh Council on Religion and Education (SCORE) and the Sikh community. EcoSikh connects Sikh values, beliefs, and institutions to the most important environmental issues facing the world. They draw on the rich tradition of the Sikh Gurus and the Khalsa Panth to shape the behaviour and outlook of the Sikh community ensuring that their deep reverence for all creation remains a central part of the Sikh way of life. Its first initiatives are to establish March 14 as Sikh Environment Day, to help gurdwaras throughout India and encourage people to think and act green. Another objective is for Amritsar the holy pilgrimage destination for Sikhs, to become one of the first Green Pilgrim Cities. This is a grassroots movement led by gurdwaras that choose to reduce their impact on their environment. Gurdwaras worldwide are pioneering new ideas in renewable energy, water conservation, waste reduction and recycling, and organic and healthy food system.

Source: http://www.ecosikh.org/programmes/green-gurdwaras/, accessed 7/10/15
http://www.arcworld.org/projects.asp?projectID=138, accessed 7/10/15


ॐ सर्वे भवन्तु सुखिनः
सर्वे सन्तु निरामयाः ।
सर्वे भद्राणि पश्यन्तु
मा कश्चिद्दुःखभाग्भवेत् ।
ॐ शान्तिः शान्तिः शान्तिः ।।
May all be happy;
May all be without disease;
May all enjoy prosperity;
May none suffer any misery.
Om Peace Peace Peace.
Brihandaaranyaka Upanishad, 1.4.14



Textile, Clothing and Lifestyle Products

Indian textiles, clothing and lifestyles are best explained as a combination of improvisation, philosophy, artisanal skills, and a collective commitment to managing with little. Handmade textiles and recycling of clothes, which is a part of India's textile, clothing and lifestyle system, could show the way for reducing GHG emissions.

In India, many communities practice weaving and stitch clothes which would fall in the medium and small sectors and industry. In view of the country's immense diversity, there is a huge variety of textiles in India, each with its own unique process, pattern and design. But what is significant is the way clothes have been traditionally produced, the use of local material and the final garment designed such that it fits and can be used by mostly all age groups, even across generations. The overall product has a life-cycle that features re-use and recycling as critical component to its identity. The material and design are customized and worn in a fashion that offers comfort considering local weather conditions and yet retains the local cultural identity. Even when a garment has outlived its function, it is converted into something new and used for a different purpose. Often this also has craft and livelihood implications.

Using old textiles, bedcovers and fabric pieces to make a totally new product is an Indian way of recycling cloth, e.g. the craft technique of kantha that holds together layers of fabric with a running saddle stitch is a typical example of creating a new and beautiful product from old saris. Traditionally, even threads, buttons or other discarded materials have been used in imaginative and beautiful ways to make new products. This is a sustainable lifestyle option that promotes a universal product and discourages buying new products, thus reducing the demand for new products developed out of an energy intensive production process.

The upcoming National Textile Policy, 2015 has considered building on the traditional practices in the textiles, particularly handloom sector to provide impetus to local, small and medium scale enterprises.

Textile, Clothing and Lifestyle Products

All India

Recycling of Used Cloth to Make New Products

India has a tradition of recycling old clothes to make new products. Traditionally it has been a practice to hand down clothes of the older sibling to the younger one and even today every daughter can claim to possess the “handed down” sarees from her mother. Our culture of recycling is evident from the fact that most Indian homes have typical mops and dusters made from an old T-shirt!

Jammu & Kashmir

Handmade Rugs from Old Blankets

The nomadic Bakarwal and Gujjar tribes of Jammu & Kashmir use acrylic yarn for embroidery on old woollen felt blankets and convert them into beautiful needle worked handmade rugs. This is a part of their tradition and culture and a method to preserve the old clothes. They also use old clothes to make caps, bags and other accessories with beautiful hand embroidery.

The motifs and stitches of the free-form embroidery of this tribe are an amalgamation of the various cultures the community has been exposed to. Often the colours used by the Bakarwal women reflect their moods. These rugs are beautiful and keep one extremely warm during winter. It takes a woman a month to embroider a rug.

The rugs and woollen blankets are produced by sustainable means and form part of the rich cultural heritage of the people of Jammu and Kashmir.

Source: Recycling of Textiles in India by Bairagi N.
http://www.omicsgroup.org/journals/recycling-of-textiles-in-india-2165-8064.S2-003.pdf-accessed on 28/9/15
http://blog.jaypore.com/2014/12/11/the-nomad-lyric-embroidered-textiles-from-kashmirs-gujjar-bakarwal-tribe/-accessed on 28/9/15
https://shepherdcrafts.wordpress.com/-accessed on 28/9/15

“I only feel angry when I see waste. When I see people throwing away things we could use.”

Mother Teresa

Gujarat

The Chindi Rug / Chakhlo

Chindi is a term in Hindi that means traditional weaving with leftover scraps of cotton strips. The old cotton cloth is cut into one-to-two-inch strips. Heavier material is also used and this can be cut thinner. The strips are then assembled and stitched together with a crochet hook and thread. The output is a colourful rug which can be used as a door mat or floor mat.

Source: http://www.offthegridnews.com/how-to-2/how-to-make-beautiful-rugs-out-of-old-clothes/-accessed on 28/9/15

Bengal

Kantha Work

Traditional *kantha* was made using threads pulled out from sarees and dhotis, which show that recycling was a way of life. The “old” thread was preferred because it made the cloth soft and *kantha* was usually used for babies and young children.

The typical *kantha* quilt is made from many layers of fabric sewn together with a running stitch which is called the "*kantha* stitch." Interestingly, while embroidering, no hoops or frames are used to keep the cloth tight and this leaves a rippled effect on the cloth. Some *kantha* with intricate designs was traditionally passed down from generation to generation and as these wore out and faded, put to practical uses like baby diapers due to its texture of softness.

These *Kanthas* come in varied sizes and are used for different purposes. From quilts to mats, prayer seats to gift covers, stoles to sarees, the *kantha* is a popular piece of cloth with typical embroidery. The motifs designed on the clothes or bed spreads are inspired by day to day life. These included birds, animals, folk scenes, fishes and flowers.

Source: http://www.utsavpedia.com/motifs-embroideries/kantha-embroidery/-accessed on 27/9/15
http://www.craftandartisans.com/kantha-embroidery-of-west-bengal.html-accessed on 27/9/15
http://www.tulsicrafts.nl/en/tag/reuse/-accessed on 27/9/15
http://thestokela.com/blogs/news/39274756-upcycling-kantha-embroidery-accessed on 27/9/15

Maharashtra and Gujarat

Godhadi and Gudri

Godhadi is the name for a traditional Indian quilt of Maharashtra and Goa. It is hand stitched patchwork traditionally made from old sarees and dhotis.

An old sari is folded so that the folds create the quilt and stuffing is not required. The layers are put together with a running stitch which is free flowing. The more decorative parts of the saree is used to create a border for the quilt. *Godhadi* represents both full sized quilts which are used on beds and draped around shoulders in winter, and its smaller versions are used as perpetually washed baby mats.

Source: https://www.weswadesi.com/online-shopping-handmade-quilt/online-shopping-handmade-godhadi-accessed on 18/9/15

http://theinitiative.in/godhadis/-accessed on 18/9/15

http://www.dnaindia.com/mumbai/report-godhadi-work-goes-global-local-farmers-reap-benefits-1571203-accessed on 18/9/15

http://blog.jaypore.com/2015/08/30/reborn-recycled-designs-for-a-sustainable-lifestyle/-accessed on 18/9/15

All India

Covers for Harsh Weather

Beating the Heat with the Turban

India is a land of diverse forms of turbans and their unique styles vary from state to state, from tradition to traditon. The Marathi *Patka* or *Pheta* is a style of wearing the turban found in Maharashtra. The cloth of this traditional turban was made by soaking it in the rich colours of red or orange that symbolised feudal pride and prestige. The more common white cotton *Patka* was for day to day use and primarily a headgear for farmers to protect their head from sunstroke. The simplest form of the turban was often a used cloth called the *mundasa* that was simply draped around the head.

Maharashtra

Ghongadi and Jaan

These are water and dust repellent woollen products made from a special coarse wool from the Deccani breed of sheep, which are known for their sturdiness and tolerance of dry climate. While *jaan* is mostly used as a mattress, *ghongadi* is used as multi purpose protection cover from rains, duststorms and winter cold. It is also used as a mattress or a shade cover. These are products which are made from material that is locally available, the source being the local sheep. *Ghongadi* and *jaan* are maintenance free and can be cleaned by brushing off the dust or sun drying and do not need to be washed with water.

While Dhangars, the shepherd community in Maharashtra, rear the sheep and cut the wool, *ghongadi* and *jaan* are the craftwork of men and women from a highly specialised community of Sangars. The farmers, herdsmen and tribals who live in areas with very high rainfall in the Western Ghats of Maharashtra and Konkan region, even today prefer the *ghongadi* and a traditional raincoat made of the same coarse wool to cover their belongings and themselves.

Jammu & Kashmir

The Craft of Recycling Waste Paper

Paper Mache (also spelled Paper Machie) is a Kashmiri craft that recycles waste paper into beautiful artifacts painted in details by expert craftsmen. The traditional Kashmiri method of making paper mache starts with soaking waste paper for several days until it disintegrates. The excess water is drained and the soaked waste paper, cloth, rice straw and bonding agents are mixed to form a pulp. This mixture is placed in a mould and left to dry for two or three days.

Paper mache was introduced in Kashmir in the 15th Century by a Kashmiri Prince who spent years in prison at Samarkand in Central Asia. The art born in the land of Persia was highly favoured by Mughal Emperors of 15th and 16th centuries. The hand painted motifs of birds and flowers on items like coasters, jewellery boxes and bangles are a popular gift item made of waste products even today.

Source: http://www.paisleyvalley.com/papermache.html, accessed 16/10/15

Bihar

Sujani Embroidery

Traditionally, *Sujani* was a name used for a blanket made at the time of child birth, by sewing together patches of different coloured cloth from old and used clothes.

Sujani is a type of embroidery sewn on two fabrics layered on one another. The background is created by a delicate running stitch all over the sheet in the same colour as the base cloth. The design is then filled in with fine running stitches in coloured thread. The main motifs, which usually have social messages, are outlined with a thick chain stitch and the inner spaces are filled with different coloured threads.

ADITHI is a group of women from Bhusura village in Muzaffarpur district of Bihar have created a livelihood option for the rural women of Bihar through this age old art form of *sujani*. The group was started by five women in Bhusara village but now has 600 women members who undertake *sujani* art.

To make this art and their livelihood sustainable, these artists undertook a major experiment with *sujani*: Moving away from the traditional stories of gods and goddesses, they began to create stories depicting their experiences in a highly patriarchal and feudal society on the cloth with *sujani*.

Source: http://www.nift.ac.in/patna/craft%20cluster.pdf-accessed on 28/9/15
http://www.stitchwallah.com/sujuni-embroidery/-accessed on 28/9/15
http://www.textilemuseum.ca/exhibitions/past-exhibitions/exhibition-essays/stitching-women's-lives-sujuni-and-khatwa-from-bih-accessed on 28/9/15
www.paramparaproject.org accessed 28/9/15

The Paradox of Plenty

"The many philosophers and seers of our tradition have emphasised the importance of frugality. Luxury and comfort, they taught, corrupts the soul. In India, we have had the space for diverse ways to engage with the world, So even though there were schools of thought that countered this austere world view, by and large, living frugally is a value that most people in our country share. In times of scarcity, this way of thinking conserved resources and helped sustain communities.

Today, in the artisan community, many of the local traditions that evolved out of scarcity have now become extremely expensive. The exquisite, indigo dyed *Ajrak*h (block print) sari we might see on an elegant society lady has its origins in the humble, everyday wear of a male pastoralist. The *Ajrakh lungi* evolved in Sindh and Kutch because of the presence of indigo, whose antibacterial qualities helped protect the wearer from disease in times of water scarcity. *Ajrakh* printing requires up to 17 steps of processing, and is time consuming to make. The fabric today is so expensive that the communities who originally created them can no longer afford them.

This example is instructive because it demonstrates how scarcity challenged communities to use and manage their resources wisely. The scale of production was limited to what they could create by hand and what they could consume.

In today's world we live in a time of plenty with many choices. But how do we choose? In earlier times, scarcity created practices of frugality and thrift, making conservation a necessity. Today, we produce and consume as if there are no limitations. Ironically, conservation has become a lifestyle choice rather than a reality we all face."

Meera Goradia,
Director, Khamir

Textile, Clothing and Lifestyle Products

Tamil Nadu

Pattamadai Mats: An Elegant Alternative to Plastic Mats

Pattamadai mats, also called *pattu paai* (meaning silk mat, so called due to its smooth texture), originated in a small village in Thirunelveli district of Tamil Nadu. The art and craft of weaving and blending intricate designs of Pattamadai mats are considered unique to this region. The conventional method of mat making is a lengthy process involving drying, soaking, splitting and dyeing.

Pattamadai *paais* are made specially for wedding ceremonies. It is a token for making the occasion memorable and has the bride and the groom's names as well as the wedding date woven in it. The traditional colours used are red, green and black and the weaves range from medium to 140 counts.

Today, apart from the sophisticated Pattamdai *pai* (mat), Pattamadai weavers also craft *korai* grass shopping bags, place mats, runners, office folders and other items.

This is a much more sustainable alternative to the popular plastic mats which are fast replacing the Pattamdai mat.

Source: http://www.paramparaproject.org/traditions_pattamadai_mats.html- accessed on 28/9/15

"The saree is a designed piece of clothing worn all over India. Over the years very beautiful designs, patterns and textures have been printed and woven into the Indian saree and yet, several thousand years of Indian history has not tried to stitch the saree. It is worn in many ways and fits all sizes. It is equally good for working, dressing up or sleeping in. The final effort of the person who designs the cloth and the person who wears it – of the designer and the user. This is a very different concept from that of designing, say, a well-stitched dress. The garment either fits or doesn't fit and, where it fits, leaves little room for the wearer to be innovative in its use."

Kartikeya V. Sarabhai

All India

The Hand Fan: A Cooling Tool for Indian Homes

Even today in rural homes of India, people use a handmade fan of local material to beat the heat. The hand fan is called *pankha* which comes from the word *pankh*, meaning wings of a bird.

The history of Indian fans can be traced to ancient times when kings had attendants to manually fan them in their palaces. Fans are made from local material like crafted fibre, sandalwood and bamboo strips depending on the region. Fans are also made from *khus-khus* (*Vetiveria zizanioides*), a root that releases a mild fragrance when waved, especially if water is sprinkled over *khus-khus* (*Vetiveria zizanioides*). It has cooling properties, and is used in many parts of the country.

Source: http://www.craftrevival.org/CraftArtDetails.asp?CountryCode=India&CraftCode=003697-accessed on 14/9/15

Reducing Carbon Footprint with Local Products

Tripura

Bamboo Products

In Tripura, bamboo forms the core of local tradition. As they say in the tribal villages of Tripura, "Once born, you cannot survive without bamboo". This is literally true because in certain tribes, the first time a person comes into contact with bamboo is immediately after birth, when his or her umbilical cord is cut with a bamboo blade. And bamboo accompanies him or her throughout his or her life.

Bamboo's widespread availability as a local material made its role almost indispensable in the local lifestyle. The indigenous people of Tripura use the material for a variety of purposes ranging from fencing to housing, fans to furniture, baskets to bridges, food to medicine, all of which strengthen the sustainability concept of "making local".

Livelihood is also generated from the bamboo since basketry is an important craftsmanship of Tripura. The different baskets woven out of split bamboo in most rural Tripuri households include *jamatia* firewood basket, *riang* carrying baskets, *karawala tukri*, *laii*, *sempa khari* date basket, grain storage basket, *dull* and *sudha* - the traditional fish trap. Made entirely of outer splits, the *Jamatia* is used by the *Jamatia* tribe of Tripura for carrying firewood. The *riang* is a closed-weave basket used by the *Riang* tribe of Tripura to carry grains and day to day marketing produce. Both men and women use this basket, though the sizes may vary in each case. The *tukri* is a shallow basket used in Tripura. The *karawala tukri* is a Tripura-Bengali product which is identical in its structure to the *tukri* of Agartala with the exception that the latter h as four strong handles attached to this basket. It is made from split bamboo, while the handles are of split cane; it is used for carrying construction materials. The *laii* is a small bamboo basket used for washing rice. The *sempa khari* is a small basket shaped like a square-based prism and used to store small objects. This basket is used to store dates and is carried suspended from the waistband. It is woven from coarse bamboo inner splits using the diagonal weaving method. It is shaped like a deep rectangular pouch open at the top. The grain storage basket in Tripura has a large square base with the sides tapering out to a large circular rim. These baskets are made by professional craftsmen and sold at weekly bazaars. These are plastered with a mixture of cow dung, clay and rice husk before being used to store grain.

Source: http://www.paramparaproject.org/traditions_basketry.html-accessed on 28/9/15

All India

Production without Using Fossil Fuels: Weaving Looms

The weaving loom is a professional tool which can be manually operated to make different designs and cloth of different sizes.

Weaving is a tradition practised by communities in almost all parts in India. People weave to make their clothes, towels, homeware, and also to make products which are a source of their livelihood. It is a useful equipment in a village home that serves the family's cloth and clothing needs, and does not require energy form fossil fuels to function.

Source: http://www.indianmirror.com/indian-industries/weaving.html- accessed on 14/9/15

Jammu & Kashmir

Kangri

As the temperature in Kashmir decreases in winter, the sales of *Kangri* - a local parlance for an earthen pot encased in wicker - picks up. Kashmiris use *Kangri* to keep themselves warm during late autumn and winter seasons, especially in the rural parts. Villagers prefer the *Kangri* to an electric heater.

The *Kangri* is a sort of mobile heater. The mobile nature of the *Kangri* is one of the major reasons that it is so popular in villages. The villagers go to the fields with *Kangri* inside the *pheran* (a Kashmir cloak) in winters. In addition, it is used to warm beds, to dry small articles of clothing, warm milk, burn incense, roast chestnuts or small pieces of meat and light hookahs.

A *Kangri* is a semi-spherical clay pot enclosed in willow rushes. Its handles are also made of willow rushes. The pot holds burning coals that stay warm throughout the day. Throughout Kashmir in winter, it is common to see people with one hand holding their *Kangri* inside their *pheran*, doing the daily chores with the other.

Source: http://www.paramparaproject.org/traditions_kangri.html-accessed on 18/9/15

Jammu & Kashmir

Kashmiri Carpets – A Home Based Industry

Carpets are woven in most homes in Kashmir and are an integral part of the state's culture. The carpets are used for sitting, sleeping and entertaining guests. In a day and age when machines reign supreme and mass production dominates the market, the handmade carpets of Kashmir represent a sustainable way of life.

Kashmiri carpets and rugs are considered to be investments for life, made by tying thousands of knots and through years of labour. Kashmir carpets are handmade, hand-knotted and involve hereditary skill that is detailed and unique.

Source: http://www.paramparaproject.org/traditions_carpet-making.html- accessed on 28/9/15

http://streettrotter.com/2013/09/16/the-tale-of-the-kashmiri-carpets/- accessed on 28-9.15

All India

Traditional Indian Clothing: Designed for the Climate

Indian clothing was traditionally made from cotton and silk, materials which are considered cool and natural. Men wore *dhotis* and women wore *sarees*. The loose fitting designs and cool materials made traditional clothing a comfortable wear in the hot weather of India. Traditional clothing was unstitched. In most regions the *saree* was worn, though draped differently in different regions. In other regions women wore two piece drapes, a longer cloth draped like a skirt for the bottom and a shorter cloth to drape the top. Typically most clothes that covered the body were produced by hand, did not require machine stitching and had intricate hand woven designs or embroidery.

Source: Jill Condra, Encyclopedia of National Dress: Traditional Clothing Around the World

"Perhaps the most important contribution we can make to an understanding of sustainable living is to restore to our own forest dwellers the respect and the authority which 'development' has snatched from them. It is these communities who have for centuries demonstrated an ability to care for the earth and to care for each other. Surely these two responsibilities constitute the core of any genuine understanding of sustainability.

These communities do not want to live in a time warp. What they demand is the opportunity to apply their values and insights to today's challenges, as equal partners who have an instinctive understanding of wellbeing as harmony between the earth and those it shelters. Theirs is an Indian wisdom with global relevance."

Ashoke Chatterjee
Crafts Council of India

Bihar

Madhubani: Paintings Made with Natural Colours

Madhubani painting, also referred to as Mithila Art (as it flourishes in the Mithila region of Bihar), is characterised by line drawings filled in with bright colours and contrasts or patterns. These paintings use mineral pigments prepared by the artists and do not contain any synthetic material. Cotton wrapped around a bamboo stick forms the brush. Black colour is obtained by mixing soot with cow dung, yellow from turmeric or pollen or lime and the milk of banyan leaves, blue from indigo, red from the *kusam* flower juice or red sandalwood, green from the leaves of the wood apple tree, white from rice powder, orange from *palash* flowers. The colours are applied flat with no shading and no empty space is left.

The work is done on freshly Plastered or mud walls and is equivalent to a modern decorative wall made of plaster of Paris.

This style of painting has been traditionally done by the women of the region, though today men are also involved to meet the demand. These paintings are popular because of their tribal motifs and use of bright earthy colours.

Today for commercial purposes, the work is also being executed on paper, cloth, canvas and other media.

Figures from nature and mythology are adapted to suit the artists' style. Floral, animal and bird motifs, and geometrical designs are used to fill up all the gaps.

Source: http://www.paramparaproject.org/traditions_madhubani_paintings.html - accessed on 28/9/15

Doing More with Less: The Power of Craftsmanship

Responding with inventiveness to the strongly contrasting geographic features of landscape, climate and topography, India's craftspersons have over the centuries developed low-energy, low-carbon footprint technologies adapted to their environments. Working with materials as diverse as metal, wood, clay, glass, grass, fibre, paper, leather, textile and other organic and inorganic matter the craftsperson's capabilities are exhibited through their knowledge of techniques in the processing of these materials as they create objects for the sacred, for the temporal and for everyday needs.

One can see this from the wool gathering and weaving of the Pashmina shawls in the high reaches of the Himalayas, to the gathering of the *al* root to create the characteristic red; from the weaving of the wild *Eri* and *Muga* silk of Assam, to the variety of creative responses to the wild grass, fiber and vegetation that grow in abundance. The ubiquitous use of plant material to build homes and bridges, to thatch roofs, create rain shields, to craft musical instruments and baskets. The sculpturing of the *Sholapith* in Bengal and Tamil Nadu; the toys and baskets of *Sikki* grass in Bihar and Odisha, and the use of *Kauna* reed to make mats in Imphal; the *Kora* mats of Kerala and Tamil Nadu, to the use of wicker in Kashmir; the mats of *Sheetalpati* and *Masland* in Assam and Bengal, to the use of *Sarkhanda* in Haryana to make furniture and containers, and of the *Pulla* grass footwear of Himachal. The traditions of clay and pottery, the making of vessels to store food, to eat a meal, to drink hot tea or contour a floor or build a wall or shape a votive the fashioning of clay continues to fulfil both the utilitarian and ritual needs of many. With the largest numbers of handlooms in the world, powered by human skill and ingenuity, weavers produce cloth on looms that require no electricity and lays no stress on the system.

The list is endless.

Of equal value is the renowned ability of the craftsperson to adapt not only to changing demand patterns but equally to their strength in reusing, recycling, up-cycling and other transformations of what is considered discarded and waste material. Examples abound from the traditional skills of making paper by hand that now use non-forest raw materials from rice and wheat straw, jute and bamboo waste to the cotton fabric cuttings leftover from the garment industry. With production centres from Puducherry in the South to Kashmir in the North, it is a small village near Jaipur in Rajasthan that lays claim to being the world's largest centre of handmade paper.

The practice of recycling old and worn out textiles continues, whether called *Kantha* in West Bengal, *Gudri* in Rajasthan, or *Sujni* in Odisha. These are all part of the same genus where old *sarees*, *dhotis* and other textiles find new life as these were layered and embroidered to be transformed into a completely different avatar of a wrap or cover for a new born or as a cover for a bed, a spread to eat on or any other use desired.

The new generation of dhurries - using traditional skills but adapted to the raw materials available today - the rag-waste of the textile trade and the scraps of plastic waste.

The *dhokra* metal icons made of iron scraps that are smelted in homemade crucibles, the making of natural pigments from matter found in the environment to create murals and for miniature painting, the alchemic transformations in plant and mineral matters into fast colours used for dyeing cotton and silk, with over 1200 large clusters and innumerable small pockets of skill and minimal use of machines, innovative recycling of waste, and environmentally sound energy saving technologies that do not deplete resources or cause pollution in the production process – all these are things Indian craftspeople remain famous for.

These indigenous domestic technologies give India a unique space, both notionally and materially. While some might term them out-of-date and regressive, their role in the coming tomorrow of an energy deficient and climatically changing world will be enormous. For a developing country like India the possibilities offered by the capabilities, skills and knowledge of its craftspeople, employing numbers that are second only to agriculture, will define us as a people and as a culture, to give us our special place in the world.

We need to recognise and harness the potential of our craftsmanship as the great Indian advantage for the future that is yet to come.

Ritu Sethi, *Director, Craft Revival Trust*

Textile, Clothing and Lifestyle Products

Chhattisgarh

Local Markets for Local Produce – Haat Bazaars

The traditional barter system continues even in the days of e-commerce! The *haat* bazaars of Chhattisgarh are more than just business centres. Held once a week, the local people of the area gather in the market to trade their products and to buy their food supplies for the week. The ancient system of exchange of goods - the barter system - is prevalent in the markets and most of the dealings are conducted in the traditional fashion. All types of goods, including food products, cattle, clothes and accessories, and even ornaments made by tribal women, are sold in the *haat* bazaar of Chhattisgarh. The government-run mobile clinic provides free medical services at the *Haat* Bazaar which shows the government's interest in conserving this traditional practice.

The Chhattisgarh *Haat* Bazaars, which number more than 200, have gained the status of a community gathering also. It is an example of sustainable consumption in these days of competitive business.

Gujarat

Market for Recycled Products

Ravivari is Gujarat's market for everything from a small pin to a large piece of furniture. It is a place, which sells recycled handicrafts, books, hardware or electrical tools. A visit to *Ravivari* is considered a must for new home owners to furnish their homes in a pocket-friendly way. The interesting part is that products sold at the *Ravivari* are old to the seller but are as good as new to the buyer!

Ravivari negates the very concept of waste - even a broken bangle finds a buyer. Many of the sellers are artisan-entrepreneurs who recycle waste into very useful things that are then re-sold in the market and elsewhere. As a result, tools of the trade and products are accorded a respect that defies the convention of 'disposable'.

Ravivari is also known as Gujari Bazaar and can be seen as a traditional version of the modern shopping mall. Spread on the eastern bank of the river Sabarmati near Ellis Bridge in Ahmedabad city, the bazaar accommodates more than 1200 traders (one third of them are women). The sellers have in-depth knowledge and technical know-how about their wares. Products are bought wholesale from dealers and markets, from local and regional producers or through barter chains.

It is estimated that over 3,000 people visit the market every Sunday from the city and even nearby villages. According to a report co-authored by IIM-A faculty Ghanshyam Shah and Arpita Joshi, apart from 1,200 traders registered as members of the Gujari Association, several hundred others are non-members but still trade along with the Gujari traders. Besides, there are 7,000 to 10,000 other traders who indirectly get business due to Gujari. More than 20,000 people are dependent on the chain, between making, transporting and the sale of goods in the market. Many migrant artisans and daily wagers also depend on Gujari for their livelihood.

Sources: www.paramparaproject.org accessed 13.9.15
www.gurjaribazaar.org accessed 13.9.15

Jammu & Kashmir

Non Motorised Short Distance Transport

Traditional horse carts or '*tangas*' were used as a mode of transportation in Kashmir and other hilly areas. *Tangas* are horse drawn carts that do not use fossil fuel for running. Though in most parts of the country, the popularity of *tangas* is shrinking, these horse carts are still seen galloping in difficult terrains of Kashmir.

Another popular means of transport were the bullocks carts which are still used extensively in rural areas. Bullock carts or '*bail gaadis*' are used by farmers to transport farm products from one place to another. The bullock cart is so much a part of the Indian lifestyle that the bullock cart race is also organised in some villages and the bulls are trained for racing.

Traditionally the royal queens and princesses were transported using the *palkee* or a palanquin, which was a hand drawn carriage. Today the bicycle, rickshaw is the local mode of transport in India. Cycle rickshaw is a fossil fuel free mode of transportation which runs with the muscular force applied to pull it by the rickshaw puller.

Source: http://myholidaysafari.com/top-10-traditional-transports-in-india/ accessed 15/10/15

In Sikh beliefs, becoming one and being with harmony with God implies that all humans endeavor to live in harmony with all of God's creation. The emphasis is on discovery and mastery of the self, not mastery over nature and the other.

Textile, Clothing and Lifestyle Products

All India

Recycling Newspapers

Culturally in India, the *kabadi-wallah* was a recycling institution before recycling became a modern day buzz word. In all waste management programmes, materials recovery and recycling is an important and preferred component. Almost all Indian households reuse newspapers in household activities, whereas the rest of it is given off to the *kabadi-wallahs*. Long before measures to contain greenhouse gas emissions were talked about, these junk dealers have been silent friends of the earth and our planet, taking away the old newspapers on a periodical basis from Indian households.

Giving/selling off newspapers for recycling has huge climatic benefits. Recycling newspapers is cost-saving, reduces greenhouse gas emissions, prevents air pollution and saves energy. In case of paper products, recycling means less demand for wood and therefore less deforestation. Recycling contributes to climate change mitigation.

Typically every home in India uses newspapers in kitchens and *almirahs* too! Old newspapers are also used to cover cupboards, kitchen shelves and storage areas. Bottles and cans are reused in kitchens for storing spices and pickles.

Source: http://m.deccanherald.com/content/17818/waste-pickers-silent-friends-polluted.html/-accessed on 18/9/15

All India

Non-Mechanised Rural Transportation

A popular mode of transport which is still used today in India is animal driven transport. Bullock carts are one of the oldest and important modes of transportation, especially rural India. The conventional bullock carts are made of wooden wheels and a bamboo/wooden load carrier.

The livestock population play an important role in the country's agricultural economy. Traditional cultivation as well as irrigation involved the use of animal power. Traditionally farmers ploughed their fields with a country plough using bullocks as the source of physical energy to drive it. The bullocks serve as a major source of power for traction in agricultural operations, load transportation and other rotary and sundry activities. These still serve as an important link between the dispersed village production centres and the various village markets.

Horse carts were used in the hills while camels were used in the desert for transportation. Animal drawn transport was a sustainable, environment friendly and pollution and fossil fuel free mode of transportation, especially in places where the connectivity of roads is poor.

Source: K.N. Ramanujam, Rural Transport in India, Delhi: Mittal Publications, 1993, pp: introduction 1-3-accessed on 18/9/15

All India

Joint Family System

Indians always had a tradition of living in a big family set-up, unlike the western countries. Joint families share many things in common, be it a family refrigerator, washing machine or a bullock cart. Since all the family members live in the same house, efficient allocation of resources is achieved along with proper land use. This system of joint family sharing in India offers a necessary economic and social security. Common use of resources reduces carbon footprints and also saves on energy. This is also economically beneficial as it reduces electricity and water bills and saves energy. Thus, we can say that this is an example of sustainable living.

All India

Tradition of Passing Down of Clothes and Books to Younger Siblings

In most Indian homes, there is a tradition of clothes from the older child being handed down to the younger one. It is also a tradition to dress a baby in old clothes, usually handed down from an older sibling or cousin, during the first few days/weeks. It is said that used clothes are softer and more comfortable for a new born baby.

There is also a tradition of passing down school books to younger siblings, and to the needy. This is an economic method, since the family does not indulge in buying new books, which saves money.

Source: http://www.shishuworld.com/index.php/traditions/52-baby-old-clothes#.Va4qs_mqqko

All India

Cotton Hand Towels or Kerchief

Cotton hand towel and specifically the cotton handkerchief is a common component of the dress of Indian men and women. These are reused over a longer time period unlike the use and throw tissue paper. Paper products are harsh on the environment since they use a lot of timber, thus impacting wildlife habitat. The paper and pulp industry is also a major cause of water and air pollution, often producing dioxins and other cancer causing chemicals.

Transportation of paper consumes energy and creates air pollution.

Using a hand towel, as opposed to tissue paper, is an environmental friendly way to prevent deforestation and can be considered as a measure to mitigate climate change effects. Using handkerchief instead of tissue paper increases the life cycle of paper.

Source: http://www.simpleecology.com/eco/soft-tissue-paper-accessed on 18/9/15

Charkha Spinning by Gandhiji

Gandhiji's *charkha* represented *Swadeshi* (of one's own country) and self-sufficiency. It also signifies interdependence, since the spinning wheel is at the centre of a network that includes the cotton growers, carders, weavers, distributors and users. As conceived by Gandhiji, it also signified dignity of labour, equality and unity, since all the volunteers in his *ashram* and others across the nation used to spin every day, and finally independence. It was a peaceful response to the British who sought control over indigenous industries like textiles. Nehru called the homespun cloth *Khadi* 'the livery of freedom'.

"God is an Artist of Nature" Padayani as Consecration and Creation

The air is thick with excitement. In the darkness of the night, indigenous torches emit flickering light, drums reverberate, chants and evocations resonate and the whole village has assembled in the grounds of the Bhadrakali temple. As the *Padayani* performance progresses, representations of the goddess, *'kolams'* ('appearances' or 'guises' for want of a better word) of other major and minor divinities, of birds and animals appear sequentially and perform dances in vigorous steps and with great gusto. Some of the famous *kolams* are that of locally prevalent spirits and gods like Madan, Marutha, and Yakshi, as well as of Bhairavi and Kalan Kolam. *Padayani* has a long history, interwoven with narratives and local myths, and also peppered with satirical comments on society and the world.

Padayani is an offering to the goddess and a grand festival celebrated annually in propitiation of the goddess

Bhadrakali in some of the Bhadrakali temples of South Kerala, in villages of Kadammanitta, Othera, Neelamperoor and others. The story of *Padayani* is linked to the celebration and appeasement of goddess Kali after the slaying of the demon Darika. This ten-day performance festival is a sequence of separate yet narratively linked episodes, in which the *kolams* address the deity in prayer imploring for peace and prosperity. The whole village comes together in preparation for the tasks related to *Padayani*, much before the event starts.

The dance and drama of Kerala have their origin from the intimate connection of the people with their environment. The oral literature, songs and dances that have survived in Kerala as links from a distant past, show that they have an environmental core, with their own perceptions of cosmology and time, of nature, elements and spirituality. The early inhabitants, who lived in close affinity with nature, considered the earth as mother, and worshipped her as a goddess. They considered themselves part of a larger community that includes other living beings like plants and animals. The forests, woods, trees, soil, water, caves and cliffs were associated with the presence of different guardian deities, and were considered the sacred ground where spirits of various types dwelt. Even while clearing the forests and hunting, some parts were left untouched as sacred groves, a tradition that kept the bio-diversity of the land intact.

The continuities of this cultural tradition are becoming less with time, but many local communities still retain cultural values, discernible in agricultural practices, medicinal knowledge, ecological sensibilities, and customs as well as arts traditions. In communities close to nature, the arts are not a distinct activity but are integrated with lifestyles, and are rooted in local milieu. There are strong oral traditions of passing down memory, craft and traditional ritual practices and performances with a focus on environmental sustainability and livelihood preservation.

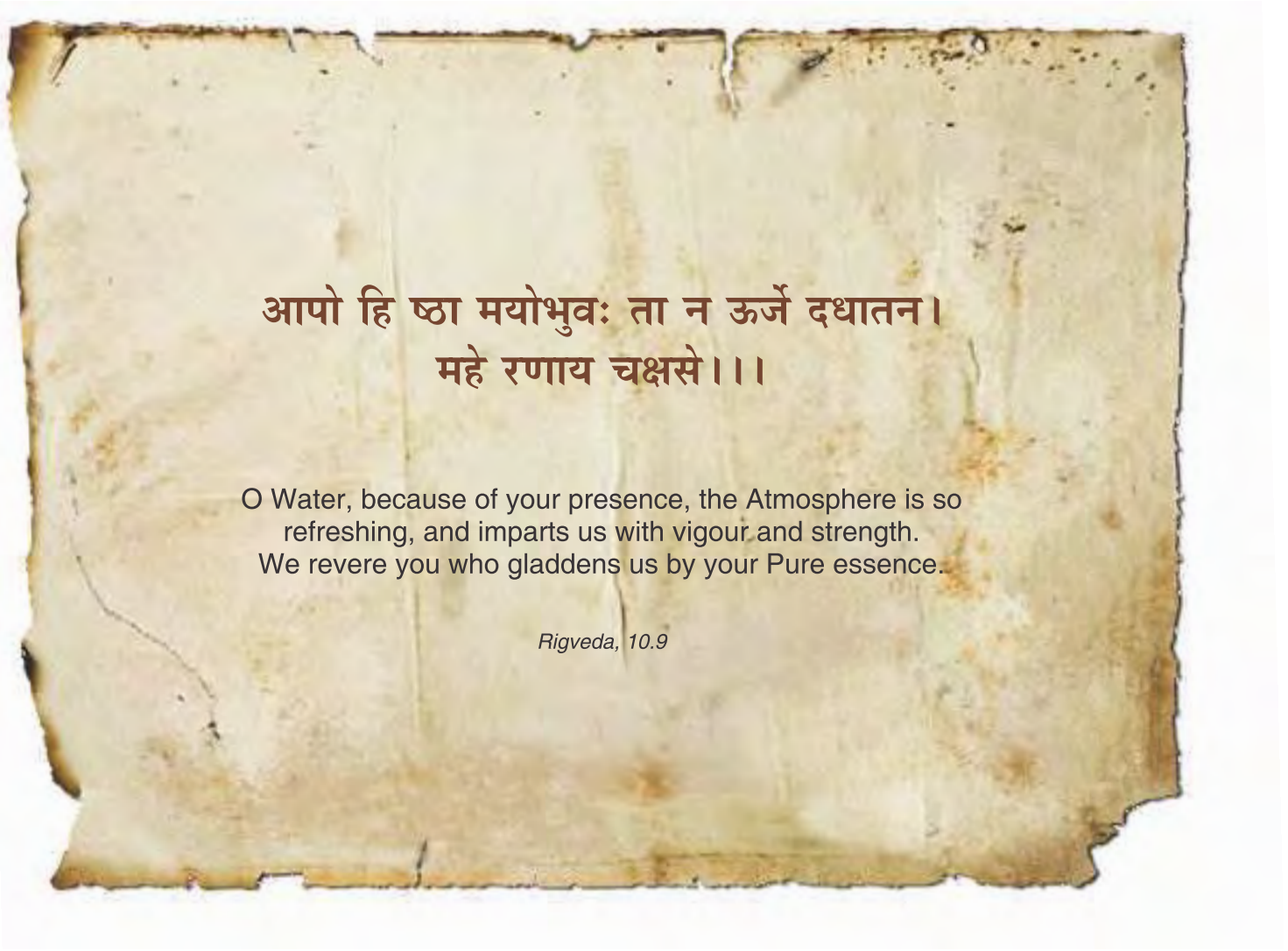
Padayani is famous for the astoundingly exaggerated costumes, specific chanting styles of narratives and songs, specialised *talams* (rhythmic sequences) and varied dance movements. The elaborately crafted headgears are the most striking feature of *Padayani*. These are huge and intricately designed, with multiple tiers of heads sculpted with great precision, skill and artistry. In *Padayani*, all costumes and masks are carved out of products derived from nature. *Padayani* costumes are a great example of traditional craftsmanship: intricate and labour-intensive, these objects are meant to be used for a short span of time, i.e., for the duration of the performance. The ephemeral quality of these products makes it necessary that they are made only prior to the performance, and are destroyed after the festival is over.

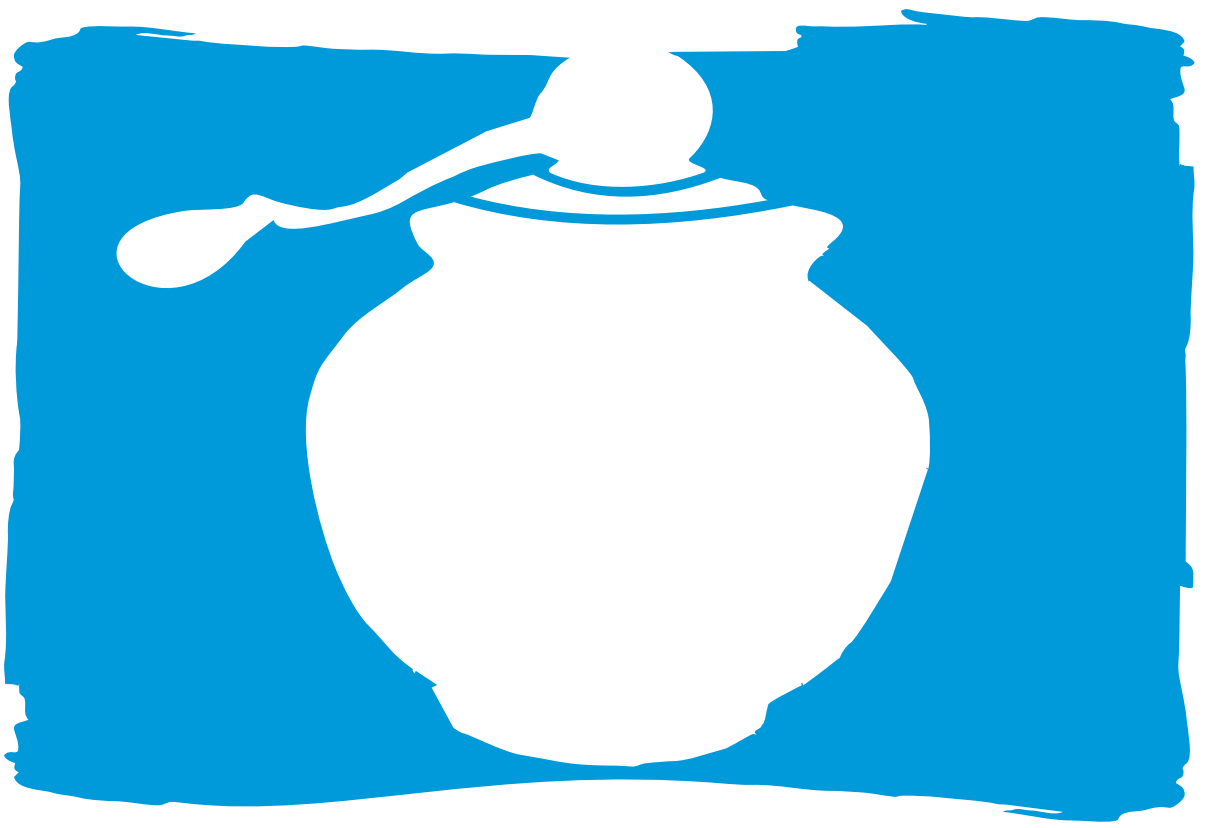
The *kolams* are made with fresh sheaths of the trunk of the arecanut tree. Strong yet supple, these sheaths lend themselves to be carved according to the need and are shaped into stylised, conventional and intricate patterns. The whole village participates in the creation of masks and headgears for *Padayani*; the biggest *kolam* is that of the goddess herself, which is carved out of a thousand sheaths of the tree. The make up for the *kolams* are also drawn from the colours of nature. The five basic colours - red, black, green, yellow and white - are believed to represent the five elements, and the ingredients include charcoal, turmeric powder, rice flour and terracotta powder.

In a larger context, *Padayani* as a ritual and performance is believed to have a therapeutic function that cleanses the mental and physical ecosystem to achieve vitality and harmony in society. The aesthetics and philosophy behind this spectacular offering to mother goddess are simple and direct: there is no material in this world that sustains forever, and what is taken from nature has to go back to nature. Goddess appeased and the festivities over, life goes back to the routine of everyday activities, till the season starts again, the next year…

Sudha Gopalakrishnan

CEO and Executive Director, Sahapedia


आपो हि ष्ठा मयोभुवः ता न ऊर्जे दधातन।
महे रणाय चक्षसे।।।
O Water, because of your presence, the Atmosphere is so
refreshing, and imparts us with vigour and strength.
We revere you who gladdens us by your Pure essence.
Rigveda, 10.9



Water

India has a long history of water harvesting and management. Communities have a sense of reverence for water and understand the importance of its conservation, particularly that of rainwater, for meeting their water needs in the long term. Communities from different locations of the country have come up with unique ways of water harvesting and management that suit the topography, climate and precipitation in their respective areas.

Step wells of Gujarat, tanks of Tamil Nadu, johads of Rajasthan, zabo system of Nagaland are some of the examples of traditional water harvesting systems that have helped people meet their domestic and agricultural water needs. These systems are an expression of their knowledge of the water cycle, water harvesting, storage, maintenance of quality and proper utilization even during the lean water period.

The striking commonality in the Indian traditional water harvesting systems is that they are all local, have community ownership, and use minimal or no fossil fuel based energy and are not technology intensive. They are collectively owned by all the members of the community and therefore the responsibility of ownership and allocation of water is also determined by the community collectively.

The traditional Indian water harvesting systems assume significance particularly given the fact that climate change is affecting rainfall patterns and the rate of evaporation due to temperature rise. Adaptation measures to better conserve the water resources and harvest rainwater for future use are being drawn from such traditional systems. Revival of local rainwater harvesting systems on a global level could provide substantial savings in water for nature and society. Traditional technology like ponds and earthen embankments continues to be the mainstay in most parts of the country when it comes to meeting the requirements of the domestic and agricultural sectors.

The total catchment area in India is 252.8 million hectare (mha), covering more than 75% of the total area of the country (INDC, India 2015). Rainwater harvesting is now an important policy component in the Watershed Development Programme of the central and state governments. Several municipal authorities have amended their existing building bye-laws, making it compulsory for every large house or hotel (200 yards or more in area) to undertake rainwater harvesting. (INDC, India 2015, pg.21)

Water

Jammu & Kashmir, Himachaal Pradesh

Climate Adaptation through Water Resource Management in the Trans Himalaya

In the difficult, water scarce areas of the Trans Himalayas, storing melting ice in tanks known as *khuds* or *kuhls* for later use is a common practice. This prevents run off and helps meet irrigation needs without the use of complicated machinery run by electricity. This also helps to make maximum use of scarce resources. The water flows from field to field irrigating the terraced fields, which prevents runoff. This also prevents use of excessive amounts of water, as the surplus water, if any, is drained back to the tanks.

In Ladakh which receives lesser rainfall than even the deserts, melting snow is the only source of water and this water flows down in the form of a stream in the evening. By then, it is too late for irrigation. Traditionally the people of Ladakh had a system of diverting water from the streams and storing these in tanks called *zings* so that it could be used for irrigation in the morning through channels. A similar system exists today where a network of guiding channels brings the water from the glacier to the *zing*. During the day, the channels fill up as the glacier melts and in the afternoon this turns into flowing water. The water that collects by the end of the day is used the next day.

In Himachal Pradesh the water is first diverted to a circular tank and then channelled off by *kuls* (*kuhl* in Jammu and Kashmir) for irrigation. *Kuhls* are constructed and maintained through the collective effort of the village community in Jammu and Kashmir. A typical *kuhl* can provide water to about 30 farmers and irrigate an area of about 20 hectares.

Source: http://www.cpreec.org/pubbook-traditional.htm, accessed 13.8.15

http://www.indiawaterportal.org/articles/local-water-storage-hindu-kush-himalayas accessed 13.8.15

www.rainwaterharvesting.org/Rural/Traditional3.htm, accessed 13.8.15

Water Temples

"During my various interactions with small and marginal farmers in the state, I have been using socio-religious analogies for inculcating upon them the culture of water conservation. Social ethos in rural areas is more prone to be pro-actively driven for a particular cause by evoking religious beliefs and, therefore, I have been encouraging these farmers to make "Water Temples" by digging farm ponds and village ponds. This religious simile of equating water ponds with temples has lent religious reverence for the preservation and conservation of water through these ponds. I have also been telling farmers that however poor household theirs maybe, they must be keeping an earthen pot full of water for drinking purpose. Similarly, village and farm ponds are like water pots for mother earth for quenching her thirst. And farmers are duty-bound to create them as an obligation towards mother earth. This is further enhanced, through belief systems, the creation of micro water harvesting structures in different parts of Gujarat."

Narendra Modi
Prime Minister of India

All India

Chemical Free Cleaning Agents

Tamarind and Rock Salt: Detergents are hard chemical additives and a major source of pollution today. Chemical additives come across as a threat to freshwater and marine ecosystems. The cost of treating wastewater for consumption is an expensive alternative.

Both tamarind and rock salt can be used as a substitute for detergents.

Tamarind has been used as a cleaning agent even before liquid washing soaps were discovered. Tamarind is mainly used for cleaning metals. Soaking in tamarind water helps remove accumulated dirt. In fact, the best way to clean silver, brass and other metals is by using tamarind. Tamarind and rock salt are eco friendly cleaning alternatives.

Source: http://www.boldsky.com/home-n-garden/improvement/2013/tamarind-uses-cleaning-032137.html- accessed on 17/8/15

All India

The Earthen Pot as a Water Cooler

It is an age old Indian tradition to store drinking water in an earthen pot or *matka* (Hindi word for earthen pot). Water stored in *matkas* or *surahis* is cooled to about 10-14^{o}C and is said to have a refreshing flavour. Many find the temperature of the water - not too warm and not too chilled - ideal for drinking.

The water inside the earthen pot stays cool due to evaporative loss. A *matka* is made of mud and has many minute pores (extremely small holes). No matter how tightly you pack the mud, these pores remain. It is through these pores that the water, placed inside the *matka*, oozes out and evaporates.

Thus, the water is kept cool in *matkas* without any refrigeration and hence helps in mitigating the climate change.

Source: http://www.skymetweather.com/content/lifestyle-and-culture/keep-water-safe-and-cool-in-an-earthen-pot/- accessed on 17/8/15

http://www.pitara.com/science-for-kids/5ws-and-h/why-does-water-stay-cool-in-matkas/- accessed on 17/8/15

Kerala

Groundwater Tapping through Surangams in Kasargod District

Surangas or *surangams* (meaning tunnels in Kannada) or *thurangams* (the Malayalam word for tunnels) are a traditional water harvesting system found in the Western Ghats, especially in Kasargod District of Kerala and Dakshina Kannada. In Kasargod, people cannot depend on surface water as the discharge in rivers is high in monsoons and low at other times. They, therefore, depend on groundwater which they access through *surangas*.

A *suranga* can be compared to a horizontal well, or more appropriately a cave, which is dug through laterite rocks. The site of the *suranga* is traditionally identified by studying the slope, soil structure, catchment area, flora and fauna. The digging is carried on till the water is struck and flows out of the tunnel to be collected in a pond or tank constructed outside the *suranga*. The length of the tunnel can range from 30-300 m and in case of longer ones, vertical air shafts are provided at regular intervals to maintain the atmospheric pressure. Many families in Kasargod depend on this water for their drinking, domestic and sometimes irrigation needs. The cost of digging the *suranga* and constructing the pond is the only cost involved in this system, as there is practically no maintenance cost.

Source: http://www.indiawaterportal.org/articles/surangas-disappearing-lifeline-farmers-kasargod-kerala

http://www.cseindia.org/node/3874, accessed 13.8.15

Rajasthan

River Water Harvesting with Khadeens

In Rajasthan there are very few rivers, like the Luni, that flow for twelve months. Many rivers spring up, flow for short periods and then disappear. Temporary lakes called *khadeens* were made in such places.

The rivers that flow in the rainy season were held in *a khadeen*. When it dries up the soil of the *khadeen* remains wet and and this allows for cultivation of crops.

Khadeens were made by raising *pals* on two sides and fixing a sheet on the third. The *pal* of the *khadeen* is called *dhora*. The length of the *dhora* is calculated according to the influx of water.

Without *khadeens* the cultivation of wheat in Jaisalmer would not be possible.

Source: The Radiant Raindrops of Rajasthan, Anupam Mishra

Gujarat

Rain Water Harvesting with Step Wells

In the arid climate of Gujarat, water is available in plenty during the rainy season but cannot be stored in shallow wells at other times due to the risk of evaporation in high temperatures. The step wells (*Vav* in Gujarati, *Baoli* or *Baori* in Hindi) were dug deep into the ground to reach the water table and were not just a place for storing water but also a space for the community to interact while washing and cleaning. .

These multiple use water sources were strategically positioned and their location is also indicative of the purposes for which they were used. For example, if a *vav* was located within the boundaries of a village, it was generally used for domestic purposes such as for drinking water and washing clothes. The step wells that were placed in the periphery of a village, dotted along trade or pilgrimage routes, would serve as resting lodges as well as a space for inter-cultural interaction. The Thar Desert was once a prominent trade centre that fell on the Silk Route during the early historical period (200B C.E.-300 C.E.). Landmarks such as water storage structures outside villages and situated along trade routes became places of inter-cultural contact.

When step wells were used exclusively for irrigation, a gate was constructed at the rim to receive the water. This was lifted and directed towards a trough or pond, from where it ran through a drainage system before being channeled into the fields.

Source: http://www.rainwaterharvesting.org/Rural/thar-desert_tradi.htm, accessed, 14.8.15

The Stepwells of Gujarat: In Art-historical Perspective, By Jutta Jain-Neubauer

Rajasthan

Climate Adaptation by Reviving Taankas, Beris and Naadis

The Thar Desert, situated in northwest India, receives less than 200 mm of rain in a year, and in some parts less than 100 mm. Less rainfall, scorching summers, chilly winters, dry monsoon seasons and regular dust storms are characteristics of the region. Yet the Thar is a densely populated desert ecosystem in the world, home to a population of more than 23 million people with unique cultures, heritage and traditions.

Water scarcity is prevalent in the area with many villages lacking a secure source for clean water for drinking and irrigation.

GRAVIS is an NGO working in the area of drought mitigation caused by the water crisis in the Thar Desert. Their vision is of an integrated approach to sustainable development: to not only ensure a secure and safe source of water for drinking and irrigation, but also transform lives through education, healthcare, microfinance and advocacy for the rights of those more vulnerable in society.

Rajasthan has 5% of India's population but only 1% of its water. This puts a heavy burden on the depleting aquifers as rainfall is unpredictable and often insufficient. Since modern techniques drain the aquifers, GRAVIS promotes traditional methods of water security including *taankas*, *naadis*, and *beris*. The low fertility of the area is further decreasing day by day due to non-availability of water for irrigation. A large part of the land is uncultivated and where there is cultivation the yield of crops is low. Water harvesting structures in the area have ensured reduction in vulnerability to climate change and climate related risks. They have made drinking water available for 6-7 months in the year.

Taanka - This method for collecting water consists of a covered cylindrical tank with a capacity to store between 18,000 and 20,000 litres of water. Water is gathered in one of the two ways: either a rooftop catchment which pipes water into the unit, or a groundwater catchment area where water pours in through a grate on the side. Previously, these *taankas* were open to the air and were easily contaminated. In order to keep the water clean and safe to drink, GRAVIS has installed secure lids to keep out animals and insects. The first *taanka* built by GRAVIS was in 1985. Since then, GRAVIS has built 5,952 *taankas* which are maintained by local people. One *taanka* can support a family of 10 for 4-6 months of the year.

Beri - These large underground water storage percolators are covered with a concrete top and gather groundwater during monsoon season. These wells can store up to 500,000 litres of water and do not require a pump, making them easy for villagers to fix and maintain. This traditional method of water gathering uses no artificial catchment and holds enough water to sustain a family of 10 all year round. To date, GRAVIS has built 563 *beris*, providing many villagers with a stable source of water.

Naadi - These village ponds are natural collections of rainwater, which provide an open source of water to entire villages. Unfortunately, if not maintained properly the ponds can become silted and unusable. In order to remove silt and debris, short loose rock structures are being built in the water pathway to the *naadi*, to keep gravel, sand and other material from entering the pond. Local materials are used and much of the labour is provided by the villagers voluntarily. These rocky borders also help to replenish the soil outside the *naadi* with moisture and fertile top soil. Natural vegetation grows easily in these areas and helps to further reduce soil erosion and silting of the *naadi*. To date, GRAVIS has worked to desilt 253 *naadis*.

Source: CEE, UNDP GEF Small Grants Programme

Bihar

Flood Water Harvesting for Irrigation

Ahar Pyne is a traditional floodwater harvesting system typical in Bihar where floods are common. An indigenous technology of South Bihar, this system continues to irrigate substantial areas even today.

Ahar Pynes ensure equity in water distribution in fragmented land holdings and promote community participation and distribution of responsibilities. It is a system that utilises the water which otherwise would have been wasted. It has saved the plains of Bihar from recurrent floods. If this system is properly integrated with the recent canal irrigation schemes, the sustainability of both types of irrigation systems will be enhanced manifold.

In south Bihar, the terrain has a marked gradient of 1m per km, from south to north. The soil here is porous and sandy, and is therefore, unable to hold water. As a result of this poor water retention capacity, the groundwater levels are low. The rivers get replenished and the water table rises only during the monsoon, but due to run-off, eventually the water percolates leaving the soil sandy and dry. The *Ahar pyne* is a catchment basin embanked on three sides while the fourth side is formed by the natural gradient of the land itself. *Pynes* are artificial irrigation channels diverted from rivers. Starting out from the river, *pynes* meander through fields to end up in an *ahar*. Most *pynes* flow within 10 km of a river and their length is not more than 20 km. *Ahar* beds serve a dual purpose as they are also used to grow *Rabi* crops after draining out the excess water that remains in the channels after the *Kharif* cultivation the latter being more water intensive.

Source: 'Traditional water management systems- An overview of Ahar-Pyne system in South Bihar plains of India and its revival' by Koul et al. http://nopr.niscair.res.in/bitstream/123456789/13855/1/IJTK%2011(2)%20266-272.pdf-accessed on 29/09/15

http://www.indiawaterportal.org/articles/ahar-pynes-traditional-flood-water-harvesting-systems-can-help-revive-agriculture-south- accessed on 29/09/15

http://www.rainwaterharvesting.org/Rural/Traditional2.htm-accessed on 29/09/15

www.paramparaproject.org- accessed 29/09/15

Rajasthan

The Saza Kuwa - A Complex Non Mechanised Water Lifting System

These are open wells from which water is lifted using an elaborate mechanical structure but without electricity. Cattle (buffaloes or camels) are used to lift the water by rotating a large gear-like structure that does not require electric power. A huge circular hill or elevated platform is constructed with the soil that is dug out to make the pit for the well. A *rehat* or wheel is a traditional water-lifting device and is placed on the platform. The sloping platform is the *chada* which is like a ladder and when rotated by the animals moves the wheel to help draw water. This large and complex structure that requires no fossil fuel is used to meet the water needs of a large community.

These structures are jointly owned and constructed by farmers who have land adjacent to each other. This ensures maximum use of resources. It is especially popular in eastern Rajasthan even today, where the majority of farmers are still small and marginal and cannot afford private, highly mechanised and resource intensive water structures.

Source: www.rainwaterharvesting.org, accessed 13.8.15

http://rashidfaridi.com/2013/06/20/time-tasted-ancient-water-harvesting-systems-in-india/accessed 13.8.15

http://www.slideshare.net/WaterManagementForum/traditional-water-harvesting-3 accessed 13.8.15

Tamil Nadu

Rejuvenating the Water Table with Eris

Eris are tanks that are found in the state of Tamil Nadu. They are a major source of water as one third of Tamil Nadu's cultivated lands are irrigated through these water harvesting structures. These were constructed keeping the micro-climate and ecological harmony in mind as they prevent soil erosion and runoffs and rejuvenates the water table. They also act as flood control systems.

The presence of these tanks near temples makes these sites self-sufficient and serve as place of social interaction. Many religions are characterised by the presence of tanks and other water storage structures. The concept of ablutions as a ritual is an integral part of almost all religious practices.

Another significance of these water harvesting structures is the social roles that stem from them. One such example is the *Neergattis* found in parts of Andhra Pradesh, Karnataka and Tamil Nadu. The *Neergatti* is responsible for the equitable and appropriate allocation of water in a village. The task is based on a deep knowledge of the local climate, hydrology and the topography. The *Neergatti* allocates water keeping in mind the concerns of the local community and the environment. The allocation is need-based which, therefore, prevents the community from engaging in excessive resource extraction. Since water is the lifeline of numerous livelihoods and is central to all sections of society, the *Neergatti* also engages in dispute settlement to some extent. He often assumes the role of a local, social arbitrator in a purely administrative capacity; the political authority is always in the hands of the Gram Sabhas.

Source: http://www.thealternative.in/lifestyle/saving-water-the-traditional-way-the-eris-of-tamilnadu/-accessed on 29/9/15

http://www.indiawaterportal.org/articles/ancient-engineering-marvels-eris-tamilnadu-accessed on 29/9/15

http://www.indiawaterportal.org/news/wonders-eris-traditional-water-harvesting-systems-tamil-nadu-irrigates-maintains-ecological-accessed on 29/9/15

"So today also, as in the past, *Gharsisar* is filled up with rainwater.
The 668 years old *Gharsisar* has still not died. Those who had built it made it strong enough to withstand blows of time. Those who created the fine traditions of maintaining their lakes through sandstorms did not probably realize that one day these would have to face the storms of neglect. However, *Gharsisar* and those who care for it, are bearing up to this storm with a lot of resilience. The battalion, which guarded the lake, is no longer present, yet the people continue to guard it in their spirit. With the first rays of the sun, the bells of the temple start ringing. Throughout the day people come to the *ghats.* Some people sit for hours silently contemplating *Gharsisar* while others sing, play the *ravantatha*, a *sarangi* type instrument and meet each other. The camel drivers going towards the sand dunes, far away from *Gharsisar* stop by to have its sweet water and they can be heard for miles singing its praise.

Even today the woman of the house goes to the *ghat* to fetch water. Water is carried in camel carts during the day, one can see tankers which have installed diesel pumps to take water from *Gharsisar*.

Gharsisar has been providing water; that is why even today while rising and setting, the sun purs into it molten gold to satiety.

Gharsisar has already become a reference. It must have been difficult to make a lake after *Gharsisar*. But every 50 to 100 years lakes have been built in Jaisalmer, one better than the other, like pearls strung to *Gharsisar*."

Anupam Mishra

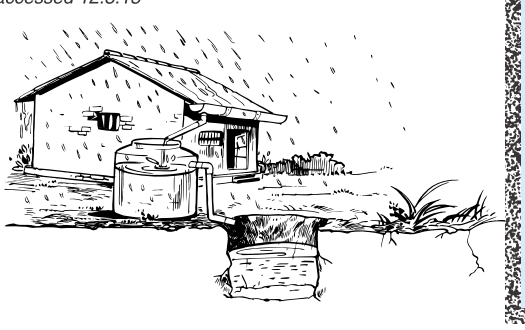
Rajasthan

Ground Water Re-charge through Water Storage

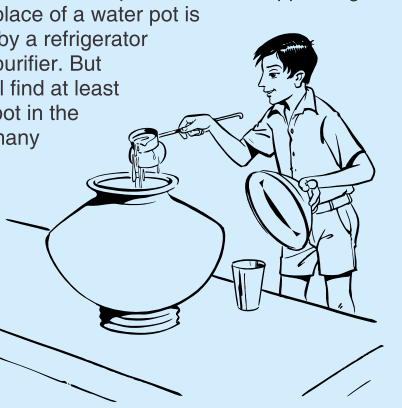
In the arid and semi-arid climatic conditions of Rajasthan the preservation of every drop of rainwater is crucial. The *Paar* system**,** commonly practiced in the western part of Rajasthan, is a means of collecting rainwater and allowing it to percolate down, to be stored as groundwater. The rainwater flows into the catchment known as the *agor* and can percolate down the sandy and porous soil. *Kuis* or *beris*, which are traditional wells, are constructed in order to access the percolated water which is called *patali pani*. Percolation also recharges the groundwater table and ensures the conservation of water by preventing run-off.

Source: http://www.esamskriti.com/essay-chapters/Traditional-Methods-of-Water-Harvesting-and-applicability-2.aspx accessed 12.8.15

http://www.rainwaterharvesting.org/rural/traditional.htm accessed 12.8.15



"Traditionally *paniyaru* – a sacred water space - was an essential and integral part of every home in Gujarat. It could be a raised platform or a stone table, mounted about 2' 6" above ground level, with curved circles to place pots, and had decorative motifs on the front. This space was used to store water both for drinking and cooking. *Paniyaru* was considered a sacred space and a lamp lit every evening close to in front of sunset. Water was stored in clay and/or brass pots placed one on top of the other in sets of two. Each house would have at least one or sometimes two *paniyarus:* one for the family and another for visitors, travelers and outsiders. The *paniyaru* inside the house was meant for family use, and the one kept at the entrance of the house near the visitors' seating area was for use of outsiders. With urbanisation and western influence, this space is now disappearing. Today the place of a water pot is taken over by a refrigerator or a water purifier. But one can still find at least one water pot in the kitchen in many houses!"



Avani V. Varia

Head, Avni and Aadhar Charitable Trust

Rajasthan

Combating Land Degradation with Nala Bunds

Nala bunds are embankments constructed across a *nala* for checking velocity of runoff, thereby increasing water percolation and improving soil moisture.

On the foothills of the Aravali mountains, almost 45% of the land is either barren or wasteland and/or pastureland. The wasteland area covers five villages each of Dausa and Bandi Kui Districts. Most of the land area in these villages is undulating, and during the rainy season, the flow of rainwater results in deep trenches and erosion of fertile soil. The rainfall in the area is very scanty and agriculture is below subsistence levels.

In Teerwada village, Dausa Gramin Vigyan Seva Sansthan (GVSS) has constructed 12 *nala* bunds, which have helped to trap water for agriculture in an otherwise parched area. Bajra is grown in the fields using this water. The water table in the nearby wells has also risen by about 5 metres.

In Village Kauleshwar Khurd, Bandi Kui, mixed cropping has been successfully tried in the areas brought under cultivation through land development for the first time. Mixed cropping of maize and moong and pulse and lobia was attempted by farmers. Many of the farmers expect to double their incomes as a result of this project initiated by GVSS and Krishi Vigyan Kendra.

One check dam (*Anikat*) was constructed a bigger catchment, benefitting nine acres of land for irrigation. It has a funding from Aakar Charitable Trust, Mumbai. This has also helped in recharging about 15-16 wells in the nearby areas. It has helped to retain water in the fields, preventing heavy runoff.

Source: CEE, UNDP GEF Small Grants Programme

Gujarat

Check Dams for Climate Resilience in Rajkot

Vruksha-Prem, an NGO in Rajkot, has constructed more than 2000 check dams with a focus on active participation and capacity building of stakeholders. Women and men are actively involved in manual labour as well as at supervisory level.

There is increased local awareness about saving runoff water and improving ground water level among the communities since the initiation of the project. Check dams are the easiest, cheapest and fastest result-oriented projects. People are using indigenous methods to construct check dams (for example arch dams and multiple dams) to save as much water as they can. This project has also established links between the stakeholders, agricultural universities, and with agriculture department of the state, leading to farmers adapting a system of leading to rotation of crops, and effective and full utilisation of the farm land.

The construction of the check dam – from planning to implementation – is indigenously undertaken with no outsiders involved. As the local people know their requirements and are knowledgeable about runoff water issues, they select the project site. Stakeholders visit other check dam sites and interact with villagers to understand the sources of the project. This has established links among the stakeholders of the region, creating a support network for the implementation of their projects.

Because of the check dams, stakeholders are now in a position to harvest at least three crops per year. Groundwater storage has improved, benefitting the economic status of stakeholders due to increased farming days. Availability of water enables crop rotation and multiple cropping which also improves the soil quality.

Source: CEE, UNDP GEF Small Grants Programme

North East India

Water Harvesting in the Hilly Terrain

This a common traditional irrigation practice in Meghalaya and other north eastern states. The hill streams are tapped as soon as they emerge from forest and water is channeled to connect in a series of terraces. In this system water flows continuously from upper to lower terraces. This method of irrigation is widely used in non fertile land to raise paddy. Submergence of water up to 5-8 cm is maintained throughout the year. After harvesting the paddy at a length, the straws are left to rot in field to improve soil quality. Bench terracing is an important conservation measure for valleys and hill slopes. In bench terrace agriculture practice, *topo* sequence crops such as maize, bean and potato are planted on upper slopes and crops requiring more water such as rice and jute are grown on lower slopes. The nutrient rich `excess runoff from upper portion of slope is used for the lower hill crops.

Source: Traditional Agricultural Practices in Meghalaya, North East India/Authors- Solomon Retna Dash Nadar Jeeva, Roytre Christopher Laloo and Bhanu Prakash Mishra/Ecology Research Laboratory, Deptt. of Botany, NEHU, Shillong

http://www.niscair.res.in/sciencecommunication/researchjournals/rejour/ijtk/Fulltextsearch/2006/January%202006/IJTK-Vol%205(1)-January%202006-pp%207-18.htm, accessed 13.8.15

"Let us begin with primary elements. First, the water that sustains life, the first principle of fertility and of life whether of ocean or river or clouds or sky. The archaeological evidence of Mohenjodaro, Harappa, Lothal and the recent excavations of Gargi valley leave no doubt about the fundamental ritual importance accorded to water and its fecundity. The *Vedas* devote many hymns to waters. Mythically, Varuna is the god of the waters; he is considered the great superintendent of the cosmic moral order (Îta); he is the guardian of the West.

In a hymn dedicated to *Varuna* in the *Atharva Veda* (IV.16), it is said:

This earth is King Varuna's as also this great far-flung sky: the two seas are his belly (appetite); at the same time he is hidden in this little water. Even we who may cross the sky will not escape King Varuna; from heaven his spies are patrolling this earth with a thousand eyes; they scan through the earth. King Varuna sees all that is between heaven and earth and that which is beyond (them).

Perhaps, there is no need to decode the myth. In saying that Varuna's sphere is the earth and heaven and in the waters, the Vedic poet is referring to an eternally known natural phenomenon of the primeval waters rising as vapour (as spies) in the sky only to descend again to Earth. Understandably, the emblem of Varuna is 'fish', his vehicle the crocodile, the wind his breath (as *Dikpala Vayu* or wind is the guardian of the North West). He spans boundless paths for the sun and ensures that the rivers fall into the ocean. He knows the paths of ships on the ocean and the flight of birds in the sky. He punishes those who transgress his laws."

Kapila Vatsayan

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"God forbid that India should ever take to industrialization after the manner of the West...If an entire nation of 300 million* took to similar economic exploitation, it would strip the world bare like locusts."

Mahatma Gandhi

*India's population in 1928 was about 300 million.

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Ministry of Environment, Forest and Climate Change
Government of India

The Ministry of Environment, Forest and Climate Change, Government of India, is the nodal agency in the administrative structure of the Central Government for the planning, promotion, co-ordination and overseeing the implementation of India's environmental and forestry policies and programmes.

The primary concerns of the Ministry are implementation of policies and programmes relating to conservation of the country's natural resources including its lakes and rivers, its biodiversity, forests and wildlife, ensuring the welfare of animals, and the prevention and abatement of pollution. While implementing these policies and programmes, the Ministry is guided by the principle of sustainable development and enhancement of human well-being.

The Ministry also serves as the nodal agency in the country for the United Nations Environment Programme (UNEP), South Asia Co-operative Environment Programme (SACEP), International Centre for Integrated Mountain Development (ICIMOD) and for the follow-up of the United Nations Conference on Environment and Development (UNCED). The Ministry is also entrusted with issues relating to multilateral bodies such as the Commission on Sustainable Development (CSD), Global Environment Facility (GEF) and of regional bodies like Economic and Social Council for Asia and Pacific (ESCAP) and South Asian Association for Regional Co-operation (SAARC) on matters pertaining to the environment.

The broad objectives of the Ministry are:

- Conservation and survey of flora, fauna, forests and wildlife
- Prevention and control of pollution
- Afforestation and regeneration of degraded areas
- Protection of the environment and
- Ensuring the welfare of animals

These objectives are well supported by a set of legislative and regulatory measures, aimed at the preservation, conservation and protection of the environment. Besides the legislative measures, the National Conservation Strategy and Policy Statement on Environment and Development, 1992; National Forest Policy, 1988; Policy Statement on Abatement of Pollution, 1992; and the National Environment Policy, 2006 also guide the Ministry's work.

http://www.moef.gov.in/

The new office building of the Ministry of Environment, Forest and Climate Change is planned to be a state of the art landmark building, with emphasis on conservation of natural areas and trees to reduce adverse environmental impact, provide adequate natural light, and shaded landscaped areas to reduce ambient temperature.

Centre for Environment Education (CEE)

Centre for Environment Education was created in recognition of the importance of environmental education in India's overall environment and development strategy. The result of a unique partnership between government and a non-governmental institution, CEE was established as a Centre of Excellence of the Ministry of Environment and Forests, Government of India, in 1984.

CEE works for a wide range of sectors, target groups and geographical areas. CEE's primary objective is to improve public awareness and understanding of the environment with a view to promoting the conservation and sustainable use of nature and natural resources, leading to a better environment and a better quality of life. To this end, CEE develops innovative programmes and educational material, and builds capacity in the field of Education and Sustainable Development (ESD). It undertakes demonstration projects in education, communication and development that endorse attitudes, strategies and technologies which are environmentally sustainable. CEE is committed to ensuring that due recognition is given to the role of education in the promotion of sustainable development.

CEE's head office is in Ahmedabad, Gujarat. In order to effectively reach out to all parts of the country, and to facilitate programmes that are culturally sensitive and locally relevant, establishing a regional presence has been recognized as essential. Regional Cells, located at Ahmedabad, Bengaluru, Bhubaneswar, Guwahati, Lucknow and Pune, facilitate effective coordination, monitoring and follow up of country-wide and locale-specific programmes in EE. In addition to supporting the core activities of the Centre, they generate a wide range of new projects and initiatives in their region. Field offices carry out EE programmes in specific situations and give an opportunity to field test approaches and solutions.

www.ceeindia.org

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The Parampara Catalogue has been compiled for the Ministry of Environment, Forest and Climate Change, Government of India by the Centre for Environment Education (CEE), a Centre of Excellence of the Ministry. The editorial process has involved consultations with a number of experts and every effort has been made to gather representative examples from the various regions of India. These examples have been drawn from tribal, folk, rural and urban communities across the country. Eminent persons from diverse fields have added an element of reflection by sharing their views on the value and implications of these practices in the context of the growing challenges posed by climate change. Extracts from ancient scriptures and contemporary sources provide a sense of the timeless relevance of the sustainability perspectives embedded in the themes and practices documented in this catalogue.

Ministry of Environment, Forest and Climate Change
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“Earth provides enough to satisfy everyone's need,
but not for anyone's greed"

Mahatma Gandhi