

VERDURE

Sixth Edition 2022

The Sustainable Decade

~FUTURE IS NOW~

INTERVIEW

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ABOUT THE DEPARTMENT

A Brainchild of Prof. Kambadur Murlidhar, the undergraduate course in Biological Science has come a long way since its commencement in 2005. The course structure of biological science has been crafted to blend all aspects of biology and provide an all-inclusive study of the living world so as to inculcate an interdisciplinary approach to the topics of all the parent science streams. Sri Venkateswara College, University of Delhi is the only institution offering this course at an undergraduate level which makes it unique in itself and the development which it has experienced is exemplified by its successful alumni delving into science and research all across the world. The scope of this course is broad with its objective being to enable the students in acquiring a skill set that will help them to appreciate the fascinating world of living organisms.

Chrysalis, the Biological Science Society, was established in 2017 and its advancements were possible due to the support of our former Principals Dr. A. S Reddy and Dr. P. Hemalatha Reddy, along with our Principal Prof. C. Sheela Reddy, our teachers, and all the students. Chrysalis aims to encompass the ideas and prospects of our department and to metamorphose into a wonderful composition. Verdure, the annual magazine of the Department of Biological Science provides a platform for our students to share and express their academic depth and creative intelligence on topics of importance and explore its different dimensions innovatively. Being in its 6th edition, the magazine showcases what the course culminates in for our students and is a testament to the diligence of the team engaged in the development of the magazine. We would like to extend our appreciation and esteem admiration to all the patrons of the magazine and our sincere gratitude to all the faculty members and the core team for their active participation in making this year's issue a huge success.

By Preetha Chatterjee, SBS

ABOUT THE FRONT COVER

Sustainability has become the new catch phrase. Everyone - from the World Bank to UNICEF -- and almost every country is talking about it. The front cover, quite straightforwardly, depicts how sustainability can be a part of our daily life. The colors around the earth represent the sustainable development goals that the United Nations has appointed for this decade and surrounding the earth are all the activities that we should normalize and promote to achieve sustainable living. Through an artistic approach, we would like to convey that sustainability can only be achieved through awareness, integration, and determination towards creating a better world for our future generations. And this is exactly what we want to portray through the front cover.

By Sanidhya Jagdish, TBS

From the Principal's Desk



PROF. C. SHEELA REDDY



1961 - 2021



Prof C. Sheela Reddy
Principal

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"In essence, science is a perpetual search for an intelligent and integrated comprehension of the world we live in."

- C.B. Van Niel

These wise words are exemplified by the Department of Biological Sciences in its entirety in the Annual Magazine. This unique multidisciplinary course in our college has been very creative in organizing activities for the benefit of students.

I take immense pride in congratulating the students of Biological Sciences for bringing out the 6th edition of their Annual Magazine, "Verdure", which is a platform to share topics of scientific importance. This year's issue includes a myriad of inputs like articles, dialogues, interviews, poems, artworks and infographics emphasising the need for actively inculcating a sustainable and eco-friendly approach in our lifestyle. It also features interviews of Bioscience Alumni actively working towards Sustainable Development Goals.

The cumulative efforts of the hard working students and equally devoted faculty have borne fruit in the form of this insightful magazine. This year, the students have very aptly chosen the theme- **Sustainability**, to emphasize the need of conscious and responsible use of resources along with the application of science in solving these sensitive matters.

I take this opportunity to sincerely appreciate the sheer dedication and perseverance of the students and faculty involved in successfully releasing the magazine. I wish the students good luck in their future endeavors.

C. Sheela Reddy
PRINCIPAL

From the Co-ordinator



Dr. Ravindra Varma Polisetty

We stand poised on the threshold of change in the world of education.

Hence, it is important for us to adjust the sails to face the winds of change.

Culminating all the immense hard work and dedication of the students of the Department of Biological Science, I present with great pride the sixth edition of our annual magazine 'Verdure'.

The theme of this edition is 'The Sustainable Decade'. It encompasses and explores different aspects of sustainability and the pivotal role it plays in our lives and society.

The team did a marvelous job in creating a perfect blend of innovative literary pieces and creative art pieces which makes the magazine a visual treat and an intellectual delight.

My deepest gratitude goes to our honorable principal, Prof. C. Sheela Reddy, for her unwavering guidance and support. I profoundly thank and congratulate our faculty members and students for standing like a pillar against all odds in conceptualization and bringing together of the magazine. I wish this year's annual magazine inspires all the readers to make an attempt towards sustainability.

FROM THE CONVENERS



Dr.Meeta Bhardwaj



Dr.P.Jayaraj



Dr.Aditi Kothari Chhajer

‘Verdure’ the Biological Science Magazine proudly presents its sixth edition this year. The journey of creating the magazine is a challenging one, and a lot is learnt during the process. This year when we started out the work towards the magazine, we were all confined to our homes and working online. The resolve was strong, that these times are not going to act as a stumbling block, but rather as an impetus for creating an impactful issue. At the time of deciding the theme of the magazine a lot of brainstorming on different ideas was done. Collectively, the student and teacher team agreed that since this year has been proclaimed as the The International Year of Basic Sciences for Sustainable Development by the 76th session of the United Nations General Assembly, what better theme than The Sustainable Development Decade- because the FUTURE IS NOW.

In the words of our Prime Minister, Shri Narendra Modi ji ,

“If we want the world to be a better place to live, we have to treat it as one unit. If we want the process of development to be sustainable, we have to work with the environment.”

In keeping with the spirit of the theme of the magazine, we are extremely glad that our diligent student ‘Verdure’ team has worked tirelessly to bring forth the current issue. The magazine is a compilation showcasing the innovative and creative skills of our dear Biological Sciences students. We teachers along with the Verdure student team had a great time creating it, and wish you enjoy reading it too!!!

Best Wishes,
Dr. Aditi Kothari-Chhajer
Dr. P. Jayaraj
Dr. Meeta Bharadwaj

Editor in Chief's Message



In my school days we were taught about global warming and how we need to adopt sustainable living methods so that our future generations don't suffer. Fast forward 10 years, the issue is not just to save the future, we are witnessing the effects of climate change right now. To avoid the catastrophic consequences scientists agree that the world must cut down the total carbon emissions in half by 2030. Also, WHO states that in the coming decades, the effects of climate change will be responsible for causing ~ 250000 deaths per year. The time to act is now. The coming decade could be a game changer if we manage to cut down carbon emissions by 45% till 2030. The year 2022, declared as The International Year of Basic Sciences for Sustainable Development by the UN and spotlights on the relationship between the basic sciences and the Sustainable Development Goals. The aim is to show how scientific research can support sustainable development, mobilize the general public into

understanding its importance. To build a sustainable world for everyone, necessary advancement in sustainable agriculture, energy, utilities and living is essential and backed by basic science research. Keeping this in mind, the magazine committee decided to keep the theme Sustainability for the 6th issue. It covers a variety of areas to help us get an overview of the current need to build a sustainable environment and the necessary steps to achieve it. We have tried to make the magazine as interactive as possible with infographics, artworks, puzzles and online material. The team also interviewed international experts in the field of climate action to give us and our readers important insights. We also interviewed alumni of our department who have years of experience and knowledge in their respective fields related to sustainability. I express my sincere thanks to the teachers in charge of the magazine for always guiding and inspiring us. Being a part of the magazine committee and working along with everyone was very enjoyable and enlightening. It makes me proud that I worked as the Editor in Chief for Verdure. I hope you will find this issue informative and engaging. I wish you Happy Reading!

SHUBHANGI ANTIL
Editor in Chief

Creative Heads' Message



remembering the first meeting, we were very dubious of how such a small team will be able to put together such a large magazine. But three months later, here we are releasing the magazine. This magazine is a culmination of all of our dedication and team effort. Despite the amount of work we had to do - ranging from designing to compiling the magazine - we thoroughly enjoyed the process. At times, putting together this magazine felt like a nightmare while at other moments we felt so proud to have created such beautiful pieces of work. Working on this magazine was quite rewarding for us as it made us tap into our creative side and think outside the box. None of this

would have been possible without the relentless support of our teachers as well as the combined efforts of our team members, all of whom worked tirelessly to bring you this magazine. We really hope you enjoy our magazine.

Happy Reading!

SANIDHYA JAGDISH
SANAH KUMAR
Creative Heads



**ANANTPREET
KAUR SOOD**

From the President

“The two most important days in your life are the day you are born and the day you find out why.”- Mark Twain

Science made me realize the purpose of my life and whatever Anantpreet has become today, I owe it all to the Department of Biological Science and Sri Venkateswara College. This university has provided the perfect blend of vital exposure and academic excellence. I have always had a sharp knack for scientific research and my aspirations to gain that practical experience in the field of research could not have been fulfilled if it was not for the faculty of Biological Science. The integration of all the other science departments provides the unique essence to this department. I would like to express my heartfelt gratitude to all the teaching and non-teaching faculty who have worked this hard to make Biological Science stand out on its own. As the Class Representative for past 3 years and the President of Chrysalis, I would like to take this opportunity to dedicate my honor to all the teacher convenors of our departmental society- Chrysalis and magazine- Verdure as well as all the student coordinators without whom the department would not have risen to this level of expertise.

From the Editors



Nandini Sharma



Preetha Chatterjee

History has repeatedly taught us that creative expression is a powerful tool to put forth hard hitting and meaningful messages across, and our team at Verdure has aspired to do just that. Be it wordplay or designing imaginative layouts, Team Verdure has aimed to portray creative expression in its truest form through this year's edition of our annual departmental magazine, on the theme- Sustainability, so as to increase social sensitivity and awareness about the issues of climate change and sustainable development. We hope that the unwavering support of our teachers and immense hard work of the entire team bear fruit when the readers flip through our magazine pages with a smile on their faces and become more informed about topics like climate action and green lifestyles. Happy Reading!



Talk by:

Dr. Laura Hug

**Assistant Professor,
Department of biology,
University of Waterloo,
Canada**

**Canada Research
Chair in environmental
Microbiology**

Research work:

**Microbial diversity and function,
Contaminated site microbial ecology,
Total community (meta-omic) analyses, including
metagenomics(DNA), Metatranscriptomics (RNA),
and proteomics (proteins), bioremediation.**



Talk by:

**Mr. Arun
Krishnamurthy**

**Indian environmental activist
campaigns cleaning various
lake across India**

**Founder of
environmentalists
foundation of India (EFI)**

**The organisation has been successful in cleaning at least
159 lakes in the country**

**Worked in google before quitting the job to become an
environmental activist.**

**TedX talks at Bangalore, NIT - Trichy, XLRI - Jamshedpur,
VSSUT - Sambalpur, GCT - coimbatore, IIM - Kashipur and
others were well received**

**Scientific methods are employed to revive the fresh water
Bodies.**

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5 GENDER
EQUALITY



8 DECENT WORK AND
ECONOMIC GROWTH



7 AFFORDABLE AND
CLEAN ENERGY



SUSTAIN

ABILITY

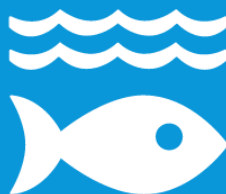
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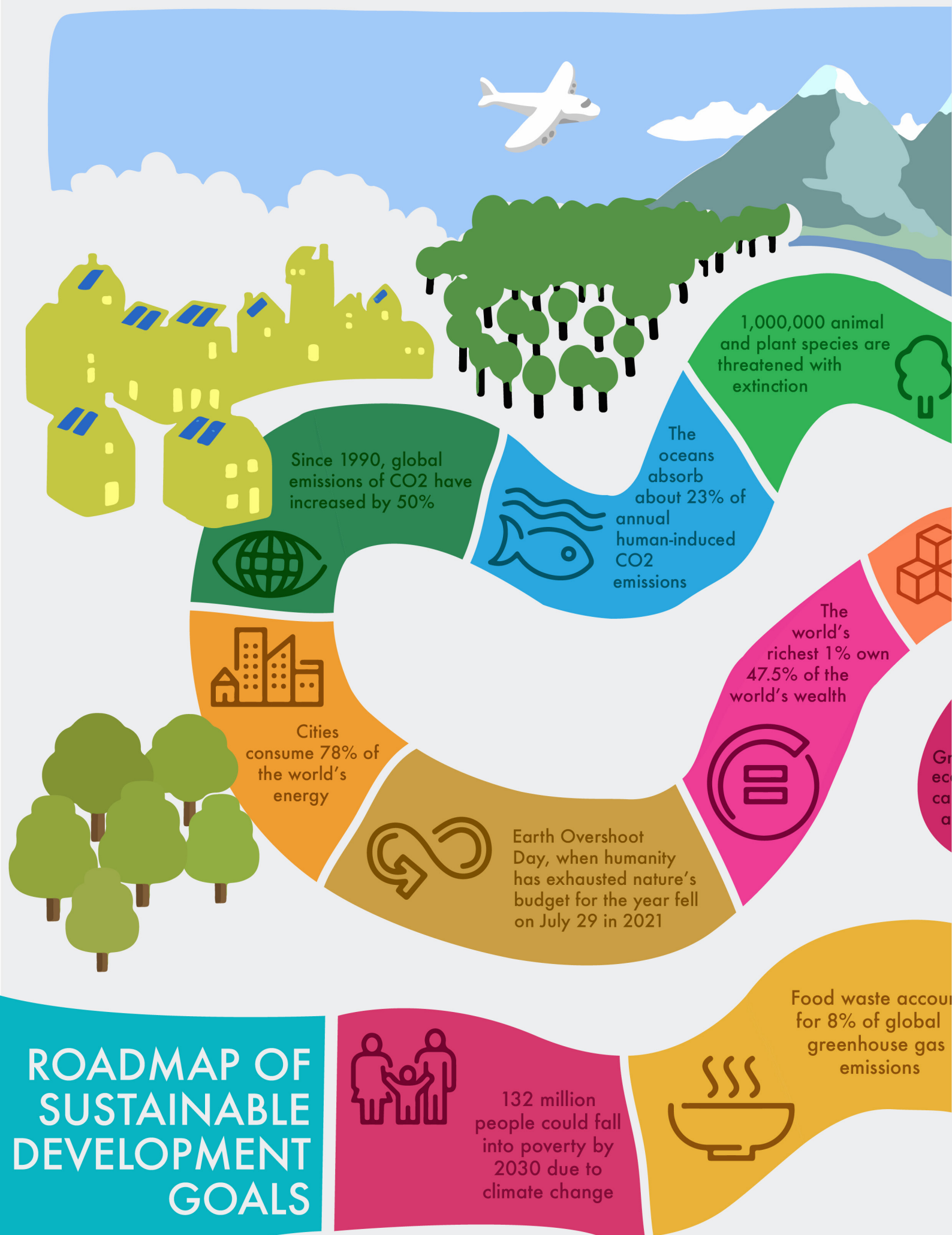


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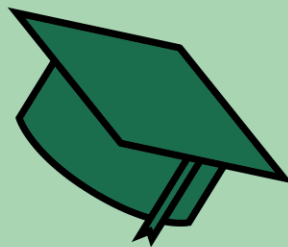


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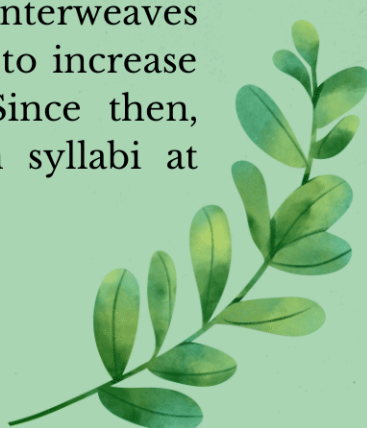


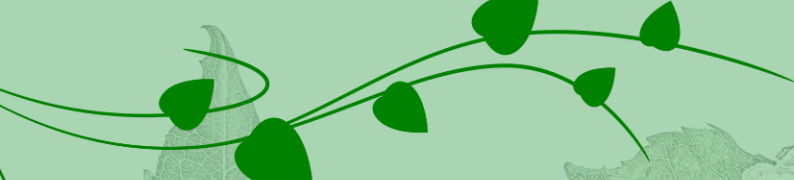
CLIMATE EDUCATION: THE NEED OF THE HOUR

By Prishita Sharma, SBS

Simply put, education refers to the act of receiving as well as providing knowledge, to improve one's skills, morals, values and wisdom in a given field. I recall that words like global warming and climate-change were introduced to us around third grade and the related problems themselves have just grown in magnitude over the years. Addressing climate change is absolutely necessary in order to work towards sustainable development goals. Therefore, climate change education is especially important for everyone to develop and incorporate different strategies to combat climate change in our daily lives.

The climate-crises itself, as we're all aware, refers primarily to the phenomena associated with global warming and its affects on earth's weather patterns. CCE or climate change education on the other hand, finds its roots in education for sustainable development (ESD) and focuses on addressing and creating effective responses to climate change. Communities can learn the negative consequences of climate change, how they will be affected specifically and what all can be done in order to prevent its adverse effects. In 2010, UNESCO had developed the Climate Change Education for Sustainable Development programme to introduce more concepts to people through media and other networks. The programme also interweaves disaster risk education into mainstream courses, in order to increase 'climate- literacy, especially in younger populations. Since then, UNESCO has been working to introduce the same, in syllabi at various levels of education worldwide.





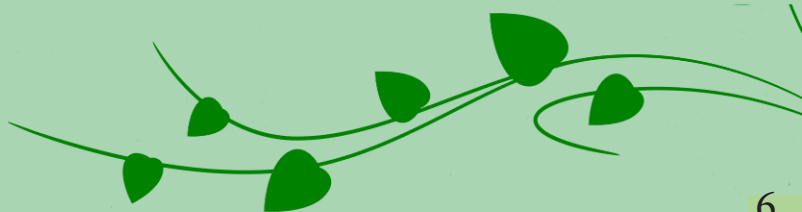
Numerous countries have made progress in climate change education through their own ways, but it has been quite slow overall. Australia is known for its national plan of Education for a Sustainable Future, started in 2000. It includes initiatives like Australian sustainable schools and aims to educate the community about sustainability with a holistic approach.



Several amendments in the existing plan and new plans have also been established over the years, to focus on the impacts of climate change, in a global context. Countries like China and Japan have integrated CCE in their curriculum guidelines and are focusing more on ESD. The most recent report by UNESCO listed out countries like The Republic of Korea, Indonesia, Colombia, Italy etc., who have successfully consolidated climate education policies in their current framework. Italy is considered to be the first country to make climate change education mandatory, requiring nearly one-hour/week discussion on climate change in schools, and modifications have been introduced in biological and earth sciences for the same. Indonesia on the other hand, upgraded its 'National Curriculum Framework' in 2013 to include climate education in primary schools. The Republic of Korea and Colombia have incorporated the same in their educational policies as well. Other nations like Cambodia, The Dominican Republic, US, UK, Botswana, Vietnam etc., have also worked on including climate education in school curriculum. The report further reveals that only 53% of countries have succeeded in the same.



In India, we have no specific curriculum for climate change, though certain topics of sustainability are taught under environmental sciences in both schools and colleges. Experts have pointed out that though this might be somewhat helpful but neither does this completely emphasise the contribution of human activities to the climate crisis, nor does it provide adequate practical solutions to the children.



They also feel that climate education is not optional but is a necessity now. The need of the hour is to incorporate climate education in all levels of learning, since it is one of the most important tools, we need to combat the global climate catastrophe. It is essential to have special interdisciplinary training programmes and modules for both students and educators to promote sustainable utilisation of available resources. These can be developed using the knowledge pool of mathematics, social sciences and biological and earth sciences. Most crucial of all steps is, the need to instil the believe in people of all ages, that individual action makes significant difference and that by small changes in our habits we will be able to protect the planet. The urgency of acknowledging and solving the climate crisis is felt even more now during the Corona virus pandemic as increasing forest covers and reducing animal-human conflict will play a major role in preventing such happenings in the future. Lastly it is necessary for the education and environment ministries of all countries to work on this issue of climate change education, to provide the future policy-makers and implementors with an appropriate knowledge and resource base, so that they are able to ensure the sustainability of the coming generations.



BLUE CARBON- AN OCEAN OF SOLUTIONS

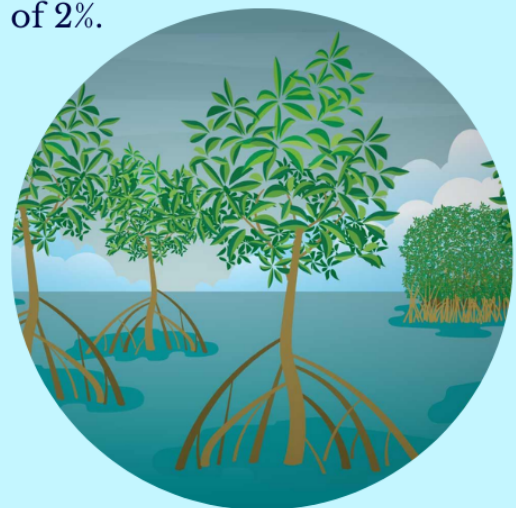
By Sanah kumar, SBS



© Vaidehi Sharma, TBS

The year 2021 has painted a very real picture of the global climate emergency that humanity is facing, ranging from rampant wildfires across Australia and Hurricane Ida in the USA to the widespread flash floods across many European countries, and has been a wakeup call for many. Consequently, there is a growing necessity to restore natural ecosystems as a means for mitigating the two principal environmental perils of our times – biodiversity loss and the climate crisis. The main focus of environmentalists in search of nature-based solutions has been on forests. But a far more vital solution to climate change lies in mangroves, seagrass meadows, salt marshes, and kelp forests all of which constitute the blue carbon ecosystems. Blue carbon refers to the carbon dioxide captured and stored by the coastal and marine ecosystems such as mangroves, salt marshes, and seagrass meadows. These blue carbon ecosystems sequester more carbon per unit area than forests. These ecosystems thus, act as major carbon sinks and have a pivotal role to play in climate change mitigation. Coastal blue carbon ecosystems are found in the coastal regions of all continents of the world except Antarctica. Despite the pivotal role they play, blue carbon ecosystems are one of the most threatened ecosystems in the world. Their rate of destruction is four times that of tropical forests and climate change further threatens to accelerate these losses. Despite the huge losses these ecosystems incur, they still account for more than half of all carbon stored in ocean beds. Together they span approximately 50 million hectares everywhere on earth except Antarctica.

These ‘big three’ blue carbon ecosystems could potentially absorb almost 1.4 billion tonnes of CO₂ by 2050 – which is one-fifth of the emissions we need to cut. These ecosystems are also highly valuable and productive as they provide a myriad of ecosystem services and goods. Mangroves are trees found along coastlines- which are regularly flooded by tidal water- in the tropical and subtropical regions of the world. Mangroves are majorly found in Australia, Mexico, Brazil, Nigeria, Indonesia, Malaysia, Myanmar, Papua New Guinea, India, Bangladesh, Cuba, and Mozambique. Mangroves survive in inhospitable salty water as they can filter out the salt as it enters their roots. They also have an above-ground root system which helps them to thrive in oxygen-deficient soils. There are approximately 50 species of mangroves that are known to exist. Mangroves have an average annual carbon sequestration rate of 8-6 tons of CO₂ equivalent per hectare which is 2-4 times greater than that of tropical forests. Mangroves are thus carbon-rich forests and are major carbon sinks of the world. In the last 50 years, approximately 30-50% of the total mangrove forests have been lost. These continue to be lost at an annual rate of 2%.

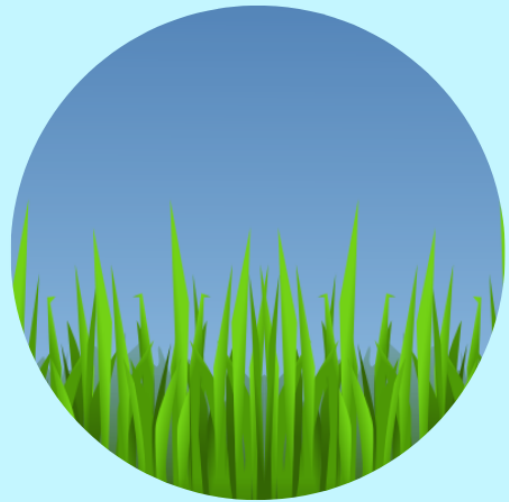


Mangroves

The major reasons for their destruction are unsustainable coastal development practices such as deforestation. Salt marshes also referred to as tidal marshes are essentially coastal wetlands that are flooded by salty water at regular intervals. These are mostly found in the temperate regions of the world and also at higher latitudes. Salt marshes are principally found in Europe, North America, Australia, and in the higher latitudes of South America and Africa. Most of the carbon is stored by the mineral-rich soil of the salt marshes and the average annual carbon sequestration rate of the tidal marshes is 6-8 Mg of CO₂ equivalent per hectare which is 2-4 times greater than that of tropical forests. Salt marshes are being lost at an annual rate of 1-2%. Major causes of destruction of tidal marshes are a rise in sea levels, unsustainable coastal development practices such as the conversion of salt marshes to agricultural land. Seagrass refers to an underwater dwelling, aquatic flowering plant. There are about 72 species of seagrasses that are known to exist currently. Seagrass meadows are located in coastal waters of all continents except Antarctica.



Salt marshes



Seagrass meadows

Seagrasses only grow in very clear waters because they require a good amount of sunlight to grow properly. Carbon is collected in seagrasses over time and then stored in the soil. Though they account for less than 0.2% of the world's oceans, seagrasses store approximately 10% of the total carbon found in ocean beds per year. Seagrasses are perhaps one of the world's most threatened ecosystems as they are being lost at a rate of 1.5% annually and this rate is just increasing with time. About 29% of the world's total seagrasses have been already lost mainly because of unsustainable development practices such as deforestation, degrading water quality, etc. Blue carbon ecosystems have diverse benefits ranging from carbon sequestration to housing the local biodiversity and also providing many precious ecosystem services. These plants capture and store carbon dioxide and thus act as carbon sinks. Hence by removing carbon dioxide from the atmosphere, they help in combating climate change. Even though blue carbon ecosystems are far more scarce than terrestrial forests, they store significantly higher amounts of carbon.

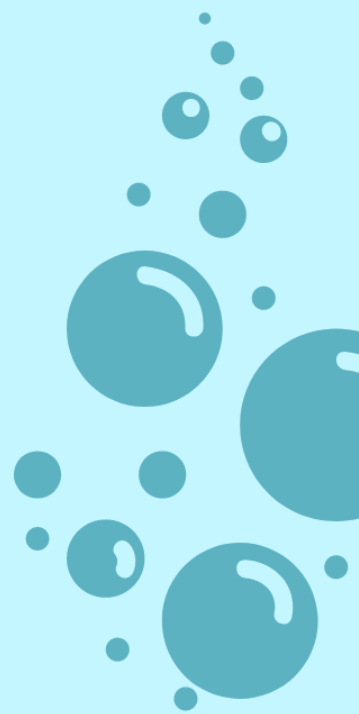
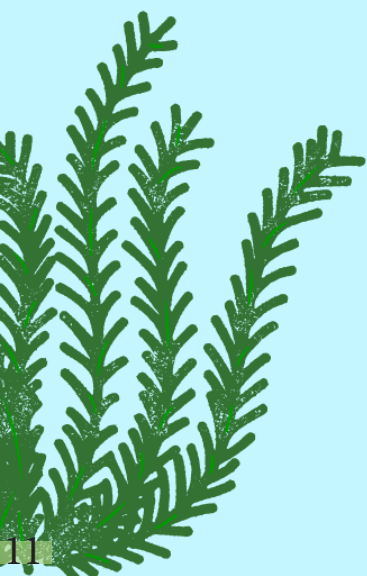
This occurs because terrestrial forests store most of their carbon in their plant parts (such as roots and leaves) while on the other hand, blue carbon ecosystems store most of their carbon in their soils. Blue carbon ecosystems also house and protect a variety of marine and coastal wildlife. Mangroves provide important spawning grounds for different species of fish and shrimp. Tidal marshes provide a habitat for the development of important marine species, which is vital for healthy fisheries and coastal marine ecosystems. Seagrass meadows act as important habitats for fisheries and flagship species, such as sea turtles and manatees.

Additionally, these ecosystems also have a pivotal role in protecting coastal communities and conferring stability to shorelines. These protect local communities against destruction caused by tropical storms, rising sea levels, and floods. Tidal marshes serve buffers to coastal communities by absorbing a part of the energy from storms and floods as well as by helping to prevent erosion.

Mangroves protect coasts against storms, floods, and erosion because of their roots which stand strong against powerful waves. Seagrass meadows perpetually build and secure sediment, which protects coasts from erosion, storms, and flooding. Lastly, these blue carbon ecosystems provide various ecosystem services and support the livelihood of many. These ecosystems are also great for touristic and recreational purposes. Mangroves provide at least US \$1.6 billion each year in ecosystem services, Tidal marshes filter pollutants and hence aid in maintaining the water quality in coastal areas. Seagrass meadows also filter sediments and other nutrients from the water.

Even though blue carbon ecosystems possess numerous benefits, these are under threat. The world's blue carbon ecosystems are disappearing rapidly. The major causes of this rapid destruction are agriculture, overexploitation, pollution, urban coastal development. Mangroves, seagrasses, and salt marshes are cleared up for commercial purposes. Mangroves are also used as a cheap source of timber. When these ecosystems are destroyed, about 1.02 billion metric tons of carbon dioxide is released into the atmosphere annually. In addition to this, the coastal communities come under threat as they remain unguarded against storms and powerful waves that brush up against the shores.

Several methods exist to protect blue carbon ecosystems. Mechanisms such as Reducing Emissions through Decreased Deforestation (REDD+) and National Appropriate Mitigation Actions (NAMAs) act as means for developing countries to procure funding for carbon mitigation practices as well as to implement policies on the national level. At the local level, Clean Development Mechanisms (CDMs) are being developed to fund climate mitigation strategies such as coastal ecosystem conservation. One way to protect blue carbon ecosystems is to invest in blue carbon projects which aim to reduce carbon emissions either by preserving existing blue carbon ecosystems or restoring degraded ones to their original condition.





**LET'S MAKE OUR FASHION
MORE ENVIRONMENT
FRIENDLY**

BY GARGI SAJWAN, FBS



"On April 24, 2013, the Rana Plaza tragedy killed over 1,100 garment workers in Bangladesh and wounded over 2,200 more. The incident left consumers all over the world questioning "who makes the clothes we wear every day and in what kind of conditions?" Documentaries like 'The True Cost' shine a light on how the fast fashion industry depletes the earth's resources and leverages slave labor to pass on a "cheap" cost to the end consumer"

DID YOU KNOW?

The fashion industry produces 10% of humanity's carbon emissions and is the second-largest consumer of water.

A 2017 report of the international union of conservation of nature (IUCN) estimated that 35% of all the microplastics i.e. Very small pieces of plastics which never biodegrade; in the ocean come from laundering of synthetic textiles like polyester, acrylic, nylon, etc.

The microplastics are ingested by small fishes which then move further up in the food chain. Are we wearing toxic ...

Chemicals are one of the main components of our clothes. They are used during fiber production, dyeing, bleaching, and wet processing of our garments. The heavy use of chemicals in **cotton farming** is causing diseases and **premature death** among cotton farmers due to heavy use of toxic chemicals, along with massive freshwater and ocean water pollution and soil degradation. Many such chemicals used in making of clothes are even harmful to the consumer. Our skin is the body's largest organ which absorbs anything we put on it including chemicals on our clothes. This poses a great danger to our health. BUT HOW?

A Greenpeace study for Detox Campaign has identified 11 chemicals frequently used to make our clothes that contains toxins, carcinogens and hormone disruptors which should be banned.



1. Choose organic fibers

Fibers such as flax (linen), hemp, organic cotton, bamboo fiber, ramie fiber, corn fiber, coir fiber, soy silk (this is rare but claimed to be 100% biodegradable) etc.



2. Choose sustainable brands

Code of origin de beers

It is a diamond company which has about 12 sustainability goals some of which includes reduced water usage in its operations, emitting least carbon emissions, conserving biodiversity etc.

3. Always wash new clothes before using them for the first time

This helps to lessen the impact of chemicals

directly put on clothes, and helps to reduce catching infections due to trial of same cloth done by many individuals at any garment store.



4. Look for garments with certification label controlling chemical content such as :

OEKO-TEX®, GOTS, or BLUESIGN®

The global fashion industry is generating a lot of greenhouse gases due to the energy used during its production, manufacturing, and transportation of the million garments purchased each year.

Synthetic fibers (polyester, acrylic, nylon, etc.), used in the majority of our clothes, are made from fossil fuel, making production much more energy-intensive than with natural fibers. Most of our clothes are produced in China, Bangladesh, or India, countries essentially powered by coal. This is the dirtiest type of energy in terms of carbon emissions.

LOOK FOR THESE LABELS

* GOTS (GLOBAL ORGANIC TEXTILE STANDARD)

GOTS is recognized worldwide as the leading textile process standard for organic fibers, verifying that the entire supply chain meets their criteria for the coveted “MADE WITH ORGANIC” stamp. Its certified products ensure that all textiles are made from at least 70% organic natural fibers and that any chemical input (like dyes etc) are evaluated for toxicity and biodegradability.



* OEKO-TEX

If an article of clothing carries this certification, it is a guarantee that every component has been tested for toxic chemicals and given a clean bill of health. An apple a day keeps the doctor away, but OEKO-TEX keeps chemicals away.



* CERTIFIED B OPERATIONS

Its certifications measure the full scope of a company's social and environmental performance. This includes anything from materials to supply chain and employee treatment.



* LEATHER WORKING GROUP (LWG)

The LWG certifies tanneries and leather traders based on their adherence to environmental protection guidelines. LWG ratings (Gold, Silver, or Bronze) are based on how companies' production processes affect the environment. Audits are done by several third parties using the same set of standards, taking into account things like waste management, energy consumption, and water usage. This certification aims to reward brands that are sourcing leather from environmentally responsible suppliers.

AND THERE ARE MANY MORE

What we think and what we do

By Shiwangi Sharma, FBS

*Up from the bed
looked through the window
a sweet smell mesmerizes around*

*birds chirping, trees swaying
what a beautiful scenery,
I could see.*

*A sudden noise wakes me up.
What i saw was just a dream,
looked through the window
honking vehicles were all around.*

*A chaotic environment was what i saw.
I cursed them for disturbing me
but one of them was also me.
All my actions that harmed the nature
surely plays a little role
but hurts my dears equally.*

Now I know my wrong doings.

*Hope we all could think about
and protect and respect our dear nature
as action speaks more than words.*

Solar Energy

-THE RENEWABLE WAY-

BY SHRADHA JAIN, SBS



" I would put my money on Sun and Solar Energy ... What a source of power... I hope we don't have to wait until oil and coal run out before we tackle that ! "

~Thomas Alva Edison

Sustainability is maintaining something up to a certain level, avoiding its recession, keeping at par with the needs of present and future generations. Hitherto, we have come across an array of sources of energy such as fossil fuels, hydroelectric power, nuclear energy etc. But the Sun, which is the ultimate source of energy on the earth, often remains overlooked....

We have put an ample amount of effort into harvesting solar energy, which is hailed as an inexhaustible resource, but the sustainability of Sun's radiation reaching the surface of the earth remains unheeded.

Have we ever wondered what would happen if the Sun became brighter or dimmer than it presently is..? Or if the amount of Sun's radiation reaching the earth's surface subtly changes...? Or if the harmful radiations which are prevented by the ozone layer start penetrating the earth's atmosphere...?

What an abrupt effect it is going to have on the diverse life forms sprawling on the earth. In the present scenario, surrounded by the global issue of climate change, global warming, depleting conventional sources of energy and the vulnerability of innocent organisms to extinction, the call of the hour is to ponder upon three main questions:-

© Vishnu Verma Narayanan

Is the sun really a sustainable source of energy?

If it's not, then what is the cause of depletion of quality or quantity of Sun's radiation? Can it be natural or anthropogenic?

How can we deal with it?

And here comes the dreadful news!

The Sun is lighter than ever and the problem is getting worse....

According to recent research the sun's brightness has reduced by about 5 times in the past 9000 years.

In the core of the hot balloon, the nuclear fusion reaction takes place. In this final showdown, the tiny hydrogen(H) atom converts to mighty helium(He) displaying enormous energy which reaches the audience on the earth.

It can be hypothesised that if, in the course of industrial evolution, some heat resistant particles reach the sun and interfere with this fusion reaction, then the energy of this ultimate light source will collapse and the living planet will lose its vitality, diminishing to a lifeless snowball...

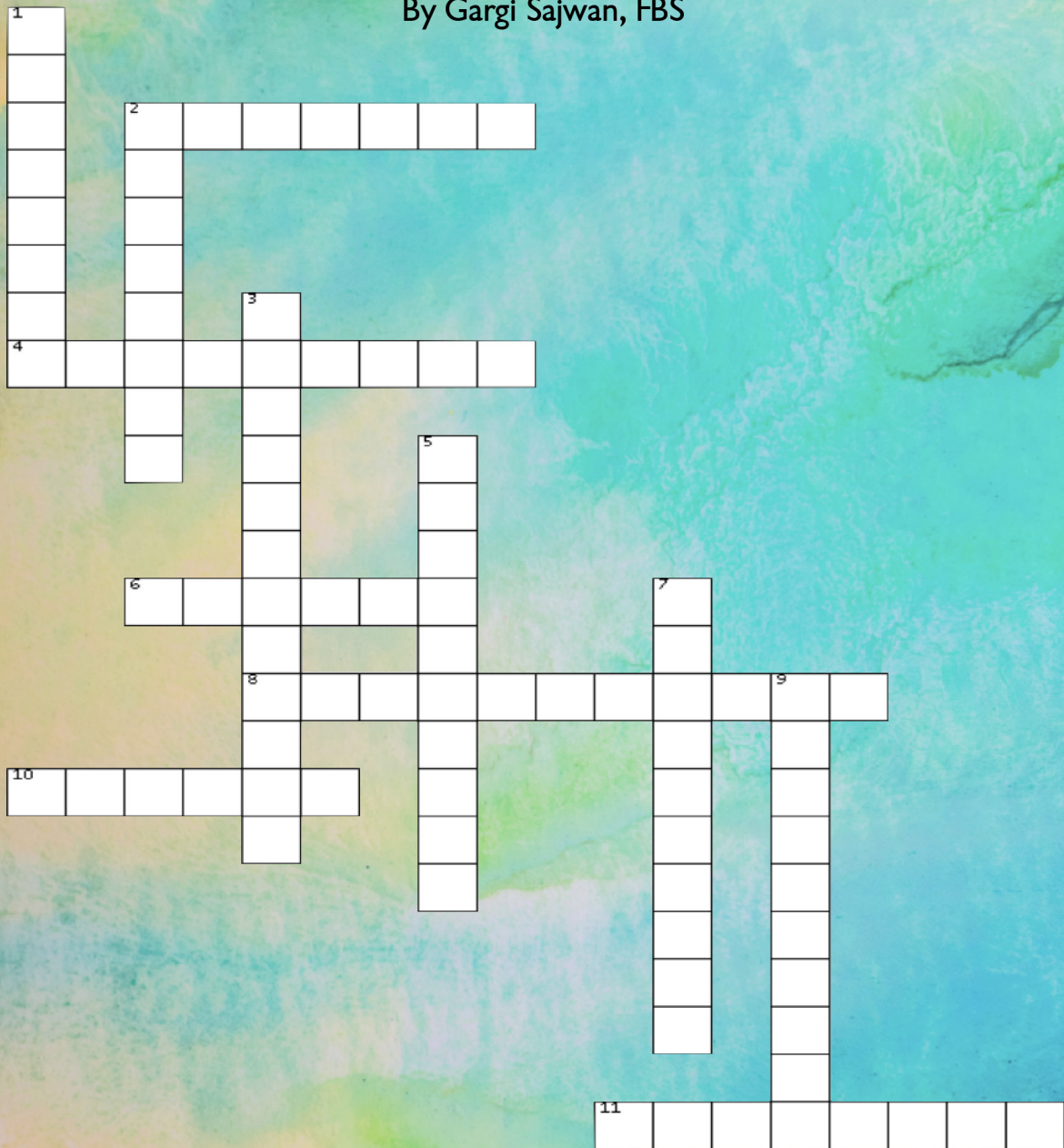
Global dimming has also been observed since systematic measurement of the Sun's irradiance that began in 1950. Global dimming is defined as the recession in the amount of direct irradiance reaching on the surface of earth. Unfortunately the prognosis isn't that good! Anthropogenic actions are indeed a cause of global dimming.

The particulate matter and the aerosols such as sulphate aerosol released by the various human activities decreases the net amount of solar energy reaching the earth. Even a subtle change in the brightness of the sun can have enormous effects on the life of mother earth and her inhabitants. Hence, there remains a wide prospect of finding out ways to avoid these terrible circumstances so as to make the Sun a real sustainable resource.



Quiz Time!

By Gargi Sajwan, FBS



ACROSS

2. This is the world's first offshore landfill.
4. The agency which was assigned to oversee the implementation of sustainable development goals in India, at the central level.
6. The place where the world's first airport powered by solar energy is located.
8. This is another word for- "Landscaping".
10. The largest rainforest on planet Earth.
11. In India, this plant is cultivated to act as biodiesel.

DOWN

1. Most abundant element in the universe which can also be used as a source of fuel.
2. The keystone species of a kelp forest ecosystem.
3. This person was responsible for catalysing the global environment movement based on her book "Silent Spring" in 1962.
5. The person who gave the following statement "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
7. This is the cleanest fossil fuel and is mostly found in fragile conditions.
9. International treaty signed for the protection of the _____.

ANSWERS

1.- Hydrogen, 2.- Semakau, 3.- Amazon, 4.- Natural gas, 5.- Ozone layer, 6.- Niti Aayog, 7.- Jatropha, 8.- Landscaping, 9.- Rachel Carson, 10.- Sea Otter, 11.- Restoratio

FASCINATING FACTS

ABOUT SUSTAINABILITY

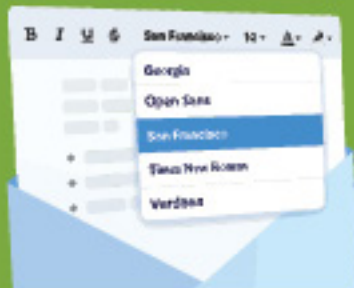
By Sanidhya Jagdish, TBS

Recycling one ton of paper saves **17** trees



Lighting accounts for **15%** of global electricity use. Switching to LEDs will use **90%** ↓ energy

Switching from the font 'Arial' to 'Century Gothic' saves 30% ink on printing



It takes around **2,700 litres** of water to make a single cotton shirt

Recycling a single 330ml aluminium drink can saves enough energy to power a TV for **3 hours**



The production of plastic is largely reliant on fossil hydrocarbons, which are non renewable resources which contribute to climate change

PATIENT **MOTHER EARTH**

By Ankita Kumari, FBS

'I have a diagnosis'
I'm in pain, I have injuries,

I am aged now, my green hairs are
gone
my skin is pale, just as the shade
fawn.

I'm unable to clench the glaciers'
the sun's torrid is melting the ice
and next thing I see- the sea level
rise,

My children's don't heed,
they are sowing plastics;
and for sure the outcomes will be
drastic.

Seeing clear sky with different
colors
they amaze;
some years later, they won't even
get,
get a night dark sky with sparkling
stars to gaze.

Do they know that the land is
vanishing?
vanishing beneath the sea,
islands are being swallowed,
by some queer monsters
Do you agree?





©Vaidehi Sharma, TBS

What are they even saving for
their own children?

A barren land? Gardens with no
flowers?

Sky with no pure air? Glaciers
with no ice?

Summers hot as standing in fire?

Winter cold as sitting in a
refrigerator?

Or the monsoon as the rain
which will wipe the life off?

Until when I'll tolerate this?

The greenery, clean lakes
fertile land, pure air to breathe
is the most I miss!

One day when everything will
end,
the lives will upend

If I'll not recover soon, let me
degrade myself;
and let everyone watch the out-
turn of their deeds.

THE TRAGEDY OF THE *Commons*

Limited resource, unchecked spending

By Gauravya Mohan, FBS

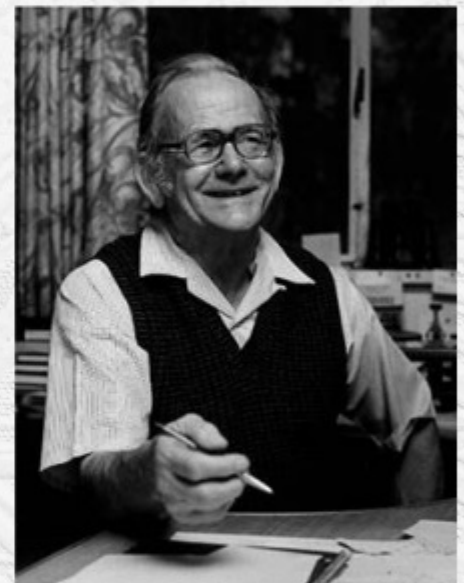


The economist William Foster Lloyd wrote a pamphlet in 1833 discussing the overgrazing of cattle on village commons. These 'commons' refer to common grazing fields. This concept was adapted by Garrett Hardin in his 1968 paper "The Tragedy of the Commons." Hardin was an ecologist studying the dangers of human overpopulation. Hardin applied the concept of the problem described in Lloyd's pamphlet to explain what takes place when numerous people share a limited resource.

“The Earth is what
we all have in
common.”
-Wendell Berry

A key feature of such a tragedy is that it provides an opportunity for an individual to benefit for themselves, while spreading out the negative effects among the rest of the population. We can understand this by the use of Lloyd's original discussion about village commons.

Imagine a common grazing ground for cattle. It would be in the best interests of all the cattle herders to divide the land equally and use their fair share of grass to feed their cattle. However, an individual herder might think it to be in their best interest to capture a larger area for their cattle to feed. Additionally, other herders in the area would come to the same conclusion and try to take more than their share of the limited resource—grazing area, in this case. This would eventually deplete the grasses in the commons and the land would soon become barren. Hence, putting individual gains over the needs of the community will result in the worst outcome for everyone. An individual herder might enjoy a greater yield of milk in the short term but will likely face starvation in the longer term since the grazing grounds no longer exist. A tragedy of the commons can present itself in various ways. It could be one self-interested individual, multiple isolated people or the entire population taking more than their share and thus causing problems for everyone.



Ecologist, Garrett Hardin

Hardin mentions that morality plays a significant role in the future of our planet. It is not the burning of fossil fuels or the release of greenhouse gases that is causing climate change, it is the lack of morality on behalf of humans. However, the purpose of this discussion is not to label all humans as greedy or shame them for existing. A situation such as this can be easily avoided if the adequate measures are taken.



©Vaidehi Sharma, TBS

A tragedy of the commons

isn't limited to environmental issues. This tragedy can be caused by a single person accumulating massive amounts of wealth and thus negatively affecting the economy. This would force the lowest of socioeconomic classes to suffer since the little they had has been further snatched away. This will cycle back to environmental degradation since an immoral individual (or an organization) with enormous wealth to their name might indulge in practices that directly affect the environment.

Nestle freely drains water from the Six Nations treaty land—a reserve land for American indigenous peoples—while the residents of the area have no access to running water. This is not the case of a third-world country. The reserve is located near the largest and richest city of Toronto, Canada. Large companies like Pepsi Co and Coca-Cola are well known for polluting water bodies. Industrial effluents are discharged without treatment into water bodies. The increase of pollutants in water can harm aquatic life and in extreme cases can cause the extinction of species.

The threat to nature is not restricted to large companies. Mundane activities like showering, littering and usage of electricity can have a significant impact on environmental degradation as well. Approximately 75% of all electrical energy in India is produced through the usage of coal fueled thermal power plants. The short term benefits of thermal power include cheap electricity for consumers and profits for its owners. In the long term, this can lead to an irreversible contamination of the atmosphere due to the burning of coal.

The overuse of antibiotics also poses a problem. Their usage has short term advantages such as treating common illnesses and increasing livestock production. However, the overuse of these drugs has led to the evolution of antibiotic-resistant bacteria that threaten the entire population. All these issues have an underlying mechanism that follows the tragedy of the commons. Short-term self-interest is placed above the common good, the greed of a few individuals affects a large population and individualism causes problems that spread out over the entire community.

Hardin understood this issue well and was correct in proclaiming that the tragedy of the commons applies in many socio-ecological problems. Understanding the working of this tragedy gives us the opportunity to solve these issues.

In the late 1970s, while recovering the data from the Dobson Ozone Spectrophotometer in Antarctica, Jonathan Shanklin noticed that the amount of atmospheric ozone had substantially decreased. The decrease was attributed to the excessive use of chlorofluorocarbons (CFCs). CFCs were then commonplace in refrigerators, aerosols and certain aircrafts. The most alarming fact regarding the issue was that CFCs initiate a chain reaction in the degradation of ozone. This seems benign and fairly harmless but this chain reaction implies that a single molecule of a CFC could destroy thousands of ozone molecules. This would have meant that even if CFC production were to suddenly stop, the ozone layer would still undergo depletion from the CFCs that were released into the atmosphere in the past.

The depletion of the ozone layer would lead to UV radiations from the Sun to reach the Earth easily. This would cause several health issues, such as skin cancer, cataract and immune system suppression. These issues were not limited to human illness, they would affect all life on Earth. The situation seemed grim.

Fortunately, the end of this story is far from the dystopia that was expected. Humans came together to work out a solution. The Montreal Protocol was drafted in 1987 and put into force in 1989. The leaders of 197 countries have agreed to control their CFC and ODS (ozone depleting substances) emissions in order to protect the ozone layer. The ozone hole still exists and forms over Antarctica every winter. However, due to the Montreal Protocol, the extent of the hole is limited. The situation would have been significantly worse if the protocol had not been adopted. Models predict that the ozone hole will be more or less fixed by 2040.

Along the northern coast of California lies a town called Arcata. The townspeople collaborated with biologists from the Humboldt State University to create an integrated wastewater treatment plant that includes both artificial and natural methods for treatment. The wastewater is first treated by conventional sedimentation, filtration and chlorination techniques. The subsequent treatment involves passing the water through a series of six marshes where a variety of organisms (algae, bacteria and plants) present in the wetland purify the water naturally and even remove toxic heavy metals. The townspeople organized a citizens' group known as the Friends Of the Arcata Marsh (FOAM) that is responsible for the upkeep of the marsh. The marsh is also a sanctuary for the various fish, mammals and birds that now reside there. Humans appeared on the Earth some 3,00,000 years ago and it has been three and a half billion years since life first appeared on this planet.

Humans have caused insufferable damage to the environment during their relatively short existence. However, humans have also shown that they have the capacity to understand and grow. We build communal agreements, elect representatives and form social contracts that keep us all in check. The cases of the Arcata marsh and the Montreal Protocol are a testimony to how humans can take action and fix such problems. A nihilistic approach to life is futile. We have shown time after time that healing is possible, no matter how bleak the future might seem.

Most problems regarding sustainability are a case where a limited resource is shared among many individuals or where short-term gains are given preference over long-term solutions. These are cases where a tragedy of the common exists. In Hardin's words, when the tragedy of the commons applies, what's good for all of us is good for each of us.

HEALING OUR EARTH

B No more rains with falling drops
Y In no more land shall creatures hop
The once soft kiss of a passing breeze
Will instead cause you to cough and sneeze.

G Ice is melting and soon no more
A Waves would gently lap the shores
R Instead, they will shed the land chores away
G By rising further everyday.

I Chirping birds of love and play
N Will soon begin to fade away
Plants will begin to sprout deceased
G Because of unbearable soaring flare up too high.

A All because of us , ourselves
J We are making this living hell
E But we still change by a little bit
W Creating attention by a little hit.

A Turning off uncalled engines, showers and light
N It doesn't take a hero's might
R , Reduce, Reuse and Recycle
F These will lead to earth's revival.

B From now and on we can make a change
S A little step to a big avail
H This is our mother earth and we should treat her right
Or soon she will not be here for future lives.



Conservation Practices OF LOCAL TRIBES of North-East India

by Akangkha Choudhury, TBS

North-East, home to more than 8,000 flowering plants and above 10,000 fauna species, is magnificent. Endowed with the mighty Brahmaputra-Barak river systems foraying through her soil and the touch of 11,000 mm precipitation in some parts , Northeast India thrives as a holy grail of biodiversity. Spanning over two important biodiversity hotspots of India and the world, the Himalayas and the Indo-Burma, the North East is a motherland to one-horned rhinoceros, hoolock gibbon, red panda, golden langur, clouded leopard, golden cat, marbled cat, the Gangetic dolphin, and the list goes on. It isn't simply the flora and fauna, the Northeast is diverse in culture and people too. With over 475 ethnic groups speaking 400 plus dialects, the place is a hub of exquisite indigenous knowledge and cultural practices rooted back to centuries.



Vaidehi Sharma, TBS

The tribal communities hold close ties with forests and the environment. They view nature as a life-giver, hence their activities are always in coherence towards a holistic approach to safeguard nature, be it agriculture or extracting the resources from the forest. They have a plethora of knowledge and indigenous practices for sustainable agriculture, irrigation, waste management, forest conservation, and many more.

Hmar tribe: Agroforestry with fruit farming

Hmar is a small tribe found in Manipur, Mizoram, and Cachar, and North Cachar Hills of Assam. They are majorly cultivators, famous for their pineapple, litchi, mango, lemon, and guava crops. The notable thing about their farming is the unique and sustainable practice of agroforestry, a tradition that roots back to their very origin. The remarkable custom of planting trees along the borders of their plantations is a splendid ecological strategy to promote forest cover optimally utilizing their agricultural lands, contrary to the conventional idea of mass deforestation to obtain land for agriculture and plantation. Further, the trees shield the soil from erosion, a major problem in hilly areas, increase soil health and promote biodiversity.



Hmar tribe and their dance form

Apatani Tribe: A unique way of wet-rice agriculture

Apatani is a local tribe of Arunachal Pradesh mainly living in the quaint old town of Ziro valley in the Lower Subansiri district. This agrarian tribe is renowned for its ingenious practice of rice farming. The farms are constructed on flatlands. Wet rice cultivation combined with pisciculture in the same field with a distinguishing irrigation system consisting of efficient water channels mark the creativity and beauty of their farming system. The Apatanis follow a holistic way of agriculture so that nothing is wasted and every resource can be potentially benefited. Therefore, even the elevation partition bunds between the fields are not left empty and are utilized to grow millets. Recycling crop residues and the use of organic wastes of the village is also done effectively to restore soil fertility. Furthermore, a very noticeable aspect of their farming practices is that they do not involve any animals, artificial machines, or any fertilizers. Even with minimal external inputs, they are able to provide the best results in their crops, which is mostly where our modern agriculture fails. The Ziro valley was nominated by UNESCO once as a World Heritage Site for its highly productive and sustainable ways of preserving ecology.



The Apatani tribe

The Alder Based agriculture of Naga tribes:

The indigenous alder-based agroforestry is an age-old unique system of self-sustainable farming practiced by some of the indigenous tribes of Nagaland, namely Ao, Angami, Chakhesang, Chang, Yimchunger and Konyak. The alder tree, which is the state tree of Nagaland, is grown in an intercropping manner with various crops like rice, tapioca, potato, cardamom, turmeric, etc. It is a fast-growing tree that needs very little maintenance and care, hence can grow easily in soils with poor nutrient quality. In return, it makes the nutrient-deficient soil fertile. Nitrogen-fixing bacteria resides in the root nodules of alder trees, in a symbiotic relationship, and enriches the soil with the absorb-able form of nitrogen. The roots of the alder trees penetrate nature and go deep into the soil,

preventing soil erosion in slopes. The trees are then pollarded by the locals to obtain timber and fuelwood.



Preparation of land for Alder Cultivation



Potato cultivation in alder grown jhum fields

Sacred Groves of Meghalaya:

Sacred grooves are grooves of trees that are worshiped and strictly conserved due to their special religious importance in a

particular culture. Meghalaya is a home to 125 sacred grooves spread over the lushness of her untouched soils of Khasi and Jaintia Hills. These sacred forests serve as an exchequer of biodiversity for the state housing 514 species of flora and fauna belonging to 340 different genera and 131 different families. It is a rich hub of medicinal plants equally as some of the species found are so rare that they are nowhere found naturally. These forests are of utmost religious and spiritual importance for the tribals associated with them. The forest goddess or 'U Basa' is prayed by the locals and is believed to reside in these divine forests. Therefore cutting of trees or disturbing the forest, and utilizing its resources for any purpose is a punishable offense under the law. In some forests even entry is prohibited, let alone the outcomes of plucking a leaf!



Sacred Groves of Meghalaya

Counting every drop with 'Zabo' water harvesting system:

'Zabo', which means 'impounding water', is an ingenious and creative method of collecting the rainwater running off the mountains and using it for irrigation purposes, developed by the Chakhesang tribes living in Kikruma village in Nagaland. Since Kikruma lies in the rain shadow zone, water scarcity was a primary problem among their ancestors. Therefore the tribe developed a multi-beneficiary and highly productive water conservation system to save and use every drop of it. Zabo is the epitome of integrated agricultural systems as it combines forest, horticulture, agriculture, fishery, and animal husbandry with a well-founded soil and water conservation base. Forest lands on hilltops are protected and well maintained which act as catchments that bring the water to slit retention tanks through bamboo channels, from there it is transferred into ponds. Fields are constructed in the terrace slopes, each field serving a different purpose. The water from the ponds irrigate the animal farms first, then this water enriched with manure and organics flows to the fruit and vegetable farms in the terrace step below it, thereafter it reaches the paddy fields, in a few steps, where they grow around 20 different variety of paddies, followed by millet, pulses and sesame

fields and finally the drained water is used in pisciculture area near the river beds which ultimately meets the river.



Organic Farming in Sikkim:

The Smallest state of Northeast, Sikkim, became the first-ever hundred percent organic state in the world in 2016 and was awarded the Future Policy Gold Award by the United Nations Food and Agriculture Organization (FAO) in 2018, (Times of India, 2019). The journey started back in 2003 when the then Prime Minister of Sikkim, Pawan Chamling, took the initiative of attaining self sustainability with organic farming. This soon became a gigantic mission of the state involving the government, environmentalists, social workers, scientists, and the common people of Sikkim to work for the common cause. Policies were made and acted upon where they banned the import and selling of chemical fertilizers, pesticides, and GMOs. Farmers were encouraged to use the naturally available resources, switch to

manure, install compost pits, diversify their crop pattern, and agroforestry. The basics of organic farming were even incorporated into school and college curriculum to promote awareness among future generations. More than 66,000 farming families benefited from the policy with better yield. Tourism mushroomed too, increasing the number of tourists by almost 50 percent in 2013-2017 (Gowen, 2018)



Mawlynnong, the cleanest village in Asia

90 kilometers away from Shillong, Mawlynnong is a tiny picturesque hamlet in Meghalaya. Also known by the name, 'God's own garden', Mawlynnong is the cleanest village in Asia. The place is mainly inhabited by the Khasi tribes. They are the ultimate knights and guard keepers for protecting its glass like cleanliness and maintaining the decorum of the place throughout. Plastic bags are completely banned here, bamboo garbage bins are

present in every corner and nook of this place. The waste is collected in these bins and sent to a pit for composting, where it is turned into manure. Solar panels are installed in the majority of the houses and rainwater is harvested using the indigenous age-old bamboo drip system. The sanitation facility is remarkable with every house having toilets and even separate toilets for guests and tourists which are easily accessible. A very striking socio-cultural aspect of this place is the role of women. The Khasis have a matriarchal society, where the role of women is indispensable. They are breadwinners, entrepreneurs, farmers, mothers and what not. With an emphasis on women empowerment and education, Mawlynnong showcases a 100 percent literacy rate where all the villagers are fluent in English. Mawlynnong is an untouched rarity, a true emerald of the eye.



The system of Pukhuri:

Bodo is the largest ethnolinguistic community of Assam, principally living

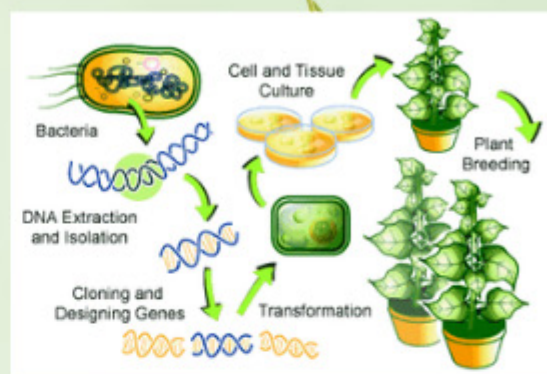
within the Bodoland territorial region of the province. The Bodos follow a traditional system of irrigation referred to as Dongs, where they use to make channels connecting the river which brings the river water to their villages. This water goes into large artificially constructed ponds in front of their houses, locally known as a pukhuri. Several outlet channels are made in the pukhuri which finally bring the water to their agricultural fields. This system of channels work in perfect order with paddy crops, which is the staple crop of Assam. Alongside storing water, the pukhuri's are used by the villagers to breed fish locally. Pisciculture in these ponds is of great economic importance for the locals. The system of pukhuri is also widespread in some of the non-tribal communities of lower Assam.



The Forest Man of India:

Jadav "Molai" Payeng, the "Forest Man of India", hailing from the river island Majuli, Assam is an environmentalist and forest activist who dedicated 30 years of his life planting around 40 million trees

and single-handedly grew an entire forest of 550 hectares on Aruna Chapori, a barren sandbar of Brahmaputra. Jadav believes in change through education. It is the only way to inculcate the virtues for environment conservation and sensitivity among the young generation. In his words, every child should be encouraged to plant a sapling from a tender age, and taught to take care of it as they grow up. He wants the young generation to have an interest in knowing about their surroundings, to know the names of local trees, indulge in birdwatching, plant gardens and protect the indigenous knowledge. Jadav was awarded the prestigious Padma Shri, for his undying dedication and extraordinary work towards nature. His "Molai " forests are now a home to Indian Rhinoceros, Bengal Tigers, Elephants, birds and lots of other faunas. His work has received international recognition with many documentaries and books made on his life . He was invited by a Mexican NGO, Fundación Azteca, to initiate a mass plantation drive in the eight lakh hectare of land given by the government of Mexico.



The scenario today

In the recent years of mushrooming urbanization and exponential growth of technology, nature and the tribal communities too have experienced a shift from their constant equilibrium. We have had a significant change in forest covers compared to the past decades with deforestation becoming more and more serious with every passing day. Many tribal communities have lost their livelihoods when forests disappeared and were forced to give up on their indigenous practices, resorting to GM crops, use of chemical inputs to get more yield and other modern methods of agriculture, as it was important to keep up with the race of time. It is very crucial to protect these indigenous knowledge and customs of tribals before they get long lost and forgotten. Several studies and research are being conducted to preserve their unique culture. The more we delve deep into it, we realize how awesome they are and that many modern problems have their solutions in our very roots somewhere there!



Bioengineered Sustainable Products

By Lavanya Tyagi, FBS

Sustainable living is a lifestyle which promotes reduction in demand of the human beings for natural resources, with suitable alternative replacements. It attempts to provide a lifestyle which reduces the impact of our actions on the environment, through judicious use of natural resources. Our current lifestyle is afflicted by various environmental issues like pollution, climatic changes, natural resources deterioration etc. These significantly affect ecological balance which further influences the overall well-being of most of the life-forms on Earth.

Scientific understanding and application of various research-based methods help us in analysis and production of rational alternative solutions. Thus, the process of scientific inquiry helps us to find out a factual approach to solve problems that we come across in our daily walks of life. Science education is consequently a key tool for human endeavor of future security.

Here are some prototypes and products which showcase the blending of science and sustainable development goals.

The Biological Source of light

Presently, light pollution is adversely affecting the environment in ways which include disruption of the ecosystem and various organisms including humans. In addition, there is a need to provide an alternative solution for the 15 percent global share of electricity for lighting, which accounts for about 5 percent of global gas emissions.

Glowee, a start-up in France, is working towards creating clean and safe lighting sources. They use technology to insert the genetic code for bioluminescence in bacteria which are non-pathogenic to produce light for daily needs. They encase the bacteria in transparent shells, which carry the essential nutrition medium for their survival and thus make light. Moreover, the biomass of these bacteria can later be used as biofuels or bio-plastics.

This is an exemplary stride towards developing a sustainable lighting source.

Flexbumin

Albumin is derived from human plasma and is often used for treatment, where it maintains the desired blood volume and pressure. This substance is usually packaged in glass bottles (resulting in larger waste production), but recently, there is creation of FLEXBUMIN, the first albumin available in a flexible, light, plastic container, which is called GALAXY. The formation of this GALAXY container involves four-layers of packaging, which helps to maintain albumin quality. It is also validated for storage and use in frozen conditions as well as at room temperature. It provides the necessary strength and inertness. The environmental impact of FLEXBUMIN has been verified by the Carbon Trust. When compared with glass bottles of equal volume, the lower mass of FLEXBUMIN results in lesser waste production after the albumin has been infused. If we use 4 containers of FLEXBUMIN per day for a week, instead of using glass bottles, the CO₂ reduction provided will be the same as using approximately 11 lesser liters of gasoline. Thus, FLEXBUMIN has been created keeping in mind the seriousness and significance of sustainability.

Ozone Sterilizer

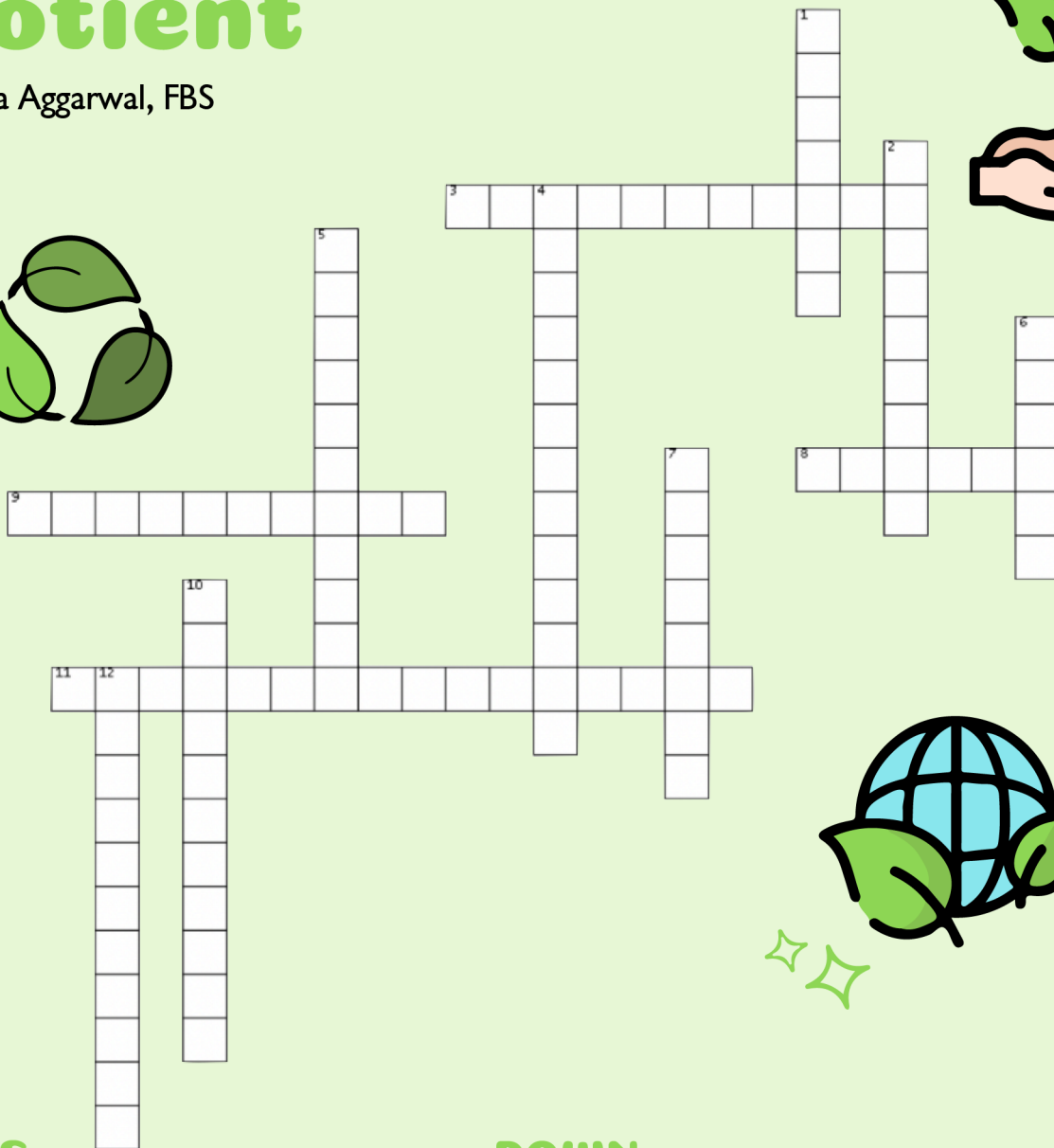
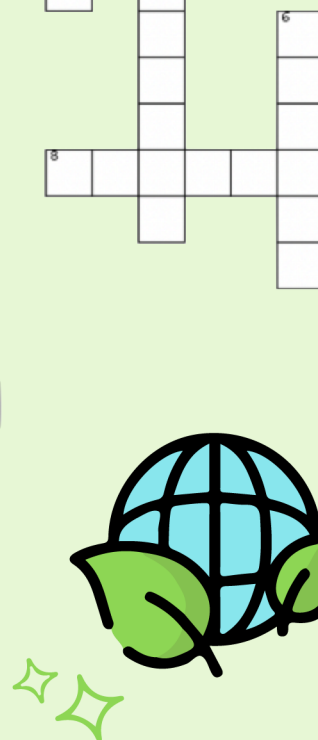
Ozone sterilizer is a system developed for low-temperature sterilization. It produces zero toxic waste and is certified as a '100% ecologically friendly' device.

It was developed collaboratively with Brasil Ozônio Industry, which is located in the University of São Paulo, along with the Brazilian Incubator of Technological Projects, Ortosintese. This device makes use of ozone as a sterilizing agent. Few of the reasons for using ozone for the purpose are that it is ideal for thermo-sensitive materials and it is highly effective in reducing microbial load. Generally, the chlorine used for sterilization shows lower disinfection effectiveness, when compared to ozone sterilizer. Moreover, as its only input is oxygen, a small amount of water is the lone residue produced by the system. Thus, there are no waste products involved that require special handling, storage or disposal. Another added advantage is that the machine uses minimal power. This Ozone Sterilizer is, however, still under the process of testing and is not yet available for sale.

Everybody is thus persuaded to adopt the principles of sustainable living and utilize science and technology to create the path for sustainable development. It is expected that keeping in mind the above illustrations, all of us would be encouraged towards scientific analysis and have a holistic approach for building a safer future.

Let's Check your Sustainable Quotient

By Anshika Aggarwal, FBS



ACROSS:

3. When the consumption of natural resources is equal to nature's ability to replenish then it is called a ____ economy.
8. The first Human Environment Conference was held in this country.
9. Meeting the needs of the present without compromising the ability of future generations to meet their own need' was first mentioned in this report.
11. The maximum number of individuals that can be supported by a given environment is called ____.

DOWN:

1. Leading country in achieving the sustainable development goals given by the UN.
2. The number of Sustainable Development Goals (SDGs) by the United Nations are ____
4. Sustainability Science is the study of the concepts of sustainable development and ____ science.
5. Another word for landscaping.
6. One of the major results of the UNCED Conference(1992) was ____
7. Electronic waste is an adverse effect of this.
10. The United Nations Conference on Environment and Development (UNCED) is also known as the ____.
12. The technology which meets the sustainable development needs is often referred to as ____ technology.

ANSWERS

1. Finland 2. seventeen 3. steady state 4. Environmental 5. Restoration 6. Agenda 21 7. Industry 8. Sweden 9. Brundtland 10. Earth Summit 11. carrying capacity 12. appropriate

OUR SANSKRITI &

By Avantika, SBS

India is a land of wonders with a great variety of different landscapes, Flora, Fauna and people with different traditions and beliefs. These traditions form the basis of Sustainable livelihood of Indian society. Sustainability and climate change may be broader terms used in modern day life but India has always been working on these in everyday life for centuries. Somewhere in this Indian culture lies the solutions of many modern day problems. History shows us how creative and impactful our past generations were in order to keep our planet clean and green.

In 1900 Mahatma Gandhi motivated the country to adopt khadi which is purely a natural fabric that can be easily decomposed by microorganisms as compared to synthetic fibres. Desi tradition of using clothes for a long period by sharing it with siblings or by donating them, using the same cloth as duster and making notes out of them is a great way to upcycle cloth. This also helps to make the fabric easily decomposable. Before the invention of plastic and styrofoam disposable plates and cups, India used compostable 'pattals' or banana leaves and 'kulhads' which are made of leaves and clay. When it comes to eating food, India prefers to eat with hands. This way a lot of plastic cutlery is reduced. Indians used to show great concern about food wastage and always tried to use the excess food by repurposing the food item or by giving it to the needy. It's not surprising to find old plastic containers being used to store other kitchen essentials like spices, pulses etc. Many people also save newspapers, old box broken plastic items and sell them. This helps in proper recycling of these materials otherwise they would end up in landfills.

Neem twigs are used for oral hygiene and wooden combs are one of the few things that made a huge comeback in recent times while in India these are age old practices. Reetha (soap nut) and shikakai were an important part of the hair care regime of women in olden times. These practices are zero waste and do not pollute the planet.

Simple yet very effective habits such as switching off the lights and fans when not in use, using buckets instead of showers, sun drying clothes, hand-washing dishes, reusing handkerchiefs, and cloth diapers instead of disposable ones help to fit in a

SUSTAINABILITY

sustainable lifestyle. Integrating traditional knowledge and innovation can do wonders. One such example is Mitticool – a natural refrigerator which uses the same principle as that of earthen pots to cool water without electricity made by Mr. Mansukh who is a traditional clay craftsman in Gujarat.

Also India has a high proportion of vegetarians. The livestock have a lot of utility, which is lost when these animals are slaughtered for their meat. The amount of energy and water required for rearing livestock for slaughter is further leading to degradation of the environment. Traditional agricultural practices like using neem spray or chilli spray to prevent pest infestation, cattle dung as natural fertilizer, crop residues as fodder and many more proves to be a step towards sustainability. Science and Technology are using these practices as the basis for development of the agriculture sector. A bio decomposer called PUSA is developed by ICAR, Indian Agriculture Research Institute, to solve the problem of stubble burning in many states of India.

Different religions have their own ways to educate people about sustainability. The ancient scriptural text Isopanishad says: “This universe is the creation of the Supreme Power meant for the benefit of all his creation. Each individual life-form must, therefore, learn to enjoy its benefits by forming a part of the system in close relation with other species. Let not any one species encroach upon the other’s rights.” The Islamic concept of environmental stewardship, which stipulates humans as stewards (khalifah) of the land and its resources, prohibits wastefulness. There is a great sense of responsibility and compassion towards nature. While worshipping trees and animals Indians also believe in raising their voice against any indiscriminate action towards them. We all know that a group of activists led by Amrita Devi came together and hugged the trees to protest against deforestation. In this protest 363 people sacrificed their lives to protect the Khejarli Forest.

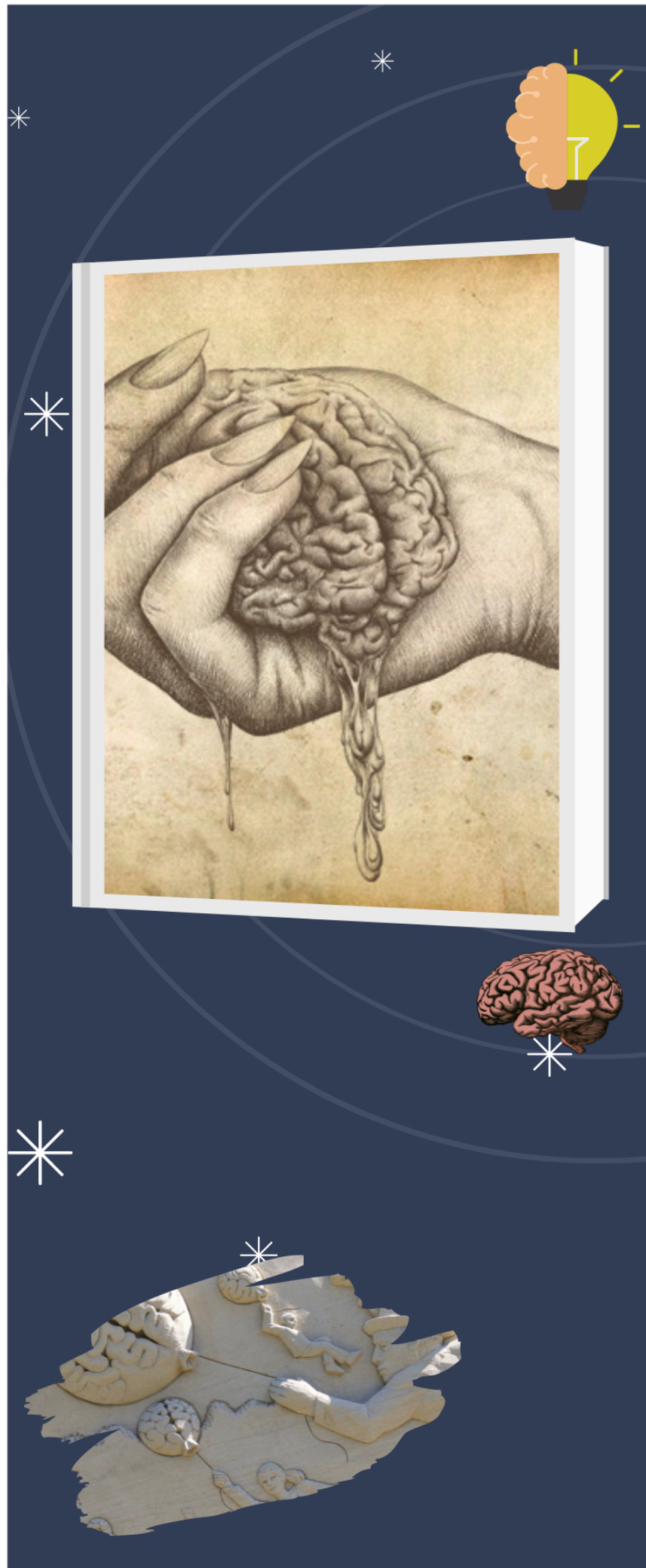
India may have a low literacy rate as compared to other countries but the roots of Indian culture are attached to a sustainable living directly or indirectly. Even though it's true that modern problems require modern solutions, but there is a lot we can learn from our traditions and ancient practices.

THE BRAIN DRAIN EFFECT

BY LAVANYA AHUJA,SBS

Sustainable development is an idea which may appear abstract at first, but however is a constellation of concrete goals and thoughts aiming towards achieving global progress and prosperity. The United Nations has come up with 17 goals targeting over 169 countries to accomplish sustainable development, precisely defined as a form of development which aims at achieving economic success but not at the expense of nature and its valuable resources, ensuring that the future generation does not have to compromise. The Sustainable Development Goals are a universal call to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

Brain drain as a factor, which might act as a hindrance to sustainable development often gets overlooked. The term 'Brain Drain' was first coined by the Royal Society to describe the emigration of "scientists and technologists" to North America from Europe, post war, in 1963. Brain drain is the phenomenon whereby nations lose skilled and talented people to other countries because of lack of resources and opportunities in their own. They tend to flee to other countries because of the abundance of better paid jobs over there. And it is highly unlikely of an individual to ignore the chance of improving their quality of life by doing so. Human capital flight might be beneficial on a global level, however it's not something which could catalyse the economic growth and development at the national level. The consequences of the phenomenon are even worse if the country is already poor. When a country allocates its resources in educating people and then those people migrate to other nations, the country suffers.



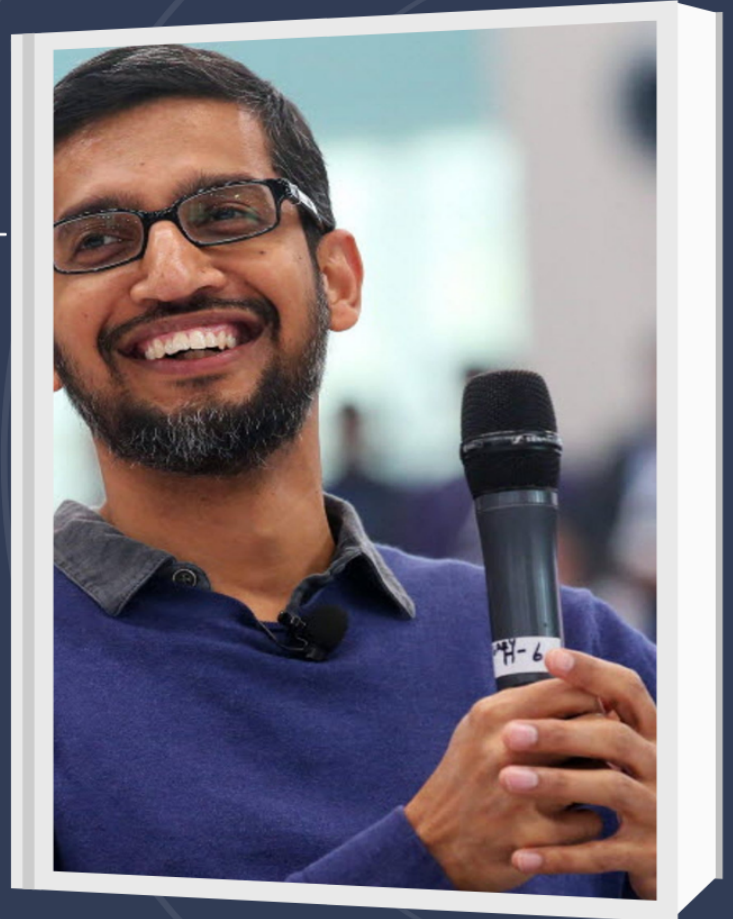
In India itself, is an ample amount of intellectuals including doctors, engineers, scientists and individuals from other qualified professions who migrate to developed countries. Despite opportunities being created, this efflux tends to remain persistent.

This robs off the country from skilled people who could have actually contributed to sustainable development and economic growth effectively. One of the reasons why developed countries flourish can also be attributed to an effective brain drain.

At global level human capital flight may help in expanding research and development activities by using international talent but leaves a dent in economic growth at national level. Factors like low living style, population problems, unemployment, lack of jobs, low salaries, low currency and GDP act as push factors in human capital flight.

In some cases, the country is not only losing its investment in the education of health professionals, but also the contribution of these people to health care. In India, for instance, the total expenditure on health care is 3% of the total GDP and that of the USA is 13%. And, the ratio of doctors to patients in India is 1:2083 whereas it is 1:500 in the USA. This is true for many developing countries. This trend has been consistent in numerous developing countries and is causing a decline in health of the people as the health care of the country suffers from brain drain of the health care professionals

Many countries have used preventive policies to limit brain drain. For example in Thailand, skilled people trained by public institutions are obliged to repay if they plan on going abroad.



Sundar Pichai, CEO of Google



Brain drain is primarily the reason poor countries are becoming poorer and rich countries are becoming richer. It is immensely important to regulate this phenomenon so that it does not occur at the expense of sustainable development.



The availability of both quality education and practical opportunities in the research fields might help in limiting the human capital flow and retaining the talented individuals within the country.

For example, China is the only developing country to be a part of the Human Genome Project and has introduced various opportunities in biological research and biotechnology which attracts and retains the people. Working on factors like employment opportunities, greater income and higher wages, research opportunities, healthier working environment, modern educational schemes and policies may curb human capital flight to a certain extent.

It can be clearly seen that brain drain is not a desirable phenomenon when it comes to achieving sustainable development and has produced poorer rates of growth and development in several countries. Moreover it is also responsible for political instability and poor health care system which further affects the growth of the country severely. It is impossible to attain sustainable development if the country constantly loses its skilled human resource. If managed carefully with policies and strategies, international migration may contribute significantly to sustainable development.



SUSTAINABLE AGRICULTURE

BY APARNA KUMARI & TANNU KUSHWAH, SBS



The human population is increasing exponentially day by day leading to an increase in food demand. Thus, we need sustainable agriculture to meet the demand of the current and future generation agriculture poses a remarkable pressure on our nature and its valuable resources. After World War II, the agriculture sector had changed drastically. Production of food increased rapidly due to the adoption of new techniques and technology, mechanization, increase in the use of chemical fertilizers and pesticides, specialization, and different policies of the government that focus on maximizing production. Although this method has many positive aspects, it is also acting as a push for severe problems which are directly affecting human and animal health, their well-being, and the environment. Sustainable agricultural practices are intended to protect the environment, expand the earth's natural resource base, and maintain and improve soil fertility. It can solve many problems generated by conventional industrial agriculture such as environmental damage, hunger, poverty, animal cruelty, etc.

WHAT EXACTLY IS SUSTAINABLE AGRICULTURE?

Many authors and organizations worldwide have their own viewpoint about sustainable agriculture. Some consider it as a set of management strategies addressing the main social concerns about food quality or environment protection. Some focus on the ability of agricultural systems to maintain crop productivity over the long term. Other authors focus on the important factor of sustainability like flexibility, which is the adaptive capacity

of agriculture to adapt to future changes. In a nutshell, everybody agrees about the following three approaches to the concept of sustainable development:

a) Environmental b) social and c) economic.

Thus, agricultural systems are considered to be sustainable if they are economically viable, environmentally safe, and socially fair. They should also be able to sustain themselves over a long period as well as be able to meet the food demands across generations. The basic goals of sustainable agriculture seek to integrate three main objectives: a healthy environment, economic profitability, and social and economic equity. These are sometimes referred to as the “three legs” of the sustainability stool. It also focuses on genotype improvement with the help of modern technology and biological approaches.



WHAT ARE THE KEY PRINCIPLES IN SUSTAINABLE AGRICULTURE?

i) integrate biological and ecological processes such as nutrient cycling, nitrogen fixation, soil regeneration, allelopathy, competition, predation, and parasitism into food production processes,

ii) Minimize the use of those non-renewable inputs that cause harm to the environment or the health of farmers and consumers.

iii) Make productive use of the knowledge and skills of farmers, thus improving their self-reliance and substituting human capital for costly external inputs, and

iv) Make productive use of people's collective capacities to work together to solve common agricultural and natural resource problems, such as pest, watershed, irrigation, forest, and credit management.

The main factors that are affecting the sustainability of agriculture resources and also affecting the environment are: -

i) Land and soil-related concerns

- Deforestation
- Soil degradation and soil infertility
- Soil erosion
- Siltation of reserves
- Wind erosion

ii) Irrigation related problems

- Groundwater depletion due to over-exploitation
- Waterlogging
- Soil salinization and alkalization

iii) Use of agro-chemicals

- Fertilizer pollution
- Pesticide pollution

iv) Environmental pollution

- Greenhouse effect
- Depletion emissions
- Methane emission
- Eutrophication

v) Erosion of genetic biodiversity



By Sanidhya Jagdish, TBS

WHAT IS THE IMPORTANCE OF SUSTAINABLE AGRICULTURE?



1. Crop rotation: - Different types of crops can be grown alternatively in a patch of soil which helps in maintaining soil nutrients, controls pests and diseases, and reduces soil erosion.



2. Organic Farming: - It is one of the most important methods of sustainable farming. In this method use of synthetic inputs and chemical fertilizers are avoided and instead biofertilizers and biopesticides are used. It relies upon techniques like crop rotation, crop residues, animal manures, off-farm organic waste, and biological systems of nutrient mobilization and plant protection.



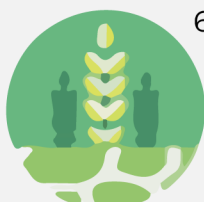
3. Integrated Pest Management (IPM): - This includes mechanical and biological methods of control that keep pest populations at bay by avoiding the use of chemical pesticides.



4. Agroforestry: - It involves the growth of trees and shrubs by mixing with the crops which can help in providing shelter and shade to plants and animals. It can also provide some extra income to farmers.



5. Cover crops and mulching: - Planting cover crops increase the organic matter in the soil and its fertility and decrease pests and diseases.



6. Mixed cropping: Growing different crops in a field is termed mixed cropping. It is generally used to reduce the loss of crops caused by rain.



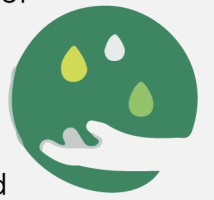
7. Natural pest predators: - Here chemicals are avoided for pest control, instead natural predators like different birds, insects, etc. are used optimum health and productivity.



8. Precision farming: - This is an approach to farm management that uses information technology to ensure that the crops and soil receive exactly what they need for optimum health and productivity.



9. Contour farming: - In this farming practice furrows are plowed perpendicular rather than parallel to the slope. In geographical terms, the contour is an imaginary line joining the same elevation. Contour bunding is a soil conservation structure created along the contours to control soil erosion.



10. Floating farming: -It is a way of producing food in areas that are waterlogged for long periods. It is mainly aimed at adapting cultivation in flooded areas. This system uses floating beds of rotting vegetation that act as compost for crop growth. The beds can float thus acting as agricultural land in a wet area.

SEEDING OF SUSTAINABLE AGRICULTURE IN INDIA

Example of Sustainable Agriculture in India

By Aparna Kumari & Tannu Kushwah, SBS

Millions of farmers in India are opting for natural alternatives rather than using conventional pesticides. Circumventing the use of pesticides is a sustainable approach to pest control employing the theory that an infestation of one type of insect indicates a disturbance somewhere in the environment. Going for the root cause of the problem instead of removing just the symptoms leads to crop improvement and balance of species of useful and harmful insects, hence diversifying the agricultural ecosystem.

A need for a switch to natural farming arises from grim scenarios faced by farmers. In 2000, around 900 farmers belonging to Punukula, Andhra Pradesh, reported health problems that encompassed conditions ranging from acute poisoning to death. Pest infestations lead to crop destruction which leaves no other choice for farmers but to take loans for tackling their expenses of chemical pesticides. Families faced debilitating healthcare costs, crop failure, loss of income, and debt, all directly connected to pesticides. With the help of local organizations farmers learned about non – pesticide management techniques like using natural deterrents such as neem and chilli pepper to manage insects and planting trap crops like marigold and castor. Non pesticide techniques seek to manage pests at a manageable level, hence preventing their infestation.

Within a year of adopting natural agricultural practices, villagers noticed a number of positive impacts. Number of health issues started declining; they gained more profits because of less expenses; sourcing, grinding and mixing natural repellents created more jobs; residents improved their living conditions from health to reasonable finances.



The village council even requested that In 2004, Punukula became one of the first villages in India to become pesticide-free pesticide salesmen stop soliciting. Soon other towns and villages in Andhra Pradesh started practicing natural agricultural methods.

Adilabad is a district in the northern part of Andhra Pradesh. The most important river which flows through this district is the Godavari. The climate of the district is characterized by hot summers. About 85% of the annual rainfall is received during the south-west monsoon season, that is, from June to September. The geographical area of the district is 40,04,035 acres; and the land is separated under different types: The net area sown in the district is 35.4% of the total geographical area while for the state the relative percentage is 40.2 Land use Proportion Forest 42.8% Land put to non-Agri uses 3.7% Net area sown 35.4%.

The study was conducted in Jamni Village of Jainad Mandal. Adilabad is among such districts where the maximum number of Pradhans live. Ethnographic approach was applied for this study, an important research tool. Most people have vegetable kitchen gardens, where they grow vegetables and fruits, and the size of their garden is very small - less than half an acre. These vegetables are consumed by the household and some of them are sold in the market.

The Pradhans collect dung (kaath) and take it to their farms. Firstly, the farmers pile up the dung, household garbage and ashes together, when the dung rots, they are considered as best fertilizers. The farmers make cattle pens on different sites of their land. Villagers contemplate the idea that manure is good for yield. They also spend some amount of money on seeds and fertilizers. Seeds of all crops are purchased from the nearby town. ITDA, the Agricultural Department, sometimes provides seeds of jowar and red gram on subsidy.

Though farmers use fertilizers for jowar and red gram, it is only done when cotton has been fully supplied with the fertilisers required. Farmers emphasize a lot on cotton crop, they purchase the best seeds and apply as much as required quantity of fertilizers. Almost the entire quantity of pesticides is purchased exclusively for cotton. There is minimal to no usage of pesticides for other crops.

The Pradhans still use simple tools that are easily available for various farm operations. These are either purchased from the market or made with help of carpenters and blacksmiths. The commonly-used tools are plough (naagar)-used for ploughing the field, crowbar (sabbal)-used for digging big areas of the field, sickle (era) and hand-axe (kuradi), are used for cutting purpose. A large wooden forked flail is used for threshing. Bullock carts are used for transporting agricultural produce.

In a single season, six to eight pluckings of cotton are done. Then the cons of jowar after drying are taken to the threshing ground. Threshing is done by the labourers by beating the corns with sticks. After winnowing, agricultural produce is taken home.



SUSTAINABLE AGRICULTURE PRACTICES IN INDIA 2021

Sustainable agriculture offers an imperative alternative to conventional agriculture, the long-term impacts of which include degrading topsoil, declining groundwater levels, and reduced biodiversity. It is vital to ensure India's nutrition security.

Sustainable agriculture is far from mainstream in India, with only 5 (crop rotation; agroforestry; rainwater harvesting; mulching and precision) sustainable agriculture practices and systems (SAPSs) scaling beyond 5 percent of the net sown area.

Most SAPSs are being adopted by less than five million (or four percent) of all Indian farmers. Many are practiced by less than one percent.

Crop rotation was found to be the most popular SAPS in India. It is practiced by 15 million farmers and covers around 30 million hectares (Mha) of land. Agroforestry, on the other hand, is mainly popular among large cultivators.

Organic farming currently covers only 2.8 Mha — or two percent of India's net sown area of 140 Mha. Natural farming is the fastest-growing sustainable agricultural practice in India and has been adopted by around 800,000 farmers. After decades of sustained promotion, IPM has achieved a coverage area of 5 Mha.

Agroforestry and the System of Rice Intensification (SRI) are the most popular among researchers studying the impact of APIs on economic, environmental, and social outcomes.

The existing literature critically lacks long-term assessments of SAPSs across all three sustainability dimensions (economic, environmental, and social).

The budget outlay for the National Mission for Sustainable Agriculture (NMSA) is only 0.8 percent of the Ministry of Agriculture and Farmers' Welfare's total budget - INR 142,000 crore (excluding INR 71,309 crore spent annually on fertilizer subsidies by the Centre).

Eight of the 16 practices identified by the study receive some budgetary support under various central government schemes. Out of all, organic farming has received most attention as many states have their very own formulated farming policies.

Civil Society Organisations (CSOs) involved in SAPSs were mostly active in Madhya Pradesh, Maharashtra, and Rajasthan. Organic farming, natural farming, and vermicomposting get the most interest from CSOs.

Conclusively, agriculture being practiced by the farmers is still adhered to traditional ideas for a good crop. This study recommends that the local knowledge of cultivation of subsistence crops is useful for sustenance. It is important to realize that indigenous local knowledge braces the survival of cultural and biological diversity.

Today, to achieve economic profitability, environmental safety, and social fairness, the challenge for farming systems is to use fewer chemical inputs and resources without reducing the yields. The human population is going to reach the 9 billion mark in the next 50 years and it is necessary to maintain a high level of food production and for farming systems to meet this high food demand. Along with this, it is important to mitigate the occurrence of pesticide residues in food which is concerning for consumers and environmental associations are concerned about it as it paves a way for a new sanitary crisis. Thus, Sustainable agriculture is the need of the hour, for prosperity and posterity.

EVOLUTIONARY TALES

WITH A PINCH OF CLIMATE CHANGE

by Nandini Sharma,SBS

Here I bring to you the first and hopefully the last episode of “Evolutionary Tales- With a pinch of Climate change”, where we will be discovering some astounding and peculiar transformations of a few animal species that have undergone a unique phenomenon called “Hyper speed Evolution”. To give a basic background, hyper speed evolution is nothing but a counter-intuitive circumstance where wildlife has experienced drastic evolutionary variations because of anthropogenic activities, with special emphasis on climate change. Contrary to popular belief, evolution isn’t always a long, slow and drawn-out process but is also manifested in the form of rapid adaptations undergone by species so as to accommodate the fast-paced environmental fluctuations caused by climate change, invasive species, global warming, human encroachment, you know, things that we should definitely take responsibility for! Evolutionary biologists all over the world describe this high-speed adaptive behaviour as “evolutionary rescue” which allows these species to survive in stressful conditions. So, without further ado, let's dive right into this “wild” interview by moving to our first guest, Mr. Anole Lizard, who will be sharing his life story with us.



Welcome
Readers!

Mr. Anole Lizard:

Thank you for having me here, a long way from my home in Turks and Caicos Islands in the Caribbeans.



As distant relatives of the Iguana and commonly addressed as **"Hurricane Lizards"**, we were more or less always on the brink of losing our lives because of extreme hurricanes that have worsened through the years because of climate change, until one day, when my great-great-great-great grandfather (or grandmother, a bit hazy on that one) decided that they'd had enough. As you know hurricanes bring with them highly turbulent winds and thunderstorms and after two back-to-back hurricanes Maria and Irma in 2017, our population was a wreck and only a few of us were left who weren't blown away. Out of these remaining fighters were fellow *Anolis scriptus* green lizards that had some odd modifications which helped them survive. These included the presence of stronger forelegs, shorter back legs and larger toe pads than before, which were surprisingly not present in the lizards before the hurricanes happened. Even I was confused as to why that happened to my body but it was very well-explained to us by Dr. Colin Donihue, who conducted multiple studies which proved better survival capability as a result of these adaptations in terms of longer hanging on the branches and streamlining of the body to resist strong winds. He also told us with evidence that such adaptations were inheritable in our case, showing that natural disasters and sudden climatic changes can not only affect natural selection but also have evolutionary impact!



So, there it is, the story of a small green lizard, who was forced to be pushed into a do or die situation because of human atrocities on the environment, and I know, being a lizard, I'm asking for a lot, but please don't put us in this situation again, otherwise we might just end up as **Edith's Checkerspot butterflies** (may they rest in peace!) who were pushed towards extinction because of the weed, English Plantain, that was an invasive species, introduced by humans in Nevada. Sadly, even after modifying themselves, they couldn't make it out alive, so please, refrain from putting us in the same ordeal too! Thank You!

Mr. Anole Lizard's life is surely an informative but scathing account of how humans have selfishly allowed themselves to live as though they have another planet to move to. Now, here we have another guest to share their "wild" experience with us, welcome, Ms. Elephant!

Ms. Elephant:



Hello from Africa! I was actually surprised to have been approached for something other than my tusks which was a welcome change, I must say. Speaking of tusks, you may very well know how much they are wanted by poachers and because of their relentless hunting of my tuskier sisters, we have now resorted to a tusk-less lifestyle. Especially during the Mozambique war, my sisters were brutally and extensively poached for their tusks, which naturally left only the scarce tuskless females behind to procreate. As a result of this, the tuskless trait transformed into being dominant among our population and now most of us never develop tusks in our entire lifetime, an example being in South Africa's **Addo National Park** where almost 98% of **female elephants are tuskless!** And you know the surprising part is that we were able to achieve this after 2-4 generations only even though we are a little slow in reproduction but sadly what you might think is a win-win situation in the evolutionary aspect is in reality not very advantageous to us, because losing tusks renders us unable to find food efficiently, protect our young ones and navigate in woody forests.



Although humans have robbed us of our body parts time and time again, I would still wish that they become mindful enough and not rob themselves of the chance to survive on this planet! Thank you!

Well, if that doesn't make us realize the gravity of the dire situation of wildlife, I don't know what will! Anyway, let's move on to our final guest for this episode, Mr. Squid!

*Mr. Squid: Uh excuse me, I have a name, you know?
Apologies Sir, let me rephrase that, our last guest is Mr. Humboldt Squid!*

Mr. Humboldt Squid:



Much better, thank you! You could've also addressed me as **"Jumbo Squid"** but the funny thing is that, it doesn't hold true as it used to earlier, all thanks to the sweltering heat waves that swept over the Gulf of California, Mexico, which forced us to bring out our inner "plasticity" and settle for almost 50% of our previous sizes. Yes, you read it right, my family is now almost half the size it used to be which provides the ability to reproduce in half the time by early spawning, resulting in a better response to extreme heat and making us more abundant in some places. This developed plastic response to high water temperatures make us better candidates in the race of survival against climate change, but just because evolution has come to our rescue doesn't take away the fact that all of this is a result of global warming and climate change, which requires strict and immediate action as we may be able to fend for ourselves for a while but not for long!

Phew! After all these hard-hitting conversations, we can surely conclude that rapid evolution can bring about higher survival capability in many species but at the same time it can backfire too, and therefore, we shouldn't assume evolution to be a kind of superhero that will swoop in and save all the species from the woes of climate change and global warming. We saw species evolving in various ways as a response to climate change, but this ability to adapt quickly is not possessed by all, which is exemplified by mouse like **"Bramble Cay Melomys"** of Australia, that became the first documented mammal species to become extinct in 2019, because of loss of its habitats by flooding of sea water



Thus, it is the need of the hour for scientists to study the intricacies of climate change and its unique effects on wildlife so as to learn about which species are more resilient and which are more sensitive in the race of survival against climate breakdown, which will consequently help them to outline and structure their research and conservation resources in a smart and sustainable way. So, keeping this in mind, we come to the end of our episode and I hope you remember that of lizards, elephants and squids can evolve and change their entire existence in a short span of time, then we, as humans can surely change our destructive habits that are causing such repercussions in the first place!

Young climate activists to follow from around the world

BY PRISHITA SHARMA, SBS

The term 'Climate-change' has been with us for a while now and the current situation demands active participation from people of all ages and ethnicities, in order to ensure the sustainability of future generations. Here, I list some youth climate advocates, who are dedicated to fighting the battle against the climate crises and are motivating several around them, to do the same.

1. Greta Thunberg



- @gretathunberg



- @GretaThunberg

Founder of 'Fridays for future', an initiative emphasizing the necessity of school strikes for climate action, Greta is one of the most renowned Swedish climate activists, who rose to fame after protesting against the Government for failing to meet the carbon emission targets, while she was just 15 years old. Defining her Asperger's syndrome as her superpower, she has motivated thousands of youngsters to fight for a better tomorrow. She started working on the issue of climate change at the age of 8 years, by bringing positive modifications in her own habits, like turning vegan and refusing to travel by air, since both the actions of livestock rearing and gas emission by an aircraft are the primary contributors to an increased Greenhouse effect, which ultimately causes more global warming.

Her speech at the 2018 UN Climate change conference gained international attention and soon after many school strikes were seen all around the world. Additionally, she had traveled via a yacht for the 2019 UN climate conference, to highlight the importance of lifestyle changes that will lower the carbon emission rates and how the actions of each individual make a difference in this battle. She is known for calling out several world leaders, on how they are just not doing enough for climate change. She was also nominated for the first 3 Noble Peace Prizes for climate activism and has been continually leading her peers to fight for the global movement of climate action.



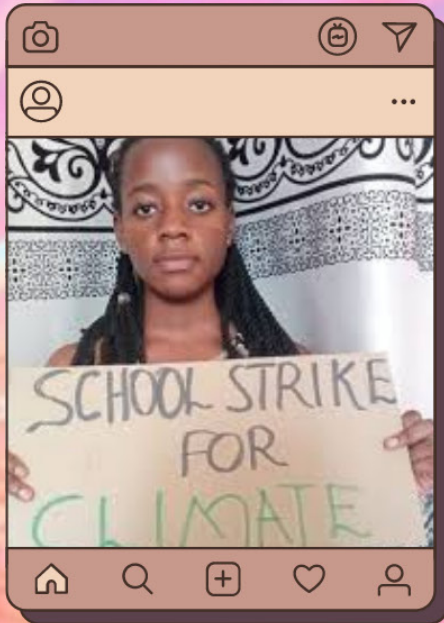
2. Leah Namugerwa



-@namugerwaleah



-@NamugerwaLeah



Leah is a 17-year-old environmentalist from Uganda, known for voicing her concerns about climate change and plastic pollution since 2019. She cites Greta Thunberg, a fellow teen-climate activist from Sweden, as one of her biggest inspirations.

She started supporting the 'Fridays for future' initiative, founded by Greta, wherein she organized several climate awareness strikes and rallies in her school, lakeshore clean-ups, etc., along with her peers. Moreover, she has been leading several tree-planting campaigns, one of which is called the 'Birthday trees project.' It motivates youngsters to plant new trees instead of throwing birthday parties, and she also celebrated her 15th birthday by planting around 500 trees. She has initiated several petitions to enforce the ban on plastic use in Uganda. In 2020, she was invited as a speaker in the World Urban Forum and is also a youth delegate in COP25. Leah has been actively advocating environmental justice through social media as well, inspiring millions around her.

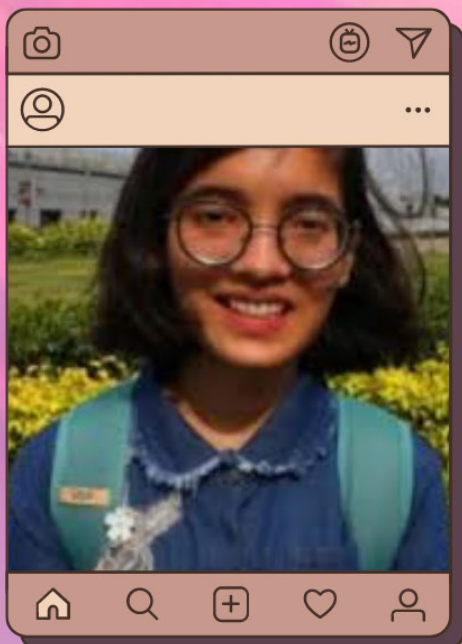
3. Ridhima Pandey



-@ridhimapandeyy



-@ridhimapandey7



Hailing from Uttarakhand, India, Ridhima is a 13-year-old environment activist, who has been working to fight climate change since the fragile age of 9. The 2013 Uttarakhand floods caused massive destruction of life and left people affected, in a terrible state. Experiencing all of this, Ridhima decided to take action against climate change with all her might.

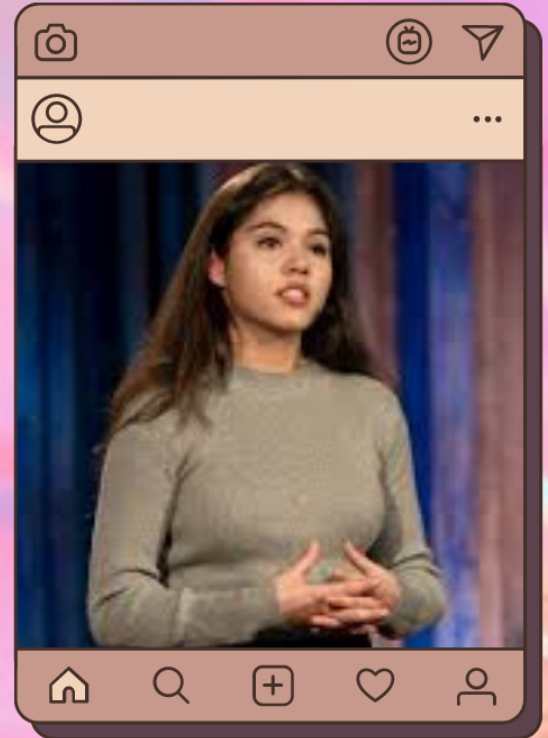
She started a petition against the Government of India, highlighting its failures in response to climate change, and along with 15 other climate activists, including Greta Thunberg, filed a lawsuit against 5 countries at the United Nations climate action summit in 2019. She had also initiated an online campaign against the air pollution levels of the country and urged the PM to declare it as an emergency. Additionally, Ridhima was listed in the BBC's list of 100 inspiring and influential women from around the world for 2020.

4. *Xiye Bastida*

 - @xiyebeara

 - @xiyebastida

Xiye, is a 19-year-old Mexican climate advocate. She had experienced the devastating effects of the climate crisis, firsthand, in 2015 when her hometown, San Pedro Tultepec, was severely damaged by floods, after a prolonged, 3-year drought period. This compelled her family to move to New York and also started her journey of climate activism. She has actively been a part of her school environment club, speaking about how the indigenous communities have suffered enormously due to the climate crisis, and more so by the politics involved. She is known for leading many climate strikes and contributing to a documentary called 'Imagine the future, which depicts future cities and landscapes. Drawing inspiration from Greta Thunberg, she is serving as one of the leading organizers of 'Fridays for future' and has received the 'Spirit of UN' award at the 2018 UN World Urban Forum.



5. *Kevin J. Patel*

 - @imkevinjpatel

 - @imkevinjpatel

Kevin is a 19-year-old environmental advocate from Los Angeles, who has been working as a climate justice activist for the last 10 years. In spite of suffering from cardiac irregularities due to poor air quality, particularly smog pollution, he has constantly fought the battle against climate change from the age of 12. Kevin has worked as a leader of 'Fridays for future' in S. California, in 2019. He has also founded OneUpAction, an intersectional youth-led non-profit organization for supporting and providing marginalized youngsters with resources to improve the situation of their communities. As a part of the same, he successfully created the first Youth climate commission in Los Angeles county, to represent the youth in the current climate crisis. He is also serving as a 2020 National Geographic Young Explorer and is also a UN Togetherband Ambassador for Goals 13 and 14. Additionally, he is a part of the Climate Power Advisory Council, Youthtopia World Circle of Youth Council, and the Intersectional Environmentalist Council. Kevin's efforts have impacted and motivated the youth around him to fight climate injustice in their own ways.



6. Garvita Gulhati

 - @garvita.gulhati

 - @GarvitaGulhati



Popularly termed as the 'Water girl of India', Garvita is a 22-year-old Indian climate activist, who hails from Bengaluru. She is the founder of WHY WASTE, a youth-led organization of like-minded individuals, working with restaurants around the country to ensure proper water management and to prevent misuse.

She started out when she was 15 with a simple concept at play: the water left behind in restaurants amounts up to 14 million liters every year and half-filling the glasses of customers would help save a large volume of this water that unnecessarily goes to waste. She proposed her idea of WHY WASTE to the National Restaurants Association of India, which took some time to show support. Since then, her organization has been spreading awareness on water conservation, especially with their #Glasshalf full idea. The WHY WASTE app helps us to calculate our water footprint, a record that can further motivate us to save 100s of liters of water every day by minute lifestyle changes.

She strongly supports the use of sustainable energy resources, which need to be more readily available for a better future. Of the 3Rs, she states 'Reducing' as the most effective of all steps towards energy conservation which ultimately lowers climate damage.

Garvita was listed in the 40 under 40 environmentalists of the year in the year 2019 and was a part of the Forbes 30 under 30 Asia list of 2021.

The 2030 agenda for Sustainable Development, has recognized climate change as "one of the greatest challenges of all time," which will adversely affect the sustainable development goals of all countries. I feel that fighting against the climate crisis requires not only participation at a country/community level but also on an individual basis. Each one of us can draw inspiration from the work done by such youth climate activists, to ensure a sustainable environment for ourselves and future generations.

Bricks made by "plastic waste"

WASTE INTO WEALTH

By Aman Kumar Ojha, FBS

While plastic has many valuable uses, we have become addicted to single use or disposable plastic with severe environmental consequences. Around the world, one million plastic drinking bottles are purchased every minute, while 5 trillion single use plastic bags are used worldwide every year. In total, half of all plastic produced is designed to be used only once and then thrown away.

Today, we produce about 300 million tonnes of plastic waste every year. That's nearly equivalent to the weight of the entire human population. Researchers estimate that more than 8.3 billion tonnes of plastic has been produced since the early 1950s. About 60% of that plastic has ended up in either a landfill or the natural environment.

But now there is a solution of this problem of plastic waste management. And this solution of plastic waste management is sustainable as well as profitable. So we can also call it as converting "Waste into Wealth". And the solution is quite simple - "making strong, durable and high quality bricks from plastic waste". As opposed to clay bricks, plastic bricks are 2.5 times stronger and 25% lighter. The price of these bricks is also cost effective which is 50% to the price of conventional bricks. There is no use of water in the making of these bricks. Also, more water is saved during the construction process, as the walls built with these bricks do not need to be cured with water.

For making bricks from plastic waste we need to collect the plastic waste and to separate it from other wastes. Second, we should dry the plastic waste if it is wet and has a content of moisture. We have to use dry plastic waste. Then, we crush the plastic waste in small particles, the small particles crush into fine size particles. Fine particles of plastic waste also heated on a furnace (Bhatti) till it is in a liquid form, we add the stone dust into melt plastic. We can mix it properly and make a mix. We poured the mix into moulds. Keep it the mould for dry. After 24 hours our plastic bricks are ready for use.

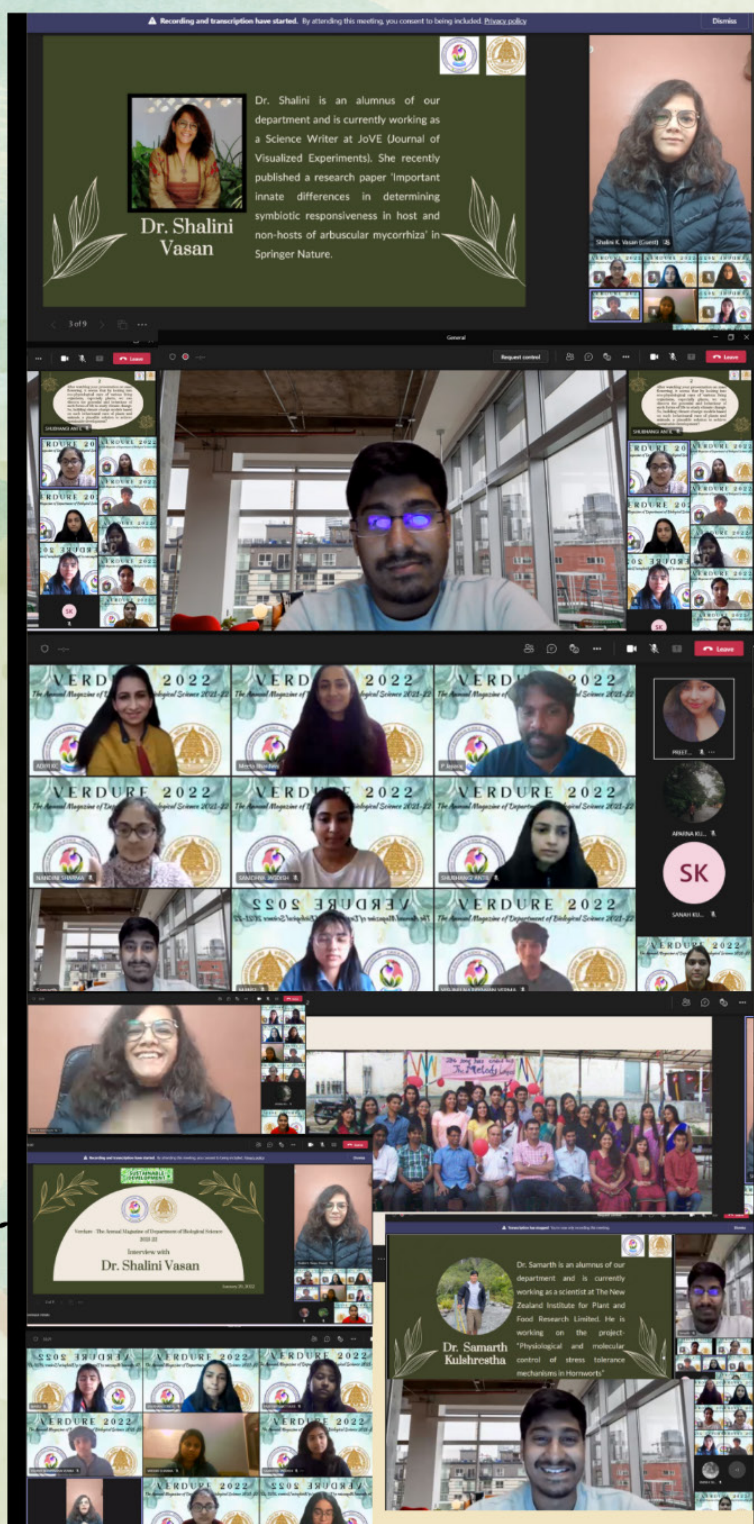
Advantages of these plastic bricks -

1. Waste plastic, which is available everywhere, may be put to an effective use in brick making.
2. Plastic sand bricks can help reduce the environmental pollution, thereby making the environment clean and healthy.
3. Plastic sand bricks reduce the usage of clay in making of bricks.
4. Plastic sand bricks give an alternative option of bricks to the customers on affordable rates.
5. Water absorption of plastic sand brick is zero percent.
6. We conclude that the plastic sand bricks are useful for the construction industry when we compare with Fly Ash bricks and 3rd class clay bricks.

So, this is a simple but very effective solution of the plastic waste problem of the world.



BIOSCIENCE ALUMNI MAKING A CHANGE



Pep Talk with



MS.SNIGHDA SEHGAL

"MS. SNIGDHA SEHGAL IS A SCIENCE TEACHER BY PROFESSION AND HAS BEEN TEACHING DIFFERENT SCHOOLS SINCE 2014. SHE USES INNOVATIVE METHODS TO TEACH SCIENCE BY FOCUSING ON SUSTAINABILITY AND HELPING CHILDREN LEARN FROM NATURE."

1

Could you give some insights into how we can create sensitivity within children related to climate change and help them to adopt sustainable living right from a younger age?

My experience has been that sensitivity towards the environment comes from nurturing a love for nature. If nature is an integral part of a child's growing up, they feel connected to it, and are invested in its existence. They automatically develop awareness of the damage that climate change/ anthropogenic activities or the 'development' that comes at the cost of the environment brings.

Children living in cities are losing out on this, as we concretise and sanitize our homes more and more. Children are born curious and I believe that we just need to fill their lives with nature. To encourage them to play and explore. To sit and observe nature- caterpillars munching and birds bathing and to find delight in watching them grow. This could start with having lots of plants at home. Plants that attract butterflies, moths, bees, and other insects. Let these little animals share your home. Or making a ritual of walks in parks or areas teaming with un-manured wilderness. One could also make them visit farms or wildlife sanctuaries, involve them in citizen science projects, or work with citizen groups near you that work towards the protection of nature and wildlife. There are many birding/ nature walks/ wildlife protection groups in every city now. The role of adults here is to not shriek in terror and instinctively swat at a spider or wasp if you spot one. Children learn fear from us adults. If you're scared of things, you'll never try to understand them.

Supplement this with learning about the ill effects of our unsustainable habits. For instance, for most people in cities, once waste goes to the dustbin, we think it's taken care of. It's only when I lived in a village where there were no dumps that I realized there's no place for my plastic waste to go to. One could start with simple composting and garbage segregation at home. Have designated dustbins for plastics, biodegradable, and recyclable wastes. Children would be curious to find out where their garbage goes and push for societies to adopt recycling and segregation. I would encourage introducing children to the 'zero waste' concept- which will help reduce your waste creation. If you can't bring non-recyclables into your homes, you will not be throwing them away. Learning to grow food (at home/school/community gardens) also builds awareness of food. Where it comes from, what goes into growing it, the use of pesticides/preservatives, and processing. As a plus it nurtures a wonder for watching things grow.

2

As you started teaching children after interning at the research lab of Dr. Chetna Sachidanandan, what motivated you to shift from research to teaching?

I loved the research and the attitude of questioning and wonder I inculcated at Dr Sachidanandan's lab. I watched zebrafish embryos grow, played with them and asked as many questions.

However, younger school children I was teaching simultaneously were struggling with simple school science that one could learn from play and observation. They were stopping to ask questions and that felt wrong, and I wanted to try and fix that. I wanted to find fun ways to teach that cultivated a curiosity for science. I also thought I would have more freedom to explore these in alternative setups amidst nature, so I visited several alternative schools, and Sholai CLOAT seemed the most appropriate for me.



3

Could you tell us more about your journey as a teacher in Sholai CLOAT and the challenges you faced? What would be your advice to young nature enthusiasts who are looking forward to exploring this field?

It felt like I was thrown into the deep end of the pool as soon as I entered! There is much to learn about teaching and learning with children, just knowing your subject isn't enough. I had to educate myself in teaching and learning and in working with children. At the same time, I wasn't taught unconventionally as a child, so I had to research or devise new ways to do that. Lesson preparation and curriculum design took up a lot of my time.

Also, having grown up in a city, I lacked experience of the natural world. For instance, I had never seen root nodules for nitrogen fixation in legumes in person. How many of you have? Here we were easily able to inspect uprooted leguminous plants and find root nodules for ourselves. Similarly, I had never seen moths and frogs complete their life cycle, here I could if I looked. Seeing the nitrogen cycle in its parts in person is very different from reading about it. I had to find these things in my surroundings and connect them to the theory in books.

My advice to nature enthusiasts would be to just dive in with an open mind, and to keep exploring and learning. You should enjoy your own lessons, and you will learn as you do. Education degrees and good mentors supplement this.

4

Since you have put a lot of emphasis into innovative ways to achieve sustainability, could you elaborate and mention a few of the methodologies? What inspires you to keep your nature explorer alive constantly?

Sholai has an interesting opinion on what one can do about global warming at https://www.sholaicloaat.org/v2/index.php?option=com_content&view=article&id=32&Itemid=45 that I recommend reading.

Most of us now know of these ways and are on our way to making changes. But here are some that I have adopted and you could too in your personal capacities-

- I check the wattage and power usage of my appliances and lights, and reduce usage/ wastage if possible.
- I compost all my biodegradables at home. It is easy, makes great compost for my plants, my waste is a tiny fraction of what it would have been otherwise, and I hope I've prevented fewer animals falling prey to food mixed with plastics.
- I segregate my waste. That way I know how much waste of what kind I am creating. Ideally, I hide my dustbin (although my mother does not approve). That way I bring fewer plastic packaged goods into the house. It's a good idea to find out where your waste goes, and what happens to it. Does it add to the huge garbage dump on the outskirts of the city or does it pollute the skies or the seas?
- I have replaced most plastics I bring into the house with compostable or recyclable material, or recycled it. My scrubs, brooms, and kitchen containers, soaps, cleaners, etc are natural.
- I buy unpackaged groceries in cloth bags and in bulk if possible.
- I reject single use items. I carry a tiffin, water bottles, and cutlery to reduce disposables
- I avoid amazon and deliveries if possible to find things locally. They are wrapped in excessive layers of plastic, and transported on planes and trucks over large distances to reach you.



5

How were you inspired to take up environmental sciences and be so passionate about working towards climate change?

It happens automatically when you live in such close association with the natural world. The Sholai campus lies in the Palani hills in the

Western Ghats of India- which are a biodiversity hotspot. Surrounded by wildlife I learnt that living amongst nature has huge benefits.

The school itself focuses on equipping its residents with the knowledge and tools to live sustainably. It generates its own electricity using solar and micro-hydro technologies. It is off the state grid, and grows a third of its food. It recycles all of its waste. I realized that this is possible with the right effort and work, and it's an amazing way to live.

6

How is teaching in sholai schools different from our schools? What difference does it make to children's studies while being around nature?

It allowed me to teach and learn through exploration. Amidst nature, and outside of a walled classroom. There were few rules as long as one was learning, which was liberating. It opened up ways of learning that were more fun and relevant to children's daily lives, children engaged more and the learning lasted longer. Children learnt engineering, carpentry and electronics,

as well as farming and cooking, along with language, arts, math and science. There was also no pressure from the school to get top marks in pure academics, and children could decide what subjects they want to pursue and what kind of exams they want to take and when.

I know that these children know a lot more about the ways of nature than I do. They knew what plant sap makes fun bubbles or heals, what berries show up in what season and where the sweetest ones are, and how frog eggs look and grow. They knew how to make tiny windmills or sound bombs with folded leaves, how to fix circuits and operate a micro-hydro turbine. They could cook up healthy fresh food from scratch. I know these children will become adults that are sensitive, a lot more aware of the natural world and people around them.

7

You have worked extensively with children, is there anything you would like to highlight about child psychology or pedagogy that you found intriguing?

This one is common sense, but comes from experience, that if a child is anxious, hungry or emotionally away, or not feeling a sense of safety and non judgment with the space you've created, it's very difficult to have them learn along with you.

Learning styles and how to teach effectively come second, and there are lots of theories and methods for those. That aside, Howard Gardner's theory of multiple intelligences has been quite intriguing. Each child has a proclivity towards something and Gardner recognises 9 such intelligences (with a potential of adding more), and as a teacher it is important to recognise and respect those in children.

Using all of the above, it's my job to create a space where learning can happen, and if the child is open to it, we do it together.



8

Could you elaborate on the sustainable technology used at sholai cloaat? How do you think this can be implemented in institutions across India?

You can learn more about sholai's appropriate technology here- <https://www.sholaicloaat.org/v2/>.

Sholai has researched and developed various Appropriate Technologies over the past 3 decades to provide for their energy needs. They currently house 89 Solar Photo-voltaic electric panels, A Micro-hydro electric plant, 8 Biogas plants, 9 Biomass efficient smokeless "Rocket" stoves and 6 Solar hot water heaters. These technologies provide year-round electricity and energy to all the buildings in the campus for lighting, cooking, powering kitchen appliances, 20 computers, TVs and allied educational equipment, all the workshop equipment, etc. In addition, they have recycled their plastics and waste materials to construct roads and buildings, and have designed their building in a manner that reduces the requirement for ACs, heaters, lights and fans.

Each institute will have to research the most appropriate technology for their area and needs, as this isn't a one size fits all solution. Regardless, Solar/Wind energy installation, composting/ biogas solutions, and even rain water harvesting/ gray water recycling are easy to start with.

9

Due to the pandemic, technology has become an important part in student's lives. What do you believe is the place for technology in classroom.?

Technology is a great supplement in classrooms. Educational researcher Sugata Mitra's "Hole in the Wall" and "SOLE" experiments have shown that if children are armed with the internet, and have exciting questions to find solutions to, plus a kind teacher- figure who gently encourages them, they will self-organize and teach themselves and each other, motivated by curiosity.

I echo his views that if the internet exists today on every phone, why not learn to use it to find solutions because that is the skill adults need most in the world. Zoom and google are now a critical and integral part of the classroom. There is also an explosion of fantastic online resources such as videos from TED-Ed, made by the best minds across the world, that summarize, connect, and present topics in the most interesting of ways. It is foolish to not use these resources and I cannot recommend them enough.

However technology is an aid to get things done, and it should not come in the way of it. Children (and adults) struggle with not letting technology distract them, and that is a skill we need to practice.

Let's talk to



SCAN TO
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INTERVIEW

DR. SHALINI VASAN



DR. SHALINI VASAN IS CURRENTLY WORKING AS A SCIENCE WRITER AT JOVE (JOURNAL OF VISUALISED EXPERIMENTS). SHE RECENTLY PUBLISHED A RESEARCH PAPER TITLED 'IMPORTANT INNATE DIFFERENCES IN DETERMINING SYMBIOTIC RESPONSIVENESS IN HOST AND NON-HOSTS OF ARBUSCULAR MYCORRHIZA' IN SPRINGER NATURE.

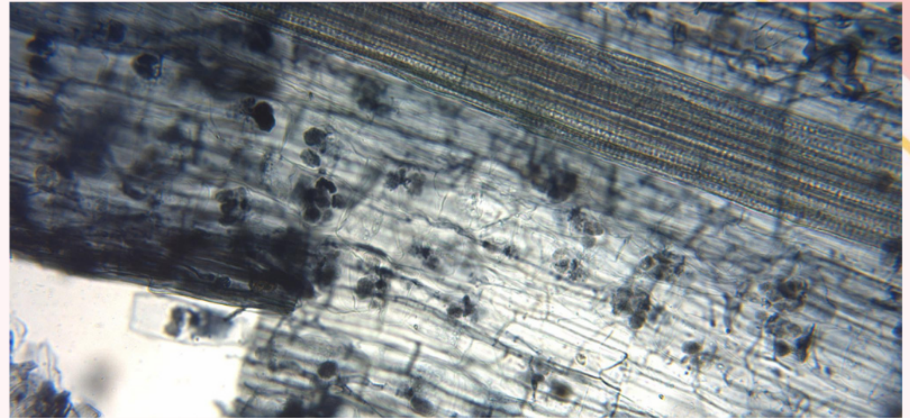
1 **What inspired you to pursue research on Arbuscular mycorrhizal fungi? What particular importance do they hold in terms of climate change?**

I have always been clear about extending my knowledge towards helping two main backbones of our country, the first being the soldiers and the second one being the farmers. When I joined The Energy and Research Institute, TERI, I was introduced into the field of mycorrhizal research and I realized that this would be my way of giving back to the farmers.

You might think that laboratory research would merely be 0.1% of what actually goes into improving the livelihoods of farmers, but it was a start for me and it might serve as a blueprint for all the researchers vying to come in and explore this field. Somewhere down the line it will help the farmer's livelihoods, so that is what motivated me to go ahead with my research career.

Now if you think about its particular importance with respect to climate change, let's first understand that climate change is not an independent entity. It is caused by a series of natural calamities and it also damages many sectors. If we talk about the agricultural

sector, which is mainly concerned with the topic of mycorrhizal research, then yes, arbuscular mycorrhiza, does help crop survival through biotic and abiotic stresses but the details of how it does that is an entirely another topic of discussion!



Arbuscular mycorrhizal fungi under microscope

2 **Could you give us some insights into the role of Arbuscular mycorrhizal fungi in agriculture and how they provide long term benefits to the soil? Do they help to mitigate the effects of climate change?**

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You might think that laboratory research would merely be 0.1% of what actually goes into improving the livelihoods of farmers, but it was a start for me and it might serve as a blueprint for all the researchers vying to come in and explore this field. Somewhere down the line it will help the farmer's livelihoods, so that is what motivated me to go ahead with my research career. Now if you think about its particular importance with respect to climate change, let's first understand that climate change is not an independent entity. It is caused by a series of natural calamities and it also damages many sectors. If we talk about the agricultural sector, which is mainly concerned with the topic of mycorrhizal research, then yes, arbuscular mycorrhiza, does help crop survival through biotic and abiotic stresses but the details of how it does that is an entirely another topic of discussion!

3 As a PhD holder in environmental sciences, what do you think an individual can do to contribute towards sustainable development?

I think every individual can and should contribute towards sustainable development, specially, this year, as 2022 has been announced as the year of basic sciences in sustainable development by the United Nations. If you actually read into it, there are 17 goals listed by the UN for achieving it and most of them are basic rights that every human being should have access to, for example, no poverty, zero hunger, clean water and sanitization, green energy and many more.

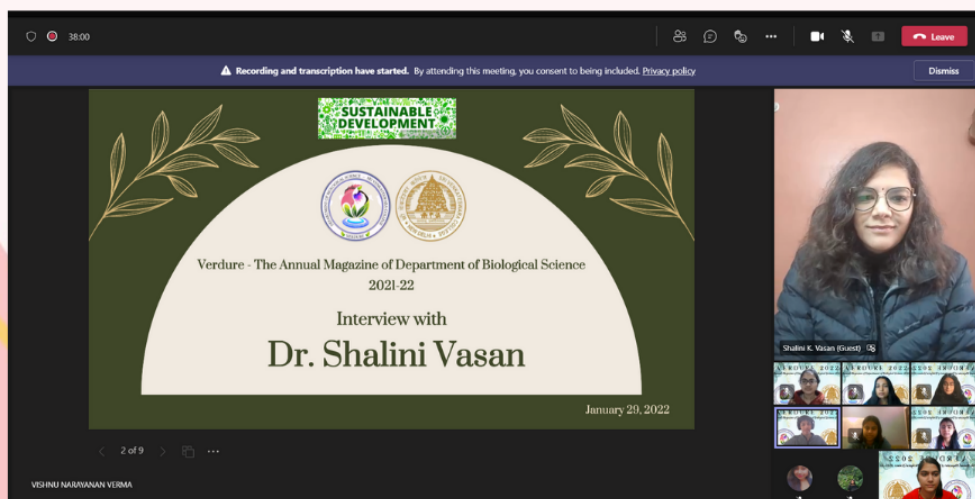
Our contribution is the only option to not only provide sustainably for the present generations, but also the future ones and all of us can do our bit by making small changes to our daily lifestyle, like not letting the water running, avoiding food wastage by taking adequate food portions, reaching out to companies involved in excess food management in case of food wastage, using biodegradable alternatives for packaging, avoiding poly bags and straws etc.

Therefore, there are multiple small things that can be incorporated in our lifestyles easily that can make a big effect in promoting sustainable development.

4 Could you tell us about your journey as a scientific researcher? What would you like to tell the young researchers who are looking forward to exploring this field?

After my graduation from Sri Venkateswara College in July 2013, I joined TERI in September 2013, as I really wanted to explore my research into the field of mycorrhiza or anything that has a potential in helping farmers. My initial plan was to have a six-month period to understand how research works for me and during my final project report submission, the TERI campus was visited by a faculty from Deakin University in Australia and he happened to interview me and gave me the opportunity of pursuing masters there, in collaboration with TERI, India.

When I submitted my first-year project review, I was offered a conversion to PhD from the reviewing panel, and that's how my MS-PhD began, which was a 100% scholarship, and I was given a research scholar stipend, so it gave me the exposure and helped me grow in my career professionally. I worked in the Delhi and Gurugram offices of TERI before moving to Australia, where I worked at the Geelong and Melbourne campuses as a part of my PhD objective, and



during the final year, my topic was accepted for a talk at Microbe, 2019, which is an annual conference conducted in Vienna, Austria, finally graduating in 2020. Looking at it, it might seem as an amazing and smooth sailing ride but my journey was nothing short of an ECG curve! Just like you would not want your ECG to be a flatline, you would not want your life to be without any ups and downs and that is something I emphasize when providing orientation sessions to budding scientists. My supervisor once told me, "Those who sweat more in training bleed less during the battle!", and that is something that kept me going when I faced multiple challenges, as life is full of them but they are always helpful at the end of the day as you will be proud of your achievements.

So, my message to the young minds is to do what inspires you and don't fail to enjoy the journey by only focusing on your destination because at the end, it is all worth it!

5 How are you bringing out your passion for environmental advocacy? What all activities do you undertake to keep it alive?

I am currently working as a science writer for the US based Journal of Visualised Experiments (JoVE) and it helps me stay at par with all the developments happening in the field of science and technology.

Environmental sciences aren't limited to my profession, but are like a passion to me. You keep exploring options professionally but when it's about your passion, you know how to incorporate it in your life in some way or the other. Environmental advocacy is making yourself and the people around you aware

of the fact that the environment is vulnerable and it needs our protection more than anything, and that is what I do. I always remember to purchase environment-friendly products so as to not add onto the already existing burden of chemicals on earth. By adding small habits into my day-to-day life, like using cloth bags instead of polybags, being vigilant about water and food wastage, choosing to walk and use public transport instead of my car whenever feasible, and recycling paper are some things I do which help reduce the stress on our environment.

Mostly people tend to neglect such habits by thinking that a single person can't make a big change which is wrong, because when each person starts making these changes at their own personal levels, then it will accumulate into a great impact in combating climate change, achieving sustainability and creating better times than what we are experiencing currently.

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With Dr. Samarth Kulshreshtha



DR. SAMARTH IS CURRENTLY WORKING AS A SCIENTIST AT THE NEW ZEALAND INSTITUTE FOR PLANT AND FOOD RESEARCH LIMITED. HE IS WORKING ON THE PROJECT- "PHYSIOLOGICAL AND MOLECULAR CONTROL OF STRESS TOLERANCE MECHANISMS IN HORNWORTS"

1

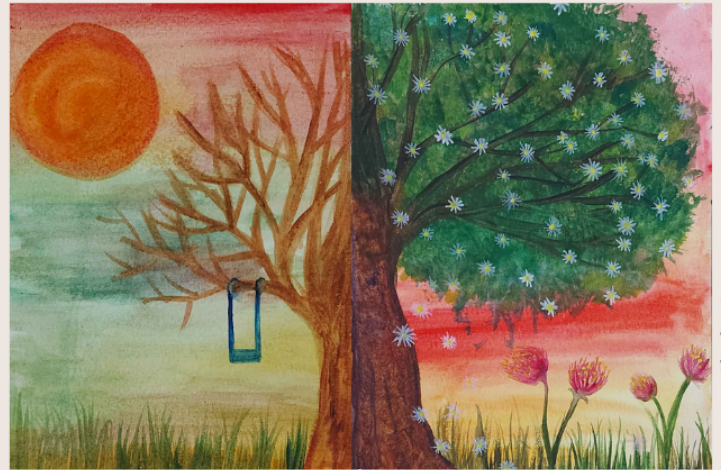
What inspired you to pursue research on arbuscular mycorrhizal fungi? What particular importance do they hold in terms of climate change?

I would say that the word climate change can be replaced with climate crisis, as change can either be positive or negative, but a crisis is somewhere we are finding these extreme weather patterns that are coming up such as extreme droughts, rainfall, temperature etc., which are fluctuating really quickly. All of these things are cumulatively affecting not only us but also our environment.

When we talk about flowering, which is the end stage of a plant's development, especially in annual plants, it is regulated by lots of genes and has the most complicated molecular gene network. As plants cannot perform locomotion and it does not have physical sensory organs like us, it has to sense the environmental cues for example the daylength, temperature, season in terms of flowering and all of these things is regulated and is tightly cross linked with the season and with the climate crisis that is happening.

Therefore, with all the Co2 increase and greenhouse gas emission you would see there is a very high rise in temperatures on an average all over the world. So far, scientists have experienced that all of those changes have led to plants to flower earlier compared to their normal time. For example, if normally a plant would flower in spring, it will flower early in winters. In that case, the plant is going to have seeds early but the seed would not grow and the fruit would never come up because of cold. Therefore, the actual timing is very crucial and when you change the climate the plants internal clock which is there with the environment in terms of daylength or climate or temperatures messes up so we

would see very different. Sometimes the plants would not even produce flowers in a particular year and produce it in the next year, and in alternate years you would get different sets of pathogen and abiotic stresses coming up so you would have various responses and that would affect flowering. These would also affect our crops and we are going to have heavy losses in our crop yield.



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2

After watching your presentation on mast flowering, it seems that by looking into eco-physiological cues of various living organisms, especially plants, we can discern the potential and behaviour of such forms of life to study climate change. So, is building climate change models based on such behavioural cues of plants and animals, a plausible solution to achieve sustainable development?

So, governments around the world are trying to potentially study these masting plants in terms of how climate change is going to affect them. For example, how this climate change and increase in temperature is going to affect the flowering, whether these plants are going to flower more regularly or are they going to be more dispersed throughout the year. They study this by doing a phenological modelling where they try to model behavioural cues and whether those responses are relatively

correlated to any of the temperature changes that are happening. For example, if I say that the plant is going to flower at a 2-degree Celsius increase, we also check whether that is actually shown in the data set that we have collected over the years or not. So, we can build those predictive models of what's going to happen if the increase goes from a certain point to another point. Apart from this, we have physiological and ecological modelling around climate change and all these can tell us how a plant or an animal would behave to certain changes in those conditions. Let's say, I can have a drought tolerant crop which is growing across a region and model them to see what are the responses to different drought conditions, then I will know what crops or what seeds I need to sow to get a drought tolerant variety out.

We can use all these modelling and cues that we understand and use it to study climate change and their effect on them and in turn basically provide a definite solution to achieve sustainable development.

3

Could you share some strategies that we can adopt for sustainable agriculture in the era of climate change?

A major problem for us is the land we are using for agriculture is becoming more exhausted of resources and therefore, we cannot grow the same piece of crop in the same land hence we end up putting more fertilizers, pesticides and ammonia into it, which leads to nitrate leaching and other problems that cause more pollution in the environment.

So, there is one solution, we can use our land more efficiently. For example, nowadays people are doing a lot of vertical farming, where there are different layers in which we

grow crops such as tomato, potato, vines etc and in this way we can adapt similar strategies to use the same piece of land to get high yields and efficiently use the land. *Also, there is the use of biopesticides and bio fungicides instead of normal fertilizers which eventually helps in reducing a lot of pressure on our natural resources and contribute towards sustainable agriculture. We can also breed new cultivars through identifying new elite varieties or markers for crops that are going to be biotic or abiotic stress resilient crops. For example, drought tolerant crops or crops which can withstand heavy frost or rainfall or can have resistance against biotic pathogens. Creating and breeding such crops whose yield won't be affected by these factors can contribute towards sustainable agriculture. This method would enable us to reduce food wastage, thereby lifting up that extra pressure to put that food on table. Least we could do now is to start segregating our garbage into recyclables, food waste, organic waste and landfills. This would not only reduce food waste but also that food can be used to make compost, and thus can be used in agriculture again.*

4

Regarding your publication on Genetically Modified Crops, how can GM crops be used for sustainable agriculture and biofuel production? Are there any potential risks involved in terms of biosafety?

There is a significant amount of effort going towards creating GM crops, not only in terms of breeding GM crops, but also using them for biofuel and bioethanol production and for sustainable agriculture.

Nowadays we use the CRISPR Cas9 system, where we can potentially edit a single base pair and create a mutant, essentially having less mutation than an original cultivar, and

then it can potentially be recognized as a plant. For example in the UK and USA, they are accepting GM crops as normal crops. We have lots of crops- like Sorghum, Maize, Sugarcane, Jatropha, Poplar, all of which has been genetically edited to increase their starch content inside the seed, or their woody material, which can then be used to increase the biomass, so we can get increased biofuel from it.

About potential risks in terms of biosafety, it is an open debate question. In terms of biosafety, we have to think about pollinators and all those interactions where the risk is present. If we are editing a crop with CRISPR Cas9 system, we would not face any biosafety risk, as it will edit a single or a couple of base pairs but the plant grown should be kept in a very tight security. We need to have containment chambers so that any risk is basically contained for the initial phase, and then if we feel there is no risk we can take it outside for field trials.

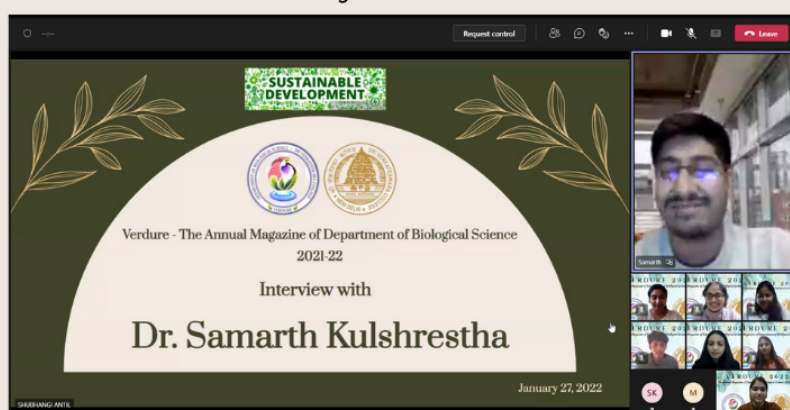
5

As you have expressed your interests in bioinformatics in your career, what are your thoughts on bioinformatics as being the most sustainable branch of science?

Bioinformatics is definitely one of the most substantial branches that can contribute to sustainable development. My interest in this field peaked during my honours' project with my professor, Dr. Mansi Verma. These days we can find bioinformatics in almost every

branch of science such as genetics, genomics, epigenetics, transcriptomics, metabolomics etc. Bioinformatics is not just knowing the data, but also how to make sense of it. It is the field where we can use the data analytical tools and easily learn and understand what a gene is; how it is regulated; what are the transcription factors present; we can identify the phylogeny to study the evolution part; we can design CRISPR constructs; we can do expression fold change and many more such things. There are command line based tools also so you can learn computing languages like the Met lab, Linux, Python which are now getting used a lot. It also helps in terms of looking at the data, as genetic data is a massive code. As humans and animals are diploid, but plants can be polyploid, so we can have multiple sets of genomes that are available, hence to analyse and identify all sorts of genes or alleles present, we need to know Bioinformatics. It will aid us in looking for the potential markers and then we can use that knowledge in creating new elite varieties or even in drug discovery as well.

Bioinformatics is also the one contributing a lot from a plants' perspective, that is knowing what is going on inside the plant in terms of their genetics and what plant is expressing in terms of their transcriptomic responses to certain cues. Whether it is abiotic or biotic, we can observe a very good snapshot of that picture through bioinformatics very easily. This will help in terms of translating that knowledge to produce cultivars, that will be able to sustain and won't get affected by the climate crisis.



Let's Glance through



Ms. Vartika Gupta

Ms. Vartika Gupta has over 5 years of experience in the sector of Development on issues such as Education, Socio-environmental Sustainability, Skill & Capacity Building, Gender. After graduating from SVC, she pursued a Master's degree in Development, specialising in sustainability.



1. Could you elaborate on your role at Thinkthrough Consulting? What all activities does this organisation undertake to encourage sustainable development and environmental awareness?

I work at Thinkthrough Consulting as a Consultant in the Public Affairs & Policy Advocacy vertical. However, my role extends to business development as well. Most of the projects are diverse in terms of the sectors and domains catering to various themes such as plastic, food & beverage, sustainability, skills, start-ups, and entrepreneurship. The 'Public Affairs and Policy Advocacy' vertical helps in developing a comprehensive roadmap on socio-political, environmental, and economic risks, thought leadership, policy intervention and advocacy solutions across numerous sectors.

Additionally, Thinkthrough Consulting offers a tri-sector approach keeping excellence, impact, and innovation at its core. To ensure its contribution to the sector of sustainable development, the suite of services are designed to contribute to the triple bottom line: social, environmental, and financial. The services include, development sector advisory, governance & risk advisory, human resource advisory, sustainability, and climate change advisory & business support services.



2. You started a campaign named, 'Wake-Cup' at Azim Premji University, could you share your experiences and some important tips related to sustainability you've adopted/learnt through the experience and at the university?

Wake-Cup was a campaign that celebrated and strengthened the belief in positive reinforcement and the beauty in constructive criticism. To tackle the problem of growing waste in the University, especially in the form of single-use plastic, Wake-Cup was launched to highlight the initiatives taken up by my peers to curb the use of single-use plastic in their daily lives.

This helped in bringing people together by creating spaces for advocacy, empathy, critique and allowed for discussions to understand the various aspects of sustainability and co-design the road ahead for a more innovative socio-economic sustainability. It was a campaign that recognised and appreciated every adaptation, or change, towards a sustainable lifestyle by people who were simply inspiring to be around and who held the passion towards making a change in the traditional sustainability discourse.



3. **A**

-s you have worked in the field of sustainable living and development for a long time, what steps would you suggest can be taken up by an individual in their day-to-day lives to make their surroundings more sustainable and contribute towards the sustainable development goals?

The one thing that works very well for me to be able to contribute towards sustainability is being 'conscious'. Whether it be food consumption, using tap water, using paper in office, or single-use plastic takeaways - the significance of being conscious is that it allows one to be aware of their waste production, and thereby seek for alternatives that can be helpful in reducing the amount of waste produced on a daily basis. The waste production could be in the form of emissions, plastic, food, water, etc. However, the narrative of sustainability speaks of not just environmental aspects but also focuses on paving a more equitable, inclusive, and value-based approach towards socio-economic aspects as well. For example, how an employer treats its workforce, how a family can work towards creating equal opportunities for all genders in the household, so on and so forth.



4. **W**

-hat are the recent challenges you faced, or you generally face while working on sustainability projects? And how did you overcome it?

A very important challenge which is now gradually moving towards its way to resolution, thanks to many new standards and compliances that have come into place at a global level, is how one interprets the concept of sustainability. While talking to a client, they may view the term wholly from the lens of their organisation. That is an important parameter however, openness to an emerging sustainability paradigm is crucial as well. This means that the destination of any sustainability intervention discourse can differ from its originally imagined course of action due to many emerging feedback loops in each system. Therefore, openness to accepting a newly discovered destination can go a long way in achieving a more satisfactory and full-filled experience towards long-term sustainability goals of a company.



5.



-s we know that Sustainable Development isn't just limited to aspects of the environment but also societal topics like- gender equality, worldwide reduction of hunger, education for all children etc. Basis your experience in diverse sectors such as education, sustainability, social impact and youth leadership; how can we contribute towards such goals at an individual level?

I have always been fascinated by interconnections, the idea of one thing being connected to the other is unique and can mean differently for different people. These interconnections are important as they compel us to see the world around us in a more holistic and comprehensive way and push us to be more open-minded to the dynamics of our environment. The idea behind contributing meaningfully to Sustainable Development is to dissect these interconnections, or feedback loops, in each system and understand how each entity is linked to the other.

For example, if we take employment into consideration, there are many perspectives to look at. These perspectives, however, depend on where you are placed in the hierarchical pyramid of the society; the placement in the pyramid determines the opportunities you may be able to easily access and the challenges you would have to face to overcome them. If you are a woman, you might have to overcome the challenges of fighting for your right to be educated in the first place, in some communities, to be able to aim for a job.

Additionally, if the woman belongs to a community that is affected by climate change, her right to be educated may be obstructed by challenges such as shortage of drinking water or shortage of food supplies in the region. Therefore, the overlaps in a system must be disintegrated first to seek out the connections that may influence each other in the long run. The depth of the analysis can determine the quality in approach and methodology of the intervention.



6.



-e saw that you have taken up certain managing roles for various enterprises. Is there anything you would like to share with students who are looking forward to pursuing similar roles?

Roles at managerial levels typically seek for a combination of leadership skill sets, adaptive learning techniques, teamwork, understanding and setting team expectations, upskilling oneself regularly, taking initiative, active listening and public speaking. Such roles can be easily pursued at undergraduate level in colleges especially like Sri Venkateswara College, where there are a plethora of opportunities in the form of clubs, fests, seminars, sports events, placement cell, internships, and research opportunities. Students should also speak and discuss pertinent issues with faculty to build skills like active listening, presentation and creating an open mindset. As a student in college, I was part of multiple initiatives and seized as many extracurricular opportunities as possible. Leading Parivartan as a Vice President, interning with NGOs and participating in sports activities helped develop my understanding on critical issues, allowed me to interact with different individuals and shaped my overall personality. College can be an enriching space to discover self-confidence while trying new things.





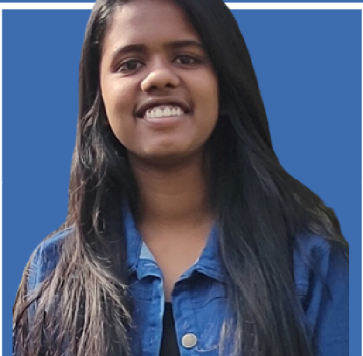
THE *Depart*

E tment



YEARBOOK

Class of 2022



ABHIRAMI SUNIL

"I knew exactly what to do, but in a much real sense, I had no idea what to do."



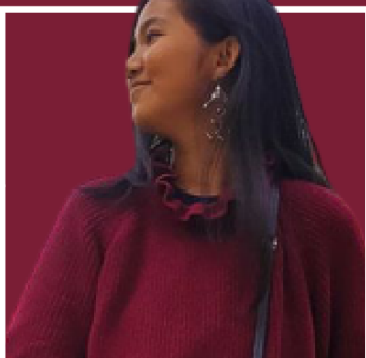
AYUSHI SHARMA

"Always remember who you were before the world told you who you should be"



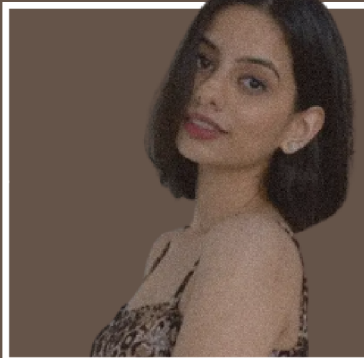
PARIDHI KOTNALA

"To Forgive is to overlook or rather to look through. Forgiving in the past is what makes the strength for being present in the now"



SHRISTIKA KONWAR

"Currently learning to love my own pace"



JAYANTI CHILLAR

"It's life, lower your expectations."



VIVEK DWIVEDI

"Can I please stay another year? - said no one"



SONALI RANJAN

"You are the sky. Everything else is just the weather."



SONALI KUMARI

"Affirm it enough and the universe will manifest it."



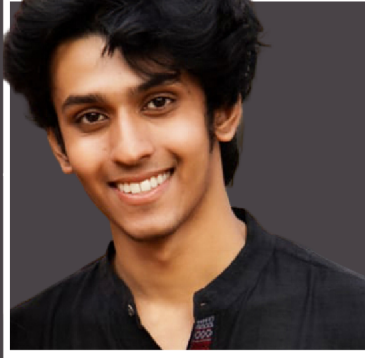
JAANVI

"Aim to be the kind of person, you'd like to meet yourself"



NEHA GULIYA

"In the end, it's not the years in your life that counts. It's the life in your years."



VISHNU NARAYANAN

"Sometimes I'll start a sentence and I don't even know where it's going. I just hope I find it along the way."



ATHARV KAPOOR

"Can I please stay another year?"



AMBIKA SINGH

"The more neatly you fit into society, the less free you actually are."



DRAVIE BANSAL

"Clouds come floating into my life, no longer to carry rain or usher storm, but to add color to my sunset sky."



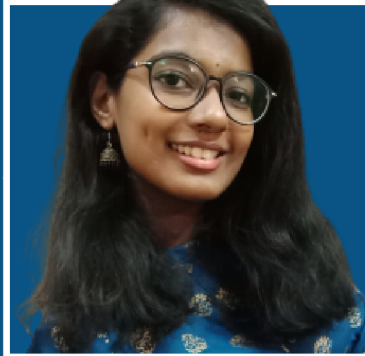
SANIDHYA JAGDISH

"They said, don't give up on your dreams. So I went back to sleep."



SHUBHANGI ANTIL

"Trust the instincts, follow your inner being and life will take you where you have always dreamed to be"



DEVIKA VIJAY

"I spent my entire time pulling an academic icarus flying too close to deadlines on my wings of deeply flawed time management."



CHESHTE VARSHNEY

" You will never "find" time, you have to make time."



RABSANG LHAMO

"Don't take life too seriously, no one makes it out alive"



ANANYA KAUSHIK

"Wherever we are, whatever we're doing and wherever we're going, we owe it to ourselves, to our art, to do it well."



ANANTPREET KAUR SOOD

"That which consumes your mind, controls your life."



DIVA SINGH

"पसंद नहीं आई ending? कोई बात नहीं, बदल देंगे; हमारी अपनी कहानी है।"



EKTA SINGH

"Every next level of your life demand a different version of you."



LAKSHITA SATI

"We all are born with a divine fire in us. We should put our efforts to discover it and fill the world with the glow of its goodness."



VAIDEHI SHARMA

"The only meaning of happiness is in the present. And you shape your present with your thoughts. Decorate your mind garden with the most beautiful of thoughts and you'll see your life bloom."

Sonali Kumari, TBS

Sri Vipra Internship: Worked on establishing the relationship between total daily calorie intake and expenditure in the young adult population during the pandemic

Vaidehi Sharma, TBS

Ashoka University: Worked on understanding the Molecular Mimicry between CoV-2 spike proteins and the human proteome by running a protein blast between the two

Ambika Singh, TBS

National Institute of Immunology: used *C. elegans* as a model organism to explore molecular mechanisms which play a significant role in Aging of organisms.

Priya Basil, SBS

Wrote a review on the effects of abiotic factors affecting different seeds. Performed experiments at home to corroborate the results.

Shristika Konwar, TBS

Sri Vipra Internship
Worked on establishing the relationship between total daily calorie intake and expenditure in the young adult population during the pandemic.

Sanah Kumar, SBS

BioXSpace: Worked as a Content Developer. Made infographics for the science communications section of the website.

Avantika Basliyal, SBS

Sri Vipra Internship Researched on the effects of abiotic factors on plant growth

Mansi, SBS

Sri Vipra Internship: Worked as a team member

Sanidhya Jagdish, TBS

SocioLabs - Internship as a graphic designer

Jaarvi, TBS

Sri vipra internship: Worked under the biochemistry department

Neha Guliya, TBS

Sri Vipra Internshi
Worked on establishing the relationship between total daily calorie intake and expenditure in the young adult population during the pandemic.

Ananya Kaushik, TBS

CSIR-IGIB: Worked as a Research Intern in the VS lab

INTERNSHIPS 2021-2022





Preetha Chatterjee, SBS
Cushy, the book club of SVC-
Content and research team
member in Cushy
Equal Opportunity cell -
Member

Vaidehi Sharma, TBS
Conquiztadors (the quizzing
society) - Member

Jayanti Chhillar, TBS
Nrityangana - President
Chrysalis - Treasurer

Prishita Sharma, SBS
Chrysalis- Executive head
Crescendo- Member
Girrup pankh - Sub-head PR
dept

Vidhi Wadhawan, SBS
Crescendo - Member
Girl Up Inaara - Member

Diva Singh, TBS
ASCEND - The Entrepreneurship Cell - Vice President
English Debating Society - Member

Tannu Kushwah, SBS
Cushy the book club- Core
team member
Equal Opportunity Cell -
Volunteer

Taruna saini, SBS
Chrysalis - Executive head

SOCIETIES 2021-2022

Shradha Jain , SBS
Eco club - Member

Neha Guliya, TBS
Vimarsh - Hindi Debating
Society

Nandini Sharma, SBS
National Service Scheme -
Member,
Nrityangana- Research and
Content Head

Shubhangi Antil, TBS
Equal opportunity cell -
Content, research & social
media team member

Aparna Kumari, SBS
Equal opportunity cell - Research, content, event manage-
ment and social media team member

Avantika Basliyal, SBS
Equal opportunity cell -
Member

Mansi, SBS
Equal Opportunity Cell -
Member

Sanidhya Jagdish, TBS
Verdure - Creative Team Member

Atharv Kapoor, TBS
TedxSVC - Head organiser
(President)



Where our seniors are



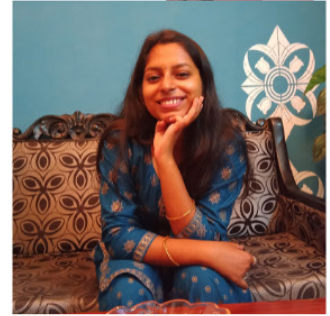
Aastha

**Banaras Hindu
University**



Neeraj Singh

**Central University of
Haryana**



Aparna Pillai

**Forest Research Institute
Deemed University,
Uttarakhand**



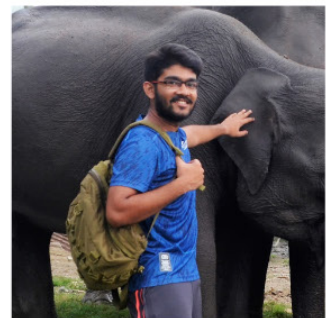
Sagar Chauhan

**Jawaharlal Nehru
University**



Yashmita Choudhary

University Of Hyderabad



Abhimanyu Madhusudan

Pondicherry University



Suman Saini

**Jawaharlal Nehru
University**

Experience at college

It was great time, every aspect of biology was touched making us decide new horizons to carry forward a legacy that started at Sri Venkateshwara College,

Great teachers, great companions made it all easy even in harsh time. It feels good and proudful to be a part of this course and college.

- Sagar Chauhan

I had a great experience studying at SVC with friendly and fun filled environments and classmates.

- Subikshu S.

Experience was over good...The thing I miss the most is the time spent with my friends in the various spots inside the clg, be it canteen, Rock garden, playground. This is the sole reason why I miss my clg so much.

- Neeraj Singh

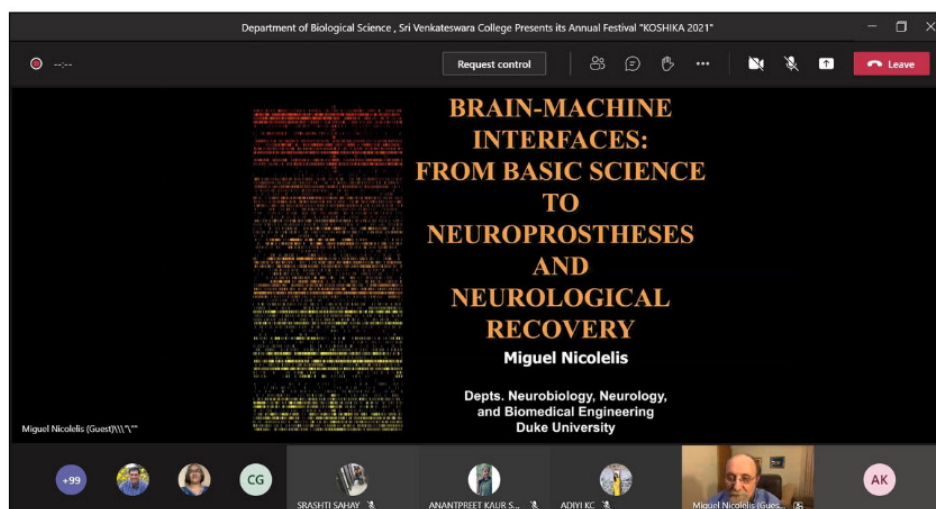
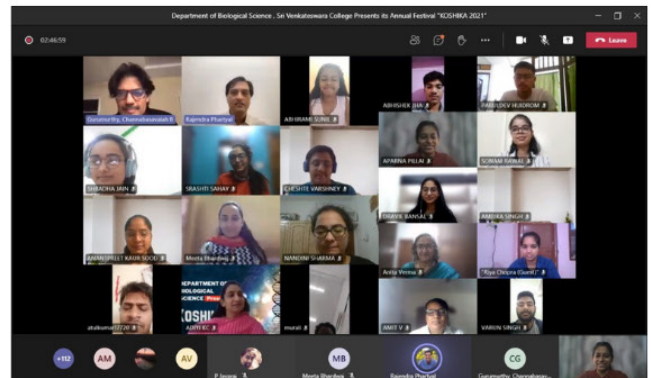
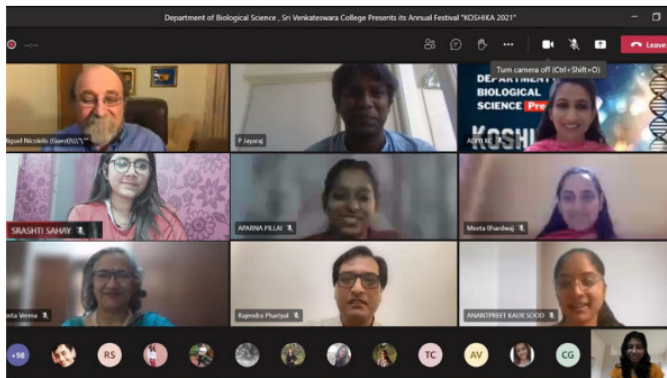
These 3 years, being a Bioscience student of venky , are eternal and unforgettable. the teachers are so hard working and supportive and each of them have unique way of teaching and loving students. It never felt like a strange place and teachers always treated us with so much warmth. I wish I could bring back those days and can be able to attend all the experiments and classes which we missed

- Suman Saini

HALL OF FAME

Full Name	Name of competition	Name of the organizing institution	Position received
Mansi	Poster competition	Sri Venkateswara College	First runner up
Devika Vijay, Vishnu Narayanan, Shubhangi Antil	Treasure hunt- Equal opportunity cell	Sri Venkateswara College	Second
Cheshte Varshney, Atharv Kapoor, Neha Guliya, Sonali Kumari	MINDSPAR 3.0	Sri Venkateswara College	Reached the final stage (top 10)
Preetha Chatterjee	Online vigilance quiz	Sri Venkateswara college	First
Nandini Sharma	Quiz competition- 1. Koshika'21. 2. Kaun Banega Vidwaan- Evolvere	Sri Venkateswara College	1. First 2. Second
Aparna kumari	Photography competition-Girl up pankh	Sri Venkateswara College	First

A GLIMPSE OF Koshika'21



CREATIVE



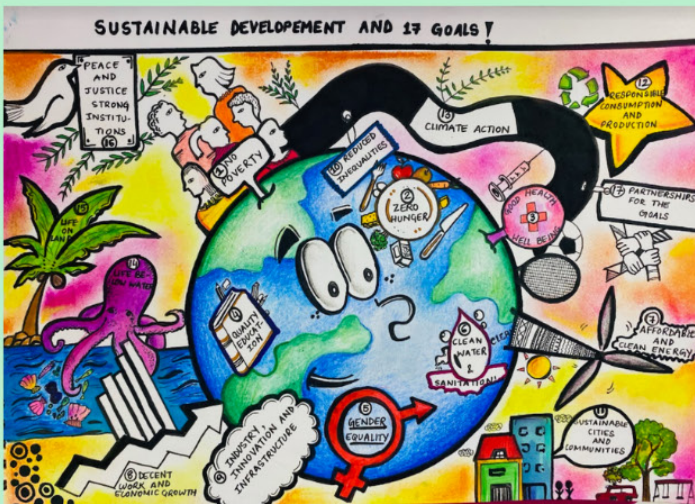
© Mansi,SBS



© Sanah Kumar,SBS



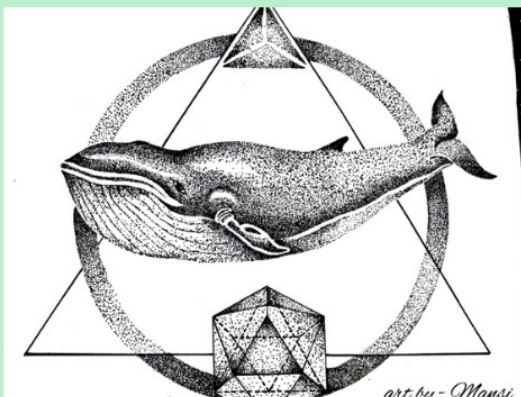
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© Lavanya Ahuja,SBS



© Vaidehi Sharma,TBS



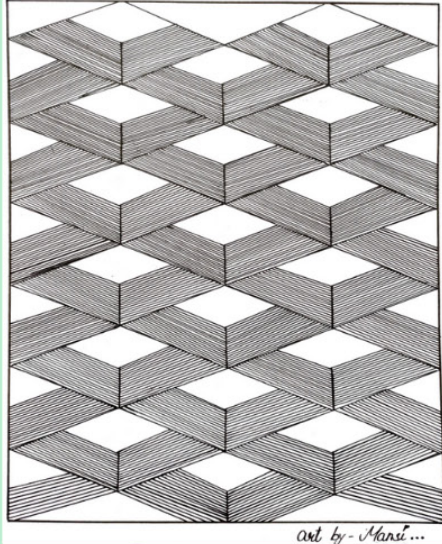
© Mansi,SBS



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signs of the island being brought back to life anyway, I had

CORNER



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© Kevika Goel,FBS



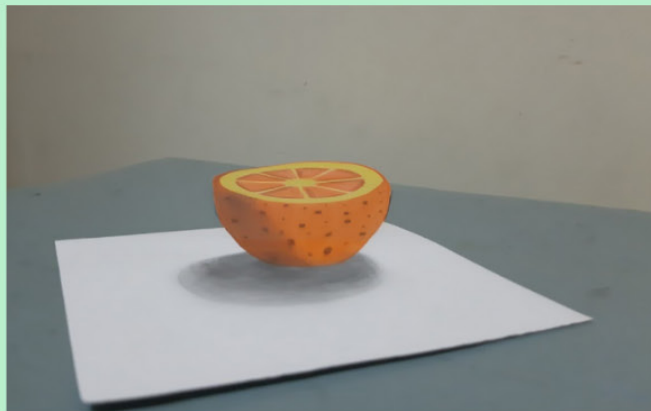
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the island being brought back to life anyway, I had

CORE TEAM



Shubhangi Antil
TBS

Editor-in-Chief



Sanidhya Jagdish
TBS

Creative Head



Sanah Kumar
SBS

Creative Head



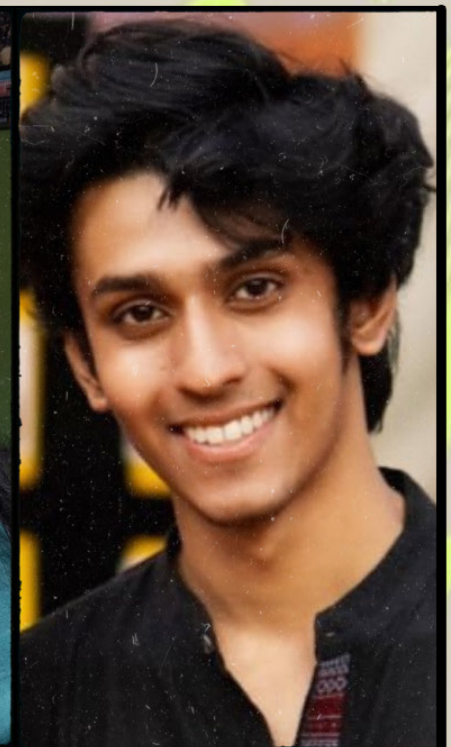
Nandini Sharma
SBS

Editor



Preetha Chatterjee
SBS

Editor



Vishnu Narayanan
Verma, TBS

Photography Head

CREATIVE TEAM



Vaidehi Sharma
TBS
Creative team member



Mansi
SBS
Creative Team member



Shivangi Sharma
FBS
Video editing

CREATIVE TEAM



Avantika
SBS
Creative Team member



Aparna Kumari
SBS
Creative Team member

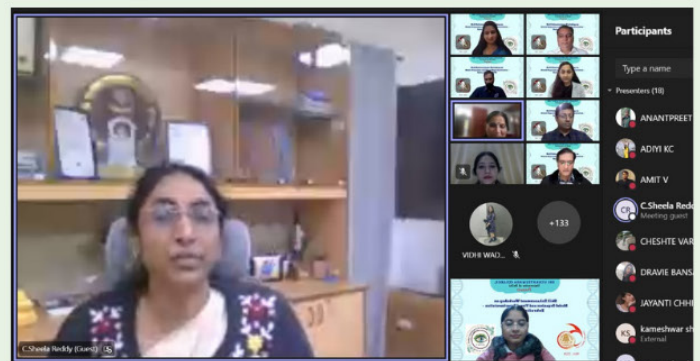
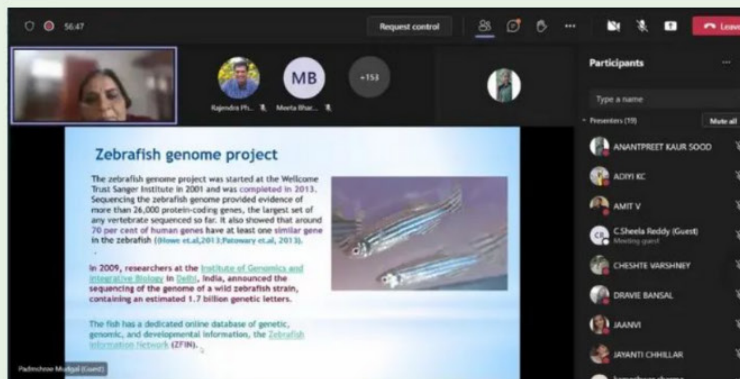
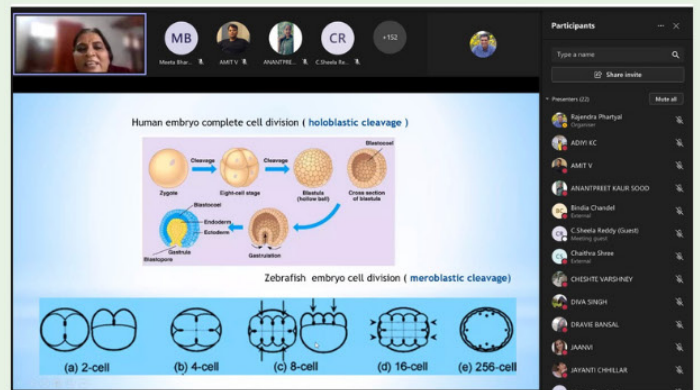


Ankita Kumari
FBS
Video editing

VOLUNTEER

VOLUNTEER

Diamond Jubilee Event - Skill Enhancement Workshop





CHRYSALIS
The Biological Science Society



SRI VENKATESWARA COLLEGE
University of Delhi

Presents

**Skill Enhancement Workshop on
Model Organism and Visual Experimentation -
Zebrafish & JOVE**

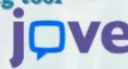
SESSION 1

**"Zebrafish- an ideal
model organism for
human research"**
Dr. Padmshree Mudgal
Daulat Ram College



SESSION 2

**"Exploration of Journal of
Visualised Experiments
(JOVE) as a teaching-
learning tool"**



FRIDAY, January 21, 2022
PLATFORM: MS TEAMS
TIME: 10 AM

Diamond Jubilee Event Team

Teacher Coordinators:

Botany

Dr. Amit Vashishtha
Dr. Aditi Kothari Chhajer
Dr. Pamil Tayal

Biochemistry

Dr. Kameshwar Sharma
Dr. Meeta Bhardwaj

Zoology

Dr. Rajendra Phartyal
Dr. P. Jayaraj
Dr. Vagisha Rawal

Student Volunteers:

Anantpreet Kaur Sood, TBS

Cheshthe Varshney, TBS

Bivishitha Naisamudhin, SBS

Nandini Sharma, SBS

Taruna Saini, SBS

Diva Singh, TBS

Saba Anjum, FBS

Ankita Kumari, FBS

Jayanti Chhillar, TBS

Jeevika Bhat, FBS

Sanah Kumar, SBS

Reetika Chauhan, FBS

Mansi, SBS

Akangkha Choudhury, FBS

Tanishk Lakhera, FBS

Kunal Raj, FBS

Gargi Sajwan, FBS

Kevika Goel., FBS

Dravie Bansal, TBS

Vidhi Wadhawan, SBS

Prishita Sharma, SBS

Lavanya Tyagi, FBS

Tannu Kushwah, SBS

Preetha Chatterjee, SBS

Jaanvi, TBS



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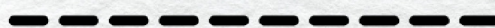
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Front Cover - Sanidhya Jagdish, TBS

Back Cover - Vaidehi Sharma, TBS

Sustainability Section Header - Sanah Kumar, SBS

———— About the Back Cover ————

The back cover is a precise demonstration of the odyssey we have transversed throughout the magazine. The theme of sustainability doesn't solely revolve around the peripheral ideas, methods, and principles being constructed by the advancing millennials, it is the culmination of the past, present, and future. Like the thick woody trunk of the Banyan tree depositing layer by layer, sustainability has arisen and has been a part of human life in various forms. Growing perpetually, in height, and with its cover spreading laterally, its roots falling down to form an abode of their own and sprout fresh, the Banyan tree appears like an epitome of strength, surpassing damage & even time. Similarly, As our planet grows older, sustainability stands still and undaunting as a bypass of all that Earth has endured; like a gift to the future and an allegory of the past. Sustainability is the only escape, the only strong anchor to hold on to and the only hope that newer and better things can always take root.

By Vaidehi Sharma, TBS

