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School of Agriculture and Allied Sciences

KRISHI PARASAR

Volume 4, Issue I, June 2024

REGENERATIVE AGRICULTURE

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Foreword

The editorial board of '**Krishi Parasar'**, the e-magazine of our School of Agriculture & Allied Sciences proposed that the theme of the forthcoming issue of **'Krishi Parasar'** will be 'Regenerative Agriculture' and I have to put some forewords on this issue. The recent heat wave flow all over our country put lives treat and there is a projection that the heat waves will again return back and put threat for human lives. The origin of heat wave is not clearly understood but probably it may be due to the impact of various activities, like industrial, transportation, agricultural etc. imposing load on the ecological systems of our mother earth which has the carrying capacity of 100 GJ/ hector/year. The regenerative agriculture may lighten the ecological load and become a part for achieving sustenance.

Agriculture needs soil and the soil is a free surface material of mother earth. The soil consists of various organic and inorganic components. The agricultural production potential is depends on the use of the quality of soil. Soils represent a non-renewable resource on which human life depends. It takes hundreds of years to generate one centimeter of new soil but it can take just one year or even less to destroy it. Despite seeing it everywhere around us, the amount of arable soil is in sharp decline. According to FAO about 30% of the soil in the world has been degraded due to climate change, pollution as well as poor soil management and usage, typically for agricultural, urban, or industrial purposes. Further, FAO also estimates that over 90% could become degraded by 2050 if no action is undertaken soon. To overcome this situation there need in focusing for the implementation regenerative agriculture to save the soil. Regenerative agriculture's main focus is to improve the biodiversity of the soil. Resilient soils and crops are crucial in today's changing environment with the ever-increasing amount of weather shocks we keep experiencing.

In the present issue of **'Krishi Parasar**' focus on 'Regenerative Agriculture' will be given in adhering to the 'Sustainable Development Goals' in overcoming the various stress on our ecological systems.

It is hoped that in the present issue of the 'Krishi Parasar' the students, faculty members and the entire university community will put their efforts on the implementation of regenerative agriculture for protecting the food security. We will be happy to see the articles from the students on these topics in achieving the "Sustainable Development Goals"

Dr. Biswajit Ghosh

Vice Chancellor

The Neotia University

Dean's Message

Dear Colleagues & Students,

I am delighted to announce the release of special issue of our e-magazine "Krishi Parasar", dedicated to the transformative field of "Regenerative Agriculture". The theme of the magazine is very appropriate considering widespread soil degradation in India which is estimated to be occurring on 147 million hectares (Mha) of land, including 94 Mha from water erosion, 16 Mha from acidification, 14 Mha from flooding, 9 Mha from wind erosion, 6 Mha from salinity, and 7 Mha from a combination of factors. This is mainly due to undulated land topography causing water erosion during rainy season, climate change, desertification, wind erosion, excessive use of natural resources, faulty cropping pattern This issue will explore innovative practices and research that aim to restore soil health, enhance biodiversity, and improve ecosystem resilience, while also addressing climate change and supporting sustainable food systems and agronomic practices, etc.

Regenerative agriculture represents a paradigm shift in how we view and interact with our natural environment. By focusing on holistic approaches that work in harmony with nature, this field offers promising solutions to some of the most pressing challenges facing our agricultural systems today.

We have received good number of articles from faculty members, researchers and students narrating their insights, findings, and experiences. Topics of interest include, but are not limited to:

- Soil health and fertility management
- Crop diversity and rotation strategies
- Integrative pest management
- Agroforestry and silvopasture systems
- Water management and conservation practices
- The socio-economic impacts of regenerative agriculture
- Policy and advocacy for regenerative practices

I understand that the e-magazine would have multiple chapters involving scientific articles, Agri-vision, poems, photography / image gallery, animation & drawing, students' corner, field activities & interviews and experiential learning modules. The magazine will serve as a good repository of knowledge for both the students and the faculty members beside providing them a platform to bring out their vision, ideas, creativity and showcase achievements of the school and academic excellence. I am sure this will generate lots of interaction among students, teachers, researchers, and the farming community.

I sincerely express my gratitude to the TNU-management for their valuable support, e-magazine editorial board members for compilation and bringing out this e-magazine on time and the contributors particularly faculty members and students at the school. I wish a grand success of this e-magazine.

Sincerely,

Prof. (Dr.) Sushil Kumar Kothari
Dean
School of Agriculture and Allied Sciences
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Content

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'Krishi Parasar' is an e-magazine that mirrors the School of Agriculture and Allied Sciences (SAAS) at The Neotia University. It reflects the literary, educational, and other activities taking place in the school. It showcases the extracurricular enthusiasm and academic ventures of the students. This is why every student looks forward to its publication and contributes to it. 'Krishi Parasar' is received with great enthusiasm by the students. The e-magazine prepares students for their future. It trains them in the concentration of thoughts and ideas. Essays, short stories, poems, and informative scientific articles are written by students and faculty members of the school and are published in the e-magazine.

The e-magazine 'Krishi Parasar' has an editorial board consisting of senior students along with professors of the school. These student editors prepare the magazine under the friendly supervision of the professors. The honourable Dean of the School of Agriculture and Allied Sciences (SAAS) is the Chief Editor of the e-magazine.

The current issue (Volume 4, Issue 1) focuses on regenerative agriculture. Regenerative agriculture is the way of the future, but it will only be successful if we can scale it up to more farms and make an impact in the fight against global warming. In practice, this means establishing farming systems—complete systems—that combine various in-field solutions to increase farmers' yields and incomes while also benefiting the environment. Such systems may seem far off, but their adoption is already happening in different parts of the world. They are gaining traction as farmers look for ways to adapt to more extreme weather and climate conditions.

In this current issue, much-needed information about regenerative agriculture has been provided by our beloved students and respective faculty members. We are grateful for your wholehearted support in each segment. We hope that by reading this issue, we can learn a lot.

Finally, I would like to express my sincere thanks to all the contributors of each segment, associate editors, respected Dean-SAAS, and Honorable Vice-Chancellor of The Neotia University for their unwavering and continuous support from the inception to the successful publication of this e-magazine. Lastly, I want to thank our students, who are the backbone of this magazine. Without their unparalleled support, we would not have been able to publish this e-magazine. I am also grateful to the Digital Marketing Division of The Neotia University for their contributions in page designing, and presenting the 'Krishi Parasar' e-magazine so beautifully.

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In recent years, the importance of regenerative agriculture has gained much-deserved attention as a key solution to combatting the challenges our planet faces. Regenerative agriculture is not merely a trendy buzzword but a holistic approach that holds the potential to revolutionize our food systems, protect our environment, and ensure a sustainable future for generations to come. Regenerative agriculture goes beyond sustainable practices by focusing on restoring and enhancing the health of the soil, biodiversity, and ecosystems. By adopting regenerative methods such as minimal tillage, cover cropping, crop rotation, and the integration of livestock, farmers can improve soil health, sequester carbon, reduce greenhouse gas emissions, and increase resilience to climate change.

Furthermore, regenerative agriculture offers a plethora of benefits, from improving water quality and reducing soil erosion to promoting biodiversity and enhancing the livelihoods of farmers. It also holds the promise of providing nutritious and healthy food for consumers while mitigating the negative impacts of industrial agriculture practices. As we stand at a critical juncture in our fight against climate change and environmental degradation, embracing regenerative agriculture is not just an option but a necessity. Governments, policymakers, farmers, businesses, and consumers all have a role to play in supporting and promoting regenerative practices.

It is time for us to collectively recognize the potential of regenerative agriculture as a powerful tool in our quest for a more sustainable and resilient future. By working together to prioritize regenerative practices, we can create a healthier planet, a more robust food system, and a brighter future for all.

On behalf of our editorial team, I would like to express gratitude to our readers, contributors, authors, and editors who have all generously volunteered their time to contribute their innovative ideas and creative thoughts to enrich our e-magazine and fulfill its mission of providing a platform for ideation and creativity in our recent publication of volume 4 Issue 1 of Krishi Parasar, dedicated to Regenerative Agriculture.

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On behalf of our editorial team, I like to extend my gratitude to our readers, contributors, authors, and editors who have all volunteered their time to help make our e-magazine successful and fulfil its mission of offering a forum for sharing original ideas and creative thoughts through the publication of our recent issue, volume 4 Issue 1 of Krishi Parasar, which is devoted to Regenerative Agriculture (RA).

In order to preserve or increase farm profitability, regenerative agriculture (RA) leverages natural systems to boost biological activity, sequester carbon, improve nutrient cycling, revitalize soil health, restore landscape function, and generate food and fiber. Although it can occur in all agricultural pursuits, RA has gained the most popularity in pastoral and agricultural operations. Through the implementation of techniques like crop rotation, cover crops, and agroforestry, farmers can gradually enhance the fertility and structure of their soil. This can result in higher crop yields and agricultural productivity, enhancing food security and lowering reliance on explicit costs like chemical pesticides and fertilizers. Cutting input costs is one of the fundamental tenets of regenerative agriculture. This is especially helpful in an economic environment like India, where smallholder farmers frequently have narrow profit margins and less financial stability. Regenerative farming methods give Indian farmers access to upscale markets that favor products made ethically and with minimal impact on the environment. Higher prices for their goods may result from this, boosting farmers' earnings and promoting rural economic growth. In addition to preserving traditional agricultural methods and fostering local food systems, RA also generates jobs in rural regions. Regenerative techniques have the potential to alleviate constraints associated with rural-urban migration and promote balanced regional development throughout India by reviving rural economies. Thus, adopting regenerative approaches can be very important to making India's agriculture sector a more economically active and sustainable segment of the country's economy.

In my capacity as editor, I would want to express my gratitude to the university management, Honourable Dean Sir, and faculty members for their assistance in getting the e-magazine published on schedule. I also want to express my gratitude to the entire student body for submitting the article on time and in a short amount of time. We sincerely hope that all of our readers will read, appreciate, and provide the editorial board with any feedback they may have, so we may continue to raise the standard of the magazine going forward.

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Welcome to Volume 4, Issue 1 of The Neotia University's School of Agriculture and Allied Sciences e-Magazine 'Krishi Parasar'. It is with great pleasure that we present this edition, dedicated to the theme of Regenerative Agriculture—a topic that holds immense promise for the future of sustainable farming.

Regenerative agriculture is more than a set of practices, it is a holistic approach to farming that emphasizes the regeneration of soil health, biodiversity, and ecosystem resilience. By focusing on rebuilding organic matter in the soil and restoring its biodiversity, this approach not only enhances agricultural productivity but also combats climate change and ensures food security for future generations. As we navigate through global challenges, embracing regenerative techniques offers a path to resilient and sustainable agricultural systems.

This issue features a diverse array of contributions from our students and faculty members, ranging from scientific articles that delve into innovative articles to personal interviews with farmers who are the torchbearers of regenerative practices. Additionally, we have included sections showcasing photography, field activities, and creative pieces like animations and drawings, all reflecting the vibrant spirit and dedication of our community.

I extend my heartfelt congratulations to all contributors for their exceptional work and commitment. Your insights, creativity, and dedication have made this edition a rich resource of knowledge and inspiration. Let us continue to explore, innovate, and implement regenerative practices, ensuring a sustainable and thriving future for agriculture.

Happy reading!

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Suman Nandi (4th year)
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Samaj Mukherjee (3rd year)
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Agri vision

Utilizing regenerative agriculture as a means to foster soil rejuvenation and resilience

Dr. Sourav Mullick
Assistant Professor, Department Soil Science and Agricultural Chemistry
School of Agriculture and Allied Sciences

Regenerative agriculture (RA) stands as a transformative farming approach harnessing natural processes to bolster biological activity, fortify soil health, optimize nutrient cycling, revitalize landscapes, and sustainably yield food and fiber, all while upholding or enhancing farm profitability. Rooted in guiding principles, RA practitioners employ an array of tactics merging biological and ecological methods to amplify production and rehabilitate landscape functionality.

Unlike endeavours to revert to pre-agricultural ecological states, RA aims to synergize with nature's ecological processes within agricultural systems to bolster overall farming system health. Initially coined by Gabel (1) and further refined by Rodale (2) into regenerative organic farming, emphasizing environmental and social enhancements sans chemical inputs, RA has seen varied definitions proposed by researchers. From prioritizing on-farm resources and minimizing synthetic inputs to embracing biological principles for heightened productivity and environmental stewardship, RA contrasts with practices detrimental to soil fertility, carbon storage, and biodiversity, which are deemed degenerative agriculture.

Recognizing the need to surpass the "do no harm" ethos of sustainable agriculture, the Food and Agriculture Organization (FAO) (3) asserts RA as pivotal in transforming food and land use, aligning with UN Sustainable Development Goal 2 which states that "By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve

land and soil quality". Despite diverse interpretations, defining RA remains elusive, hindering stakeholders in grasping and applying its concepts effectively. Recent efforts aim to provide clarity, such as Schreefel et al.'s (4) focus on soil conservation's role in enhancing sustainable food production dimensions and Newton et al.'s (5) recognition of the broad scope for defining RA.

Guided by principles to

- minimize soil disturbance,
- maintain year-round soil cover,
- prolong live plant presence,
- promote biodiversity, and
- integrate animals.

RA proponents anticipate erosion prevention, soil enrichment, reduced external inputs, improved crop yield, emission reduction, enhanced financial returns, and better human health. RA methodologies blend biological and ecological systems to enhance productivity and restore landscape function, leveraging natural processes like soil carbon capture, symbiotic plant-microbiota interactions, soil structure improvement, and livestock integration to foster ecosystem services. Tailored to specific farming and climatic contexts, RA is not a one-size-fits-all solution but rather a flexible framework adaptable to diverse conditions. While RA shares commonalities with other sustainable agriculture practices, its core concepts facilitate the implementation of varied techniques tailored to individual properties, aligning with broader sustainability goals in agriculture

Soil health encompasses the soil's vital role as a dynamic living system within the delicate balance of ecosystems and land management practices. It serves as a linchpin for sustaining biological productivity, preserving air and water quality, and fostering the well-being of plants, animals, and humans (6,7). Recently, the Intergovernmental Technical Panel on Soils (ITPS) (8) refined this concept, defining soil health as the soil's ability to uphold the productivity, diversity, and essential environmental functions of terrestrial ecosystems.The foundation of soil health lies in its desirable physical, chemical, and biological attributes. These include characteristics like texture, water retention capacity, pH levels, soil organic matter (SOM), microbial diversity, nitrogen mineralization, and soil respiration—all of which contribute to the support of robust and productive crop growth. Soil functions as a complex and vibrant ecosystem, teeming with diverse micro- and macrobiota that play pivotal roles in regulating its properties and processes.

However, the intensification of agriculture, propelled by modern technologies, has eroded the soil's capacity to fulfill its vital functions over time. This degradation threatens both the long-term productivity of agricultural lands and the provision of crucial ecosystem services. Regenerative agriculture (RA) emerges as a proactive approach to address these challenges by focusing on enhancing soil health (9,10). The primary objective of regenerative agriculture is to rejuvenate soil health by augmenting organic matter levels and bolstering fertility and productivity. Through regenerative practices such as cover cropping, crop rotation, and minimal tillage, farmers work in harmony with nature to rebuild soil structure, increase organic matter content, and promote biodiversity. By prioritizing soil health restoration, regenerative agriculture not only enhances agricultural sustainability but also safeguards the resilience of ecosystems for future generations.

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Figure 1: Principles of Regenerative Agriculture

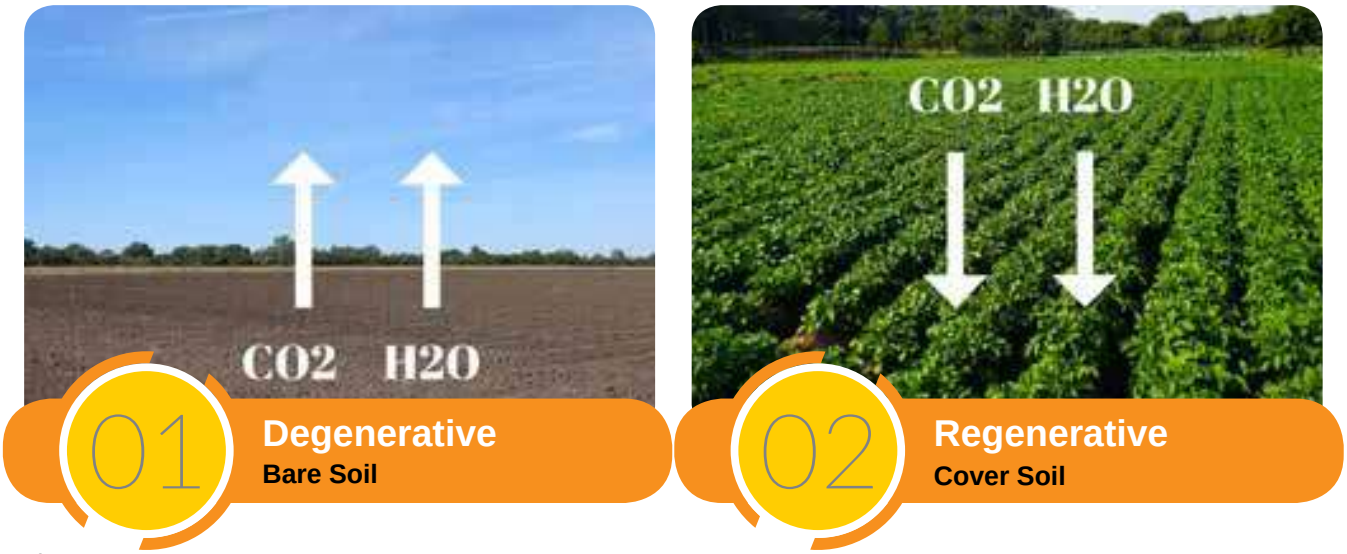

Figure 2:

Figure 3: Soil in Regenerative Agriculture

Precision Agriculture: GPS (Global Positioning System) and GIS (Geographic Information System) to boost up productivity and profitability of crops

Prof. Bharat Chandra Saha
Professor
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Precision agriculture or smart farming is the science of improving crop yields and assisting the farmers to take decisions by using the latest technology such as remote sensing, artificial intelligence (AI) and analysis tools. Concept of this farming is based on the facts that plants or animals should precisely get the treatments they actually need. It is determined with a great accuracy by using the new range of latest technologies such as GPS, sensor technology, Information and Communication Technology (ICT), AI and robotics. It is a new concept that has been adopted throughout the world, to increase productivity of crops by reducing labor, time, and ensuring effective management for application of fertilizers and irrigation. It is an advanced innovation and optimized field level management strategy, for use with an aim to improve the productivity of resources on agricultural farm lands. Thus it is a new and advanced technology in which farmers are taught to apply optimized inputs such as water, fertilizer and plant protection chemicals to enhance the quality of produce and of course the crop yield.

This precision agriculture started with the recognition that soil is a spatially variable continuum and its impacts on production are also spatially variable. This concept is the building block on which site-specific crop management and precision land management have been developed. To this end, soil science is the fundamental functionaries of precision agriculture. However, as growers understand and manage their soil variability better, for their production goals to negate these effects on production variability, than other factors and interactions become more significant and have noticeable effects on production. This is the situation that precision agriculture in developed agricultural countries now finds itself. Consequently, the Precision Agriculture academic community has shifted from a soil science base to a computer science base over the past 10 years, particularly at the International and European Precision Agriculture conferences. However, in regions where Precision Agriculture is less developed, especially in African agriculture, the Precision Agriculture community and its objectives have remained more strongly aligned with soil science and therefore, managing soil variability. The resurgence of soil science for small-holder has now been a key theme in the first two African Precision Agriculture conferences in the 2020s. The continued need for more and better soil information and at a lower cost continued to be a part of the next evolution in Precision Agriculture.

Precision Agriculture and the Farming Revolution:

The first farming revolution that occurred from 1900 to the 1930s was the mechanized agriculture. Long after that, it was the 1960s when the Green Revolution took place. Due to scientific progression genetically modified crops were introduced. As global population is expected to reach 9.6 billion by 2050 and food production must be double than the current levels advanced analytical capabilities and precision agriculture with high yielding varieties will be key elements in the third revolution.

Precision Agriculture Vs Traditional Cultivation:

In traditional agriculture, farmers apply the same amount of pesticides, fertilizers, and irrigation across fields, at prescribed times and frequencies, as per the general recommendations for the region. But, there are always differences in biological, physical, and chemical parameters even within a single field. Uniform treatment of fields without considering inherent differences may result in the overuse of inputs in fertile land and underuse in poor patches. This inefficient use of land, water, fertilizers, and pesticides increases cost of production.

Whereas, precision agriculture targets to use the intrinsic differences in farm and optimizes inputs by Variable Rate Application (VRA). To implement VRA, detailed spatial data are collected across the fields and locations through geographic information systems (GIS) and crop lifecycles using GPS and remote sensing. Using such advanced descriptive, predictive, and prescriptive analytics engines, precision agriculture arrives at data-driven management to implement cost-effective, environment-friendly sustainable modern farming solutions and thereby increases the yield.

Advantages of Precision Agriculture

By using precision agriculture technologies and practices, farmers can target their inputs (such as seeds, fertilizers, pesticides etc.) to specific areas of the field that need them the most, rather than applying them uniformly across the entire field.

This targeted approach will help farmers save on inputs, as well as increase crop yield and quality. In addition, these technologies will help farmers monitor and manage their crops more effectively, allowing them to respond to potential problems more quickly and efficiently.

Precision Agriculture and Climate Change:

Agri-businesses are highly vulnerable to climate change. Farming is becoming increasingly challenging in many areas due to decreased yields and increased frequency of extreme weather events like drought or flood. Climate change is expected to diminish global agricultural production by 17 percent by 2050, according to a study by the National Academy of Science (NAS).

Precision Agriculture- the Road to Sustainability Precision farming, according to NAS, should play a big role in making farming more sustainable, without compromising production or farmer earnings. With precision agriculture, the World Economic Forum believes world food production could rise 10-15 percent by 2030, and greenhouse gas emissions and water consumption would decrease by 10 to 20 percent, respectively, if 15 to 25 percent of farms adopted the technology.

In a nut-shell, farmers can achieve the following benefits by using the technologies of precision agriculture:

- Identify the best crops and hybrid seeds suitable for a particular area
- Work only on exactly identified areas to be replanted
- Take specific actions to provide the essential and optimum level of inputs (fertilizers and other chemicals)
- Save time and cost and minimize the environmental impact of polluting soil and water
- Create maps for irrigation schedules and use exact of water.
- Anticipate pest infestations and diseases and take preventative measures.
- Apply herbicides and pesticides without harming biodiversity and killing of non-target plants
- Harvest produce when they mature to meet consumer preferences.

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Scientific Articles

A Phenomenal Step: Regenerative Agriculture

Soumyajit Chanda
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Abstract

Regenerative agriculture simply means about farming and ranching in a style that nourishes people and the earth, with specific practices varying from grower to grower and from region to region. There's no strict rule book it include some basic principles like, Reducing Soil Disturbance, Integrate Livestock, Covering the soil, Practice Crop Diversity, Ensuring live roots in the soil all-year-round. It's our duty to be concerned about soil health for our future generations. So that the concept of Regenerative agriculture is very important to us. We need to adapting some techniques for this purpose.

Key Word

Nitrification, Mulching, Healthy soil, Wellbeing of Human and Animals, Living roots.

Introduction

Continuous use of synthetic fertilizers not only causes deterioration of soil but also causes various hazard to human & animals' health. Here the Regenerative agriculture promotes soil health, carbon sequestration, and biodiversity while reducing environmental impact. Unlike synthetic fertilizers, it enhances resilience to climate change, mitigates nutrient runoff, and offers long-term economic viability. By fostering sustainable practices, it ensures food security, ecosystem health, and a more resilient agricultural future.

- **Role of Legume Crops**

Legume crops play a crucial role in regenerative agriculture by fixing atmospheric nitrogen(Nitrification) through symbiotic relationships with nitrogen-fixing bacteria in their root nodules. This natural process enriches the soil with nitrogen, reducing the need for synthetic fertilizers. Additionally, legumes improve soil

structure, enhance biodiversity, and provide valuable organic matter through their residue, contributing to overall soil health and fertility. Rotation with legumes also breaks pest and disease cycles, promoting sustainable farming practices.

- **Role of Mulching**

Mulching plays a vital role in regenerative agriculture by conserving moisture, suppressing weeds, controlling soil erosion, regulating soil temperatures, improving soil health, and reducing soil compaction. By covering the soil surface with organic materials such as straw, leaves, or compost, mulch acts as a protective barrier, preventing water evaporation, blocking sunlight to inhibit weed growth, and stabilizing soil temperatures to create an optimal environment for plant growth. Additionally, organic mulches gradually decompose, enriching the soil with valuable organic matter, enhancing soil structure, and promoting microbial activity, thus fostering resilient and sustainable farming systems that prioritize soil health and productivity.

- **Can regenerative agriculture reverse climate change?**

Around 22% of anthropogenic greenhouse gases come from agriculture, forestry, and other land uses, according to the Intergovernmental Panel on Climate Change (IPCC). Soils are one of the Earth's most important carbon sinks, holding more carbon than all of the world's vegetation plus our atmosphere combined. When practices that maximize carbon inputs to soils, such as planting cover crops, are combined with practices that minimize carbon losses, like no-till, soils can sequester significant amounts of carbon each year. Regenerative agriculture has the potential to transform agriculture from a source of greenhouse gases towards net carbon drawdown.

- **Role of Syngenta Group**

As a science-based company, Syngenta Group drives innovation that enables farmers to adopt regenerative practices across the world. We develop technology that can help farmers apply regenerative practices, and research the best ways of applying regenerative agriculture in the field.

Principles of Regenerative Agriculture

1. Don't disturb the soil.

Soil supports a complex network of worm-holes, fungal hyphae and a labyrinth of microscopic air pockets surrounded by aggregates of soil particles. Disturbing this, by ploughing or heavy doses of fertiliser or sprays will set the system back.

2. Keep the soil surface covered.

The impact of rain drops or burning rays of sun or frost can all harm the soil. A duvet of growing crops, or stubble residues, will protect it.

3. Keep living roots in the soil.

In an arable rotation there will be times when this is hard to do but living roots in the soil are vital for feeding the creatures at the base of the soil food web; the bacteria and fungi that provide food for the protozoa, arthropods and higher creatures further up the chain. They also keep mycorrhizal fungi alive and thriving and these symbionts are vital for nourishing most plants and will thus provide a free fertilising and watering service for crops.

4. Bring grazing animals back to the land.

This is more than a nod to the permanent pasture analogy, it allows arable farmers to rest their land for one, two or more years and then graze multispecies leys. These leys are great in themselves for feeding the soil and when you add the benefit of mob-grazed livestock, it supercharges the impact on the soil.

5. Grow a diverse range of crops.

Ideally at the same time, like in a meadow. Monocultures do not happen in nature and our soil creatures thrive on variety. Companion cropping (two crops are grown at once and separated after harvest) can be successful. Cover cropping, (growing a crop which is not taken to harvest but helps protect and feed the soil) will also have the happy effect of capturing sunlight and feeding that energy to the subterranean world, at a time when traditionally the land would have been bare.

Conclusion

In conclusion, regenerative agriculture offers a holistic approach to farming that prioritizes soil health, biodiversity, and ecosystem resilience. Regenerative agriculture not only enhances farm productivity and profitability but also contributes to climate change mitigation, biodiversity conservation, and food security. As we face increasing challenges posed by climate change and environmental degradation, regenerative agriculture provides a promising pathway towards building resilient, thriving agricultural systems that benefit both people and the planet for generations to come.

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Happy Seeder Technology In Jute Cultivation

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Abstract

Jute (Chorchorus spp.) is a significant cash crop in West Bengal, accounting for three-fourths of the country's total production and playing a crucial role in the economy, particularly in the terai region. However, declining jute cultivation due to competition from rabi maize, labor migration, and marketing challenges has been observed. To address the issue of burning wheat straw after using a combine harvester for wheat crops, scientists at UBKV introduced Happy Seeder Technology for jute seeding. This successful demonstration, likely the first in India, showcased the feasibility and eco-friendliness of sowing jute without burning wheat straw. The results indicated increased productivity and profitability, encouraging further adoption of this climate-smart technology. Jute's resurgence is also attributed to environmental concerns and consumer preference for natural, biodegradable products over synthetic alternatives.

Keywords: Jute, Happy Seeder Technology, Terai Region, UBKV, Eco Friendliness, Biodegradable product.

Introduction

The Happy Seeder, used for the first time in India to plant jute, was introduced by the Satmile Satish Club as part of the ACIAR-funded SRFSI project in West Bengal around 2016. Initially facing challenges in convincing farmers to adopt zero tillage for jute cultivation, successful demonstrations in Coochbehar and Mathabhanga villages, with support from the Assistant Director of Agriculture and UBKV faculties, led to widespread acceptance. Line sowing with the Happy Seeder proved effective in addressing weed concerns and reducing labor requirements, making it appealing to farmers. This technology, now adopted by many farmers in West Bengal, is not only bringing satisfaction and cost savings but also positive environmental impacts.

Description

The participatory demonstrations conducted in various villages like Hawargari , Ghughumari, Barashakdal, Barsimulguri, Patakamari and Latapota of Coochbehar and Kalaberia Banabasti, Dakshin Kamsing and Purba Kathalbari of Alipurduar districts of West Bengal during the pre-kharif seasons of 2018 and 2019 showcased the benefits of adopting Conservation Agriculture (CA) practices in jute cultivation. The implementation of standardized Conservation Agriculture (CA) practices for jute cultivation in West Bengal involved the introduction of the Happy Seeder technology and the development of CA-jute protocols by UBKV and CIMMYT. Farmers were educated about the benefits of CA practices through group meetings, skill development trainings, and field days. Demonstrations showed that Zero Tillage (ZT) resulted in higher fiber yields compared to Conventionally Tilled (CT) plots, with better plant growth and population observed in ZT plots. Precision seeding machines helped maintain optimal plant populations, leading to improved resource utilization and increased yields. On average, ZT-jute plots saw a yield increase of 25.83-27.83%. The successful adoption of CA practices in jute cultivation has the potential to enhance productivity and sustainability in the region.

Why Happy Seeder Technology in Jute Cultivation ?

In an effort to address the issue of residue burning caused by the use of combine harvesters in wheat cultivation preceding jute crops, scientists at UBKV successfully calibrated the Happy Seeder for jute seeding, making it the first attempt in India to sow jute using this technology. Demonstrations of jute cultivation under Conservation Agriculture (CA) practices, including the use of multi-crop planter and Happy Seeder, were conducted over the past three years. Prior to the demonstrations, group meetings were held in villages to discuss the challenges of jute cultivation and the benefits of adopting CA practices. Interested farmers were identified with the help of government officials from the Department of Agriculture, Government of West Bengal. Selected farmers received skill development training before implementing the program, and field days and extension programs were organized to showcase the benefits of CA-jute cultivation. In 2020, farmers who had been practicing multi-crop planter (MCP)-jute under zero tillage conditions for two years were selected for demonstrations using the Happy Seeder technology.

Jute sowing through Happy Seeder Technology in Wheat residues

Jute crop is coming out through residues

Harvesting of thicker stem jute crops under Happy seeder Sowing

Farmer become happy to get more yields by using Happy Seeder Technology

How Does happy Seeder Works

The Happy seeder is attached to the tractor through a three point linkage system. After Operation of Happy seeder: hitching with the tractor, the PTO shaft of tractor is attached to the PTO shaft linkage of machine which gives drive to the flail. As the drive wheel moves the fertilizer and seed metering device, the seed and fertilizer starts dropping in furrows/slits opened by furrow opener. The flail starts operating through the PTO shaft and the residue coming in front of tynes is cleaned by these rotating flails.

Benefits of Happy Seeder Technology

- It reduced cost of cultivation without yield penalty.
- Timely sowing is assured
- Crop residues help to retain moisture and helps in temperature regulations.
- Less weed emergence for which pre-plant or pre-emergence herbicides application may be skipped (which is compulsory for MCP-jute).
- Gradual decomposition of crop residues helps to improve physical properties of soil in addition to adding a substantial quantity of nutrients which otherwise lost by burning.
- Sowing of jute without burning wheat straw makes it an ecofriendly climate smart technology.

Summary

Happy seeder technology in jute is bringing huge satisfaction to Bijay Roy, Hosenara Bibi, Ramen Barman, Bhabatosh Patwary and many more demonstration farmers in terai region of West Bengal in terms of good yields and higher profits along with significant positive effects on environmental impacts. Even under this covid 19 pandemic, the demonstration plots were visited by many nearby and distant jute farmers. The cost of cultivation has been substantially reduced in this technology which attracted many more farmers and we hope in subsequent years, this technology would reach many jute farmers of the region with active support from the Government.

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Imbalanced Fertilizer Application

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Abstract

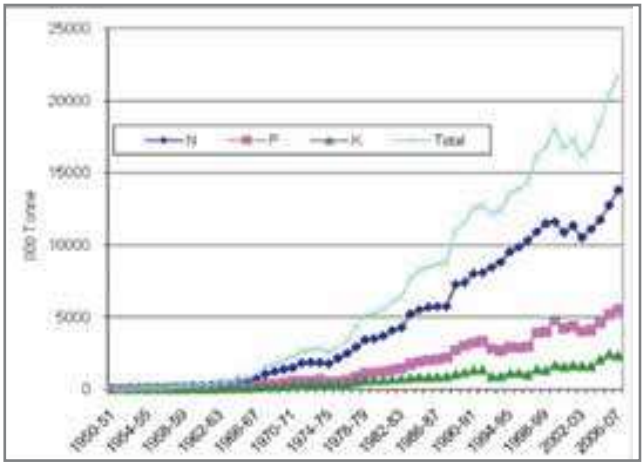
Fertiliser use in India has seen higher growth rates than any other major agricultural input in the last four decades. There has recently been a serious slowdown in the growth of fertiliser use, primarily caused by supply-side constraints. The composition of fertiliser use has also resulted in serious imbalances in the use of major plant nutrients, which could cumulatively have a detrimental effect on soil health and crop productivity. The main cause of the imbalance is found in the price distortions resulting from the structure of fertiliser subsidies. The trend in the prices of agricultural products offers scope for reducing and rationalising fertiliser subsidies to boost fertiliser production and reduce nutritional imbalances.

Keywords: Balanced fertilization, Plant Nutrients, Soil Fertility.

Introduction

Role of fertiliser in increasing agricultural productivity and production during the last five and half decades has been well documented. A very close association is observed between growth of fertiliser and crop productivity in almost all the states of the country. No input in agriculture has seen as much growth as witnessed in the use of fertiliser in the recent history of agriculture. Fertiliser consumption was around 67 thousand tonnes in early 1950s and it picked up very fast during mid 1950s. By early 1960s consumption of NPK crossed 400 thousand tonne and at the time of onset of green revolution consumption of fertiliser approached 1 million tonne. On per hectare basis, fertiliser consumption in India increased from 0.5 kg in early 1950s to 7 kg at the time of onset of green revolution in 1966-67. It is worth mentioning that in the pre green revolution post independence period

fertiliser consumption remained quite low but its growth rate was higher than that of crop production. The main reason for low use of fertiliser in pre green revolution period was that the use of this input was confined to a few cash crops. Principal crops like cereals and pulses which occupied more than 70 percent of gross area under cultivation were hardly applied inorganic fertiliser. Such crops were grown mainly for subsistence purpose based on low input requiring technology Traditional varieties of crops grown at that time were not responsive to chemical fertilisers



Growth and Imbalances in Fertiliser Use

Fertiliser has to play an important role in future growth of Indian agriculture as the net area available for cultivation is shrinking due to rising demand for new houses, factories, infrastructure and other commercial uses. It seems that practically all increase in farm output in future has to come from the increase in productivity. This would require improved technology and increased application of yield enhancing plant nutrients. A large number of studies have shown that most of the increase in foodgrain output during the first two decades of green revolution are attributable to chemical fertilisers. Therefore, growth in fertiliser consumption in the country is of paramount importance to raise agricultural production and to meet future requirements of the Country.

More in the news

- Prices of all the fertilizers except **muriate of potash (MOP)** have come down.

The **World food index** is a weighted average of global prices of a representative basket of food commodities over a base period value, taken at 100 for 2014-2016.

FAO FOOD PRICE INDEX

(2014-2016=100)

ALL-INDIA CONSUMPTION OF FERTILISER PRODUCTS

	UREA	DAP	MOP*	NPKS	SSP
2009-10	266.73	104.92	46.34	80.25	26.51
2010-11	281.13	108.7	39.32	97.64	38.25
2011-12	295.65	101.91	30.29	103.95	47.46
2012-13	300.02	91.54	22.11	75.27	40.3
2013-14	306	73.57	22.8	72.64	38.79
2014-15	306.1	76.26	28.53	82.78	39.89
2015-16	306.35	91.07	24.67	88.21	42.53
2016-17	296.14	89.64	28.63	84.14	37.57
2017-18	298.94	92.94	31.58	85.96	34.39
2018-19	314.18	92.11	29.57	90.28	35.79
2019-20	336.95	101	27.87	98.57	44.03
2020-21	350.43	119.11	34.25	118.11	44.89
2021-22	341.8	92.72	24.56	114.79	56.81
Apr-Nov 21	217.53	70.47	19.26	85.88	42.67
Apr-Nov 22	232.53	83.53	11.23	69.96	38.7

*For direct application, excluding supply to complex fertiliser units.
Source: Fertiliser Association of India. (All figures in lakh tonnes)

Issue:

Two ambitious schemes of the incumbent government - Soil Health Card and mandatory neem-coating of urea - were supposed to promote balanced use of fertilisers.

Urea:

However, far from weaning farmers from urea, the annual consumption of this nitrogenous fertiliser has risen from 30 to 35 million tonnes (mt) in the last five years.

- Urea has 46% nitrogen (N), while DAP contains 46% phosphorus (P) plus 18% N and MOP has 60% potassium (K).

DAP:

There is another fertiliser — di-ammonium phosphate or DAP — that is seeing a similar phenomenon of over-application.

Di-ammonium phosphate or DAP: intermediates/raw materials:

Phosphoric acid, ammonia, sul-phur and rock phosphate.

In other words, instead of balanced use of plant nutrients based on soil testing and specific crop requirement, Indian farmers are effectively applying just urea and DAP - both high-analysis fertilisers containing 46 per cent N and P respectively.

Outcome

- The effects of these – the current NPK ratio is about 13:5:1, as against the ideal 4:2:1 – would ultimately show up in crop yields.
- Plants, like humans, will respond poorly to fertilisers if only one or two nutrients are given in excess

Impact

- Significant improvement in the overall availability of fertilizers except for MOP.
- Significant reduction in the government's subsidy bill on fertilizers.

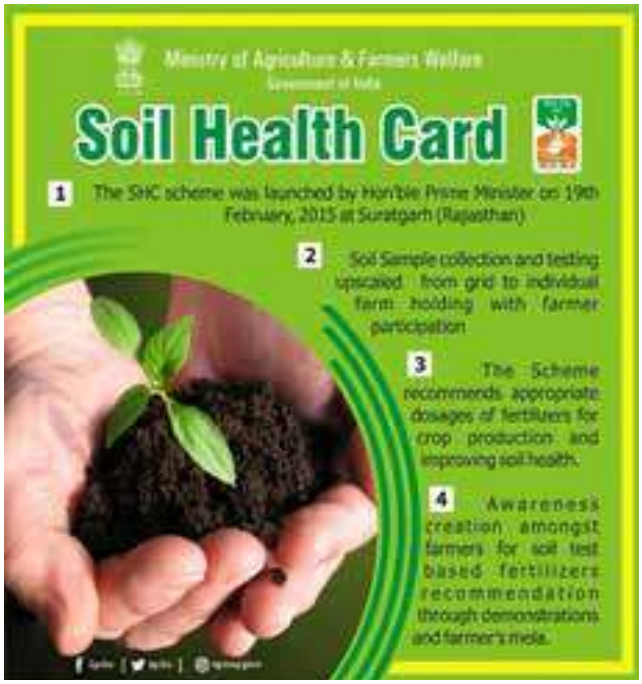
Fertiliser growth at all India level

Fertiliser use increased by more than 19 percent during 1950-51 to 1960- 67. The reason for such a high growth rate was that fertiliser use in the base was quite low. This growth rate raised per hectare use of fertiliser to 7 Kg/ ha by the year 1966-67 which is the beginning year of green revolution in India. Fertiliser use increased by more than 10 percent per year during initial years of green revolution which raised per hectare use of NPK to 32 Kg by the year 1980-81. The serious slowdown started after 1991-92 which was further exacerbated after 1999-2000.

Government initiatives to rationalise fertiliser use:

1. The Soil Health Card Scheme:

Soil Health Card Scheme is a scheme launched by the Government of India on 19 February 2015. Under the scheme, the government plans to issue soil cards to farmers which will carry crop-wise recommendations of nutrients and fertilisers required for the individual farms to help farmers to improve productivity through judicious use of inputs.



2. Neem Coated Urea (NCU):

It is a fertilizer and an agriculture scheme is supported by the Government of India to boost the growth of wheat and paddy.

- Apart from the increase in yield, Neem Coated Urea application has other use full effect on paddy and wheat crops.
- Farmers have observed that the incidence of white ants was reduced with the use of Neem-coated Urea in wheat crop. This is because of

the fragrance of Neem oil that on dissolution was released in the standing water in the standing water and insecticidal properties of Neem

‘One Nation, One Fertilizer’ scheme:

- Under the scheme, all fertiliser companies, State Trading Entities (STEs) and Fertiliser Mar-keting Entities (FMEs) will be required to use a single “Bharat” brand for fertilisers and logo under the PMBJP.
- The new “Bharat” brand name and PMBJP logo will cover two-thirds of the front of the fertiliser packet.

- Indian Farmers Fertiliser Cooperative (IFFCO) Limited has produced the liquid nano urea.
    1. It is cheaper than conventional urea.
    2. 80-85% more efficient.
    3. It has a shelf life of a year

Conclusion

They supplement naturally available nutrients in the soil and also provide additional nutrients that are required for specific types of crops. A distinct advantage of compounded NPK fertilizers is that they can be formulated based on the type of crop and soil.

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Regenerative Agriculture in India and it's Works

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There are different kinds of methods to sustainable farming. With ever-growing awareness on the need to conserve resources and promote healthier eating habits, individuals and farmers are exploring methods and approaches such as:

- Organic farming
- Nuclear technology
- Agroforestry
- Biofertilizers and so on

One interesting approach to agriculture is **"Regenerative Farming".**

What is Regenerative Farming?

It is often used as an umbrella term for different ways in which farmers can help:

- Protect and increase biodiversity
- Improve soil fertility and health
- Regenerate topsoil
- Biological sequestration
- Collect and conserve seed

Simply put, regenerative agriculture helps in making a positive impact on the global ecosystem.

Core principles

Depending on the location and types of crops being grown, a farmer can practice regenerative agriculture by incorporating all or a few of the following methods:

- Organic farming
- Crop rotation
- Composting
- Permaculture
- Biochar
- Managing grazing habits of livestock
- No-till policy

- Using cover crops
- Seed saving to name just a few

Each method has specific advantages to offer. For instance, moving cattle around judiciously prevents overgrazing of land and allows the vegetation to increase naturally. No-till method reduces soil erosion and helps water to percolate into the soil as well.

Adoption of these methods results in benefits such as healthier and 'stronger' soil that is climate resilient and has the ability to retain captured carbon. This is also known as biological sequestration or bio sequestration which promotes the storage of carbon in plants.

It is interesting to note that much of regenerative farming work is centred around carbon. Soil that is rich in carbon is not only healthier but is also capable of retaining larger amounts of water. This carbon-rich soil also helps plants with greater amounts of nutrients. With regenerative agriculture, a farmer actually helps capture carbon from the atmosphere and sequester or 'lock' it into the soil.

Take for instance, the use of organic compost - this fertilizer does not depend on traditional manufacturing which goes into making chemical fertilizers.

Regenerative Agriculture in India

Kerala is seeing success in this sphere. With the knowledge of Vriksha Ayurveda; an ancient system of knowledge on agriculture science; and **Agro Ecological Farming Systems (AEFS)** the state is aiming to make sustainable farming the norm rather than an exception. 84,000 hectares of land is slated for conversion to eco-friendly cultivation.

Madhya Pradesh's cotton farmers are working with Cotton Connect and receiving training and support for using methods such as green manuring, pasture and cover cropping to try growing different types of crops and in using GMO-free seed for regenerative cotton crop.There are various ways in which farmers can shoulder the onus of growing healthy food in an earth-friendly manner and surely we, as consumers of agriculture produce, can do our bit in supporting the adoption and development of gentle methods like regenerative agriculture which are hoping to take agriculture back to its deep connection with Mother Nature.

The regenerative agriculture leads to the regeneration of healthy topsoil, capable of producing high quality nutrient dense food, increases biodiversity both above and below the soil surface, while increasing water holding capacity and sequestering carbon." It completely excludes the use of synthetic inputs (such as chemical fertilizers, pesticides, hormones, feed additives etc.); make use of nature-based inputs like compost, on-farm organic waste, biofertilizers, bio stimulants, biochar, mineral grade rock additives etc.; and completely rely upon practices like crop rotation, crop diversification, use of crop residues, cover crops, green manure, perennials, integration of livestock and planned grazing. In the second method, emphasis is laid on the regeneration of topsoil and use of local produces.

Is today's food comparable to the crop nutritional quality of 50 years ago?

According to the studies of Mayer et al. 2022 in the last 50 years nutrient quality and density of our food is decreasing gradually. Crop breeders are often solely held responsible for this because of their mental orientation towards enhancing the yield and biotic and abiotic stress tolerance of crops as much as possible while neglecting other important traits like taste and nutrient density. However, we must not forget the unchecked, irresponsible use of toxic, synthetic fertiliser and continuous depletion of top soil rendering it lifeless. Soil life is comprised of different soil e.g., variety of algae; micro, meso and macro fauna and fungi; protist; archaea; actinomycetes; bacteria. The latter group is combinedly called soil microbiome. They often harbour a symbiotic relation with plants aboveground. Many of these microbiome aids to decompose the complex soil organic matter thus making simple nutrients available to plants. In exchange, plants give them various soluble sugary exudates produced by photosynthesis. Plants thus accumulate necessary microbiomes in their rhizosphere, gets nutrients and sustain these microbiomes through sugars thereby maintaining a healthy relationship.

Future-proofing with Regenerative Agriculture

Increased consumer awareness and government initiatives promoting sustainable agriculture have fuelled the global growth of regenerative farming practices. According to a report by Bluewave Consulting, the global regenerative agriculture market is projected to expand at a CAGR of 14.6 per cent between 2023 and 2029, reaching a value of $21.03 billion by the end of the decade. This growth is driven by the rising demand for organic food and the recognition of the environmental challenges associated with traditional farming methods. India's agricultural sector is also embracing regenerative agriculture, as evidenced by government commitments.

The Union Budget 2023, outlines plan to support one crore farmers in transitioning to natural farming, over the next three years, along with the establishment of 10,000 **Bhartiya Prakritik Kheti** Bio-Input Resource Centres for promoting organic farming. A NITI Aayog report estimates that 2.5 million Indian farmers are already implementing regenerative agricultural techniques. With projections of expanding organic farming to 20 lakh hectares in the next five years, and 12 lakh hectares falling under the **Bharatiya Prakritik Krishi Paddhati Programme (BPKP)**, regenerative agriculture is poised to play a significant role in India's agricultural landscape.

Moreover, advancements in technology are facilitating the implementation of restorative practices and efficient resource management, further bolstering the prospects of sustainable agriculture. With long-term benefits and potential for positive impact, regenerative agriculture is set to reshape India's agricultural practices in the coming years.

Farmers in India face numerous challenges such as unpredictable weather patterns, lack of modern technology and machinery, insufficient access to credit and loans, low market prices, and soil degradation. Other challenges include the use of outdated farming methods, water scarcity, and a shortage of skilled labour. These factors contribute to the overall struggle for farmers to maintain a sustainable livelihood.

Drawing from decades of research, regenerative agriculture uses farming principles designed to mimic nature. To build healthy soils and fertile, thriving agro-ecosystems, this approach incorporates a range of practices like agroforestry and well-managed grazing. Benefits of these practices include richer soil, healthier water systems, increased biodiversity, climate change resilience, and stronger farming communities.

To celebrate the ongoing work of individuals and organizations dedicated to healing agro-ecosystems around the globe, Food Tank is highlighting these **18 organizations building** a global grassroots movement for better agriculture.

1. Aranya Agricultural Alternatives
2. Grounded
3. Kiss the Ground
4. RegenAG
5. Regeneration International
6. ReNature

Carbon Credits: A Game Changer for Sustainable Agriculture

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Abstract

Carbon credits are a cornerstone of global efforts to mitigate climate change by incentivizing emissions reductions and promoting sustainable practices. These credits represent a unit of measurement for the reduction, capture, or removal of greenhouse gases from the atmosphere. The concept revolves around assigning a financial value to each ton of carbon dioxide equivalent (CO2e) emissions avoided or removed.

Carbon credits operate within cap-and-trade systems or voluntary carbon markets, where entities can buy and sell these credits to comply with emissions regulations or voluntarily offset their carbon footprint. The issuance and trading of carbon credits provide economic incentives for industries and individuals to invest in emission reduction projects, such as renewable energy generation, afforestation, and energy efficiency initiatives.

Key to the effectiveness of carbon credits is their ability to facilitate emissions reductions where they are most cost-effective, encouraging innovation and investment in sustainable technologies and practices. However, challenges such as ensuring the integrity and additionality of offset projects, as well as addressing issues of equity and distribution, remain important considerations in the carbon credit landscape.

Overall, carbon credits play a vital role in driving the transition to a low-carbon economy, promoting environmental stewardship, and advancing global climate goals.

Keywords: Carbon-credit, carbon dioxide, agriculture

Introduction

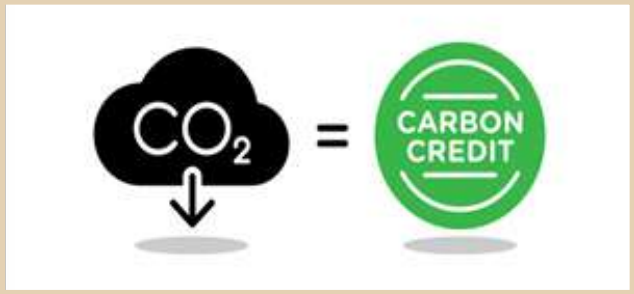
Carbon credits in agriculture represent a proactive approach towards mitigating climate change while promoting sustainable farming practices. Essentially, carbon credits serve as a financial incentive for farmers to adopt eco-friendly methods that reduce greenhouse gas emissions and sequester carbon dioxide from the atmosphere.

Carbon credits are a fundamental component of global efforts to combat climate change. These tradable permits represent a unit of greenhouse gas emissions and serve as a mechanism to incentivize emission reductions and promote sustainable practices. By assigning a financial value to emissions reductions or removals, carbon credits create economic incentives for businesses and individuals to invest in cleaner technologies and initiatives. Through compliance and voluntary markets, carbon credits play a crucial role in driving the transition to a low-carbon economy while supporting environmental conservation and sustainable development goals worldwide.

How Do Carbon Credits Work?

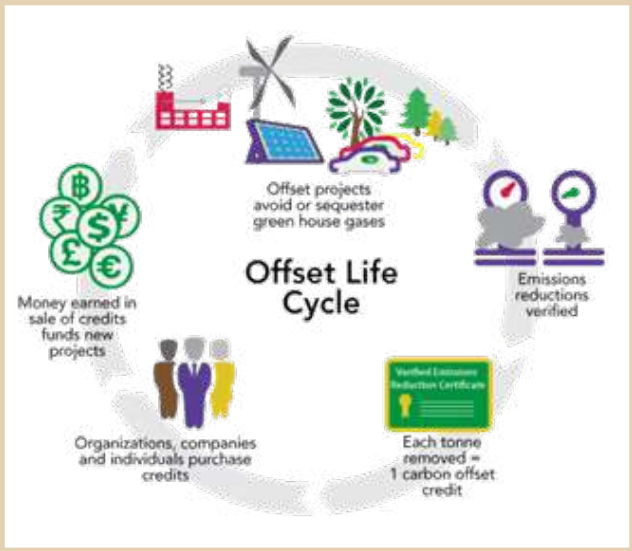
The ultimate goal of carbon credits is to reduce the emission of greenhouse gases into the atmosphere. As noted, a carbon credit represents the right to emit greenhouse gases equivalent to one ton of carbon dioxide. According to the Environmental Defense Fund, that is the equivalent of a 2,400-mile drive in terms of carbon dioxide emissions.

Companies or nations are allotted a certain number of credits and may trade them to help balance total worldwide emissions. **"Since carbon dioxide is the principal greenhouse gas,"** the United Nations notes, **"people speak simply of trading in carbon."**



Application of Carbon Credits

Carbon credits in agriculture offer a promising avenue for mitigating climate change while promoting sustainable farming practices. One application involves carbon sequestration through practices such as agroforestry, conservation tillage, and cover cropping, which enhance soil health and organic carbon storage. Additionally, methane capture from livestock operations and manure management can



generate carbon credits. These credits incentivize farmers to adopt practices that reduce greenhouse gas emissions and enhance carbon sinks, contributing to climate resilience and sustainable food production. Moreover, carbon credits provide a potential revenue stream for farmers, fostering economic viability while addressing environmental challenges in the agricultural sector.

Acknowledgement

We would like to thank Dr. Pragun Paul sir and Dr. Solanki Sarkar ma'am for their expert advice and encouragement throughout this article, as well as Dr. Saumi Goswami ma'am and Dr. Argha Banerjee sir for their guidance and helping in the topic. And lastly we like to thank also Dr. Madhurima Barik ma'am for guide us and making it a success.

Conclusion

Overall, carbon credits and carbon offsets are both important tools for reducing emissions. Businesses can use these tools to reduce their emissions while also receiving a financial benefit in return.

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Various Approaches for Food Waste Processing and its Management

Rahul Das
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Abstract

Food wastage is a huge crisis arising in today's world. An extensive amount of waste generation has become a serious concern of our society in the past years that affects developing and developed countries equally, and according to the Food and Agriculture Organization(FAO),as much as one-third of the food intentionally grown for human consumption is never consumed and is therefore wasted, with significant environmental, social, and economic ramifications. By wasting food, we also waste the time and energy that we have used to produce the food and as well our natural resources and the limited available agricultural land will be used up which could be handled in a much better and affects the environment including the overall greenhouse gas emission. Solid wastes from food processing and crop production have been incorporated into plastics for packaging production (e.g., films, trays) with the aim of finding solutions for plastic reduction and agricultural waste management. The reuse and reintroduction of agricultural waste as an input into the production cycle creates a semi closed loop for non-biodegradable plastic. The above shows the potential of agricultural waste in food packaging.

Keywords: Food waste, waste management, anaerobic digestion, waste disposal, recycling, waste treatment, solid waste.

Introduction

Every year approximately 1.3 billion tons of food which equals one third of total food production worldwide is lost or wasted. Food waste is predominantly challenging in industrialized countries that have a major contribution to household food waste. As food production is resource intensive, food loses and

wastes indirectly cost the environment and the major effect of this can be seen in the environmental burden in the form of, water and air pollution, deforestation, soil erosion as well as greenhouse gas emissions that occur during the processes of food production, stowage, and waste-management. The Global Food Report, by the Institute of Mechanical Engineers, has claimed that there could be a whopping three billion to be fed with food by the end of this century. Hence, it lies in our hands to focus in producing food in safer quantities by availing the best technologies.

Food waste is generally defined as the loss of materials planned for human ingestion that are afterward either discharged, which thereby get contaminated, degrade and are subsequently lost. As per Food and Agriculture Organisation(FAO) of United Nation, food is “Any modification in the accessibility, edibility, wholesomeness or quality of eatable material that averts in from being eaten by people”.

Food Waste Processing

1. Enzymes Production From Food Waste and Their Application

The grave environmental, social, and economic concerns over the unprecedented exploitation of non-renewable energy resources have drawn the attention of policy makers and research organizations towards the sustainable use of agro-industrial food and crop wastes. Enzymes are versatile biocatalysts with immense potential to transform the food industry and lingo cellulosic bio-refineries. Microbial enzymes offer cleaner and greener solutions to produce fine chemicals and compounds. The recent developments in bio catalytic systems are designed to either increase the catalytic capability of the commercial enzymes or create new enzymes with distinctive properties.

2. Value Added Products From Food Waste

Food is a fundamental component necessary for the survival and sustenance of life. The valorization of food waste through the production of value-added products based on bioactive compounds is a pioneering solution for reducing waste and generating new economic possibilities. These bioactive compounds, such as polyphenols, vitamins, minerals, and prebiotics, bring numerous health benefits and increase the value of products.

3. Fermented Foods And Their Production

Fermented foods are defined as “foods or beverages produced through controlled microbial growth, and the conversion of food components through enzymatic action”. Many foods have historically undergone fermentation, including meat and fish, dairy, vegetables, soybeans, other legumes, cereals and fruits. Fermented foods may be produced by the action of fermentative microorganisms naturally found on the raw materials or in the production environment. However, to improve reliability “starter cultures” are frequently used. Starter cultures may be pure or mixed cultures.

Food Waste Management

1. Prevent Food Waste At Source And Supply Chain

Food waste starts right from production, continues throughout the supply chain till consumption .One of the ways of reducing food waste in restaurants is purchasing in line with the daily sales. Storage, too, plays an important role in food waste prevention. Storing food at the right temperature slows down the bacterial growth, increasing longevity of the food.

2. Redistribute Excess

Social activists and NGOs have always encourage restaurants, supermarket owners to distribute the excess amount of food. Food manufacturers and retailers can contact food distribution organisations for the purpose of food donation. Distributing excess food on shelf can serve two purposes with one stonefeeding the hungry and reducing food loss.

3. Feed the Animals

Fermented foods are defined as “foods or beverages produced through controlled microbial growth, and the conversion of food components through enzymatic action”. Many foods have historically undergone fermentation, including meat and fish, dairy, vegetables, soybeans, other legumes, cereals and fruits. Fermented foods may be produced by the action of fermentative microorganisms naturally found on the raw materials or in the production environment. However, to improve reliability “starter cultures” are frequently used. Starter cultures may be pure or mixed cultures.

4. Organize Your kitchen

Keeping your kitchen organized can help you avoid duplicate buying, therefor helping in food waste reduction. Store spices, cereals, pulses and beans in proper airtight containers.

This way, it will be more easy to reach and you can always get what you want, without any hunting. And we lead to efficient Food Management.

Conclusion

Food waste has serious and environmental implications, but many of us don’t think twice about it. It is clear that food waste is caused by people in developed countries not valuing food, lack of technology and poor infrastructure in developing countries, poor distribution methods of food, as well as waste during cultivation and harvest. It has a significant effect on environment, economy and even has social impact.

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Application of Green House to Avoid Biotic Stress

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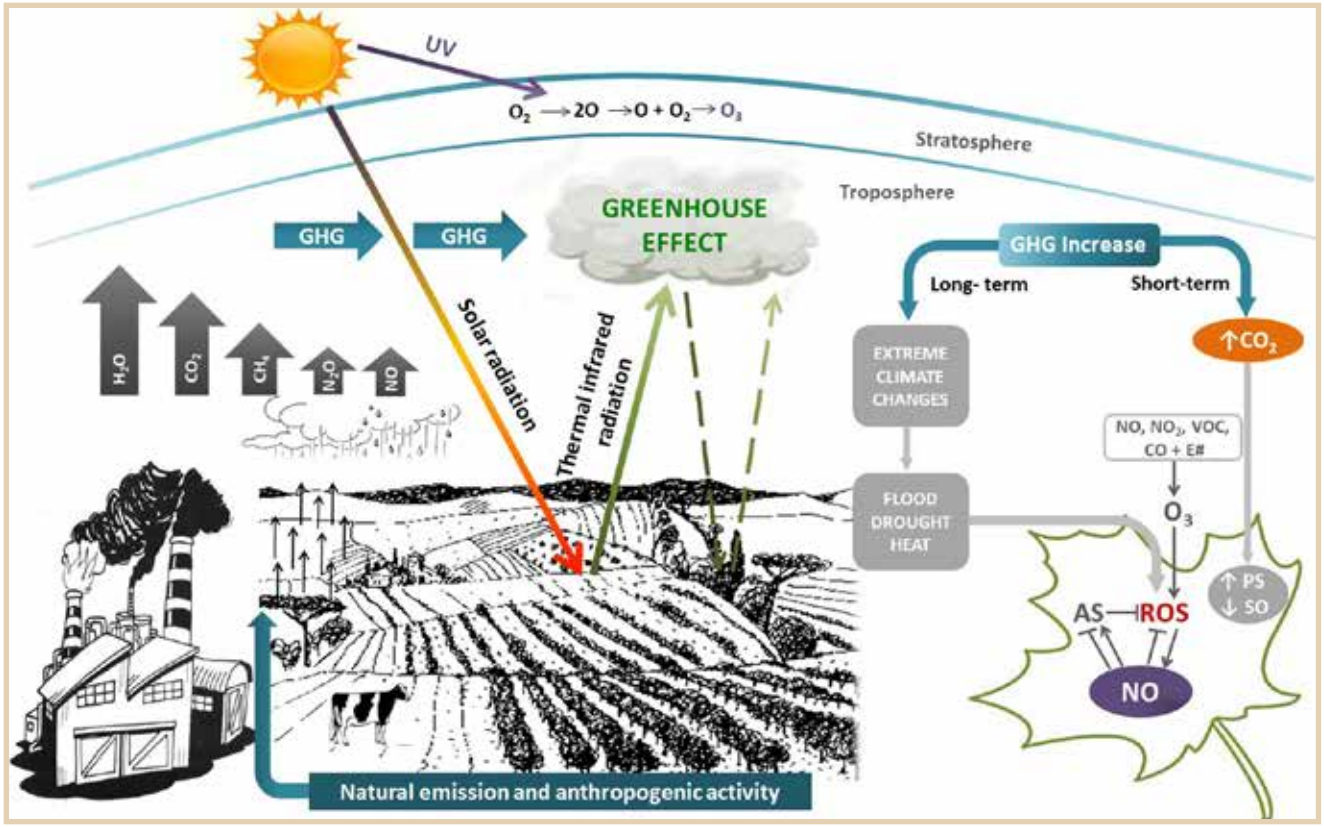


Abstract

Biotic stress, caused by pests, diseases, and weeds, poses a significant threat to agricultural productivity worldwide. As traditional pest management strategies face challenges due to factors such as resistance development and environmental concerns, there is a growing interest in alternative approaches. Greenhouse technology presents a promising solution by providing a controlled environment that can effectively mitigate biotic stress factors. This review explores the application of greenhouses in managing biotic stress through various mechanisms such as physical barriers, biological control agents, and integrated pest management strategies. Additionally, it discusses the environmental and economic benefits associated with greenhouse cultivation in reducing reliance on chemical inputs and enhancing crop resilience. Furthermore, the potential challenges and future directions for optimizing greenhouse technology to combat biotic stress are highlighted. Overall, this review underscores the importance of integrating greenhouse technology into modern agricultural practices to ensure sustainable food production in the face of increasing biotic stress challenges.

Keywords: Greenhouse technology, biotic stress, pest management, integrated pest management, sustainable agriculture, crop resilience.

Introduction

Crop plants are continuously exposed to multiple abiotic and/or biotic stressors, leading to hindered growth and development and, subsequently, loss of productivity and crop quality. Recent climate model projections show that the Mediterranean basin is one of the regions that will be influenced mostly by climate change (IPCC, 2019). For this reason, improvement of the tolerance, of relevant crops, to water deficit and heat crucial to adapt to climate changes. In this context, reducing crop yield losses and increasing agricultural water use efficiency (WUE) in the Mediterranean region, which is one of the highest crop‐producing areas in Europe, are a priority. Hence, improving plant response to adverse environmental conditions is in fact particularly important for sustainable food security. Upon water deficit and salinity conditions, as well as under extreme temperatures, plants adapt through physiological and metabolic responses, mostly regulated at the transcriptional level (Gupta et al., 2020; Hirayama & Shinozaki, 2010). Recent evidence show that plants respond to combinations of stress by activating a complex transcriptional module, which differs from their single‐stress responses and is related to the actual environmental conditions encountered (2014). Consequently, considerable attention should be directed toward enhancing plant tolerance to combinations of multiple abiotic and biotic stresses, hence approaching real‐life agricultural conditions. Understanding the mechanisms involved in plant responses to multiple simultaneous stresses is therefore crucial for the development of broad‐spectrum strategies applicable for the improvement of stress‐tolerance in crops. Despite the fact that several advancements in the development and application of sustainable technologies to improve plant resilience have been made in the last decade, a gap in the knowledge between controlled conditions and open field studies is still present. This is probably due to the complexity of the natural environment that can “mask” the effects, but also to the difficulties of studying complex plant traits, i.e. root traits, in the field. To fill in this gap is a relevant challange for present, as well as for future researchers. In this review, diverse strategies used to improve plant tolerance and resilience to abiotic and biotic stresses are described and discussed based on recent research.

Light control techniques

Light is very essential for growth and development of the plants. It also influences seed germination and dormancy. Albeit a noteworthy assemblage of exploration exists that proposes light quality impacts plant advancement and development altogether. When other abiotic factors like temperature, humidity and CO2 etc. are optimized, an optimum light intensity and duration can maximize the photosynthesis.

1 Maximization of sunlight in greenhouse

2. Greenhouse structural frame design

To allow greater light intensity inside the greenhouse structural frame should be thin and its roof should be widely spaced. Use of white paint or any reflectant for the frame reflects the solar light into the greenhouse instead of absorbing it. Greenhouse having curve roof helps in better transmission of light than the straight roof.

Covering material

Glass, single layer PE film and double layer PE film has 90%, 88 % and 77% capacity to transmit the sunlight inside.

Cleaning of covering material

Gradually transmission capacity of light reduces due to deposition of dust etc. So cleaning of the covering material before cloudy period can help to maintain the transmissivity of the covering material.

Position of windbreak

Windbreaks should be placed in such a way that it should not cast shadow in the greenhouse.

Ventilation

Natural ventilation frameworks can be extremely effective in mild climates, and during winter in warm atmospheres. Nonetheless, they are not effective during summer in the tropical and subtropical locales where daytime temperatures are higher than that required for keeping up greenhouse cultivation conditions. Ventilation-enlarged cooling plans are utilized in such situations . For instance, McCartney and Lefsrud (2018) did handle field trials of natural ventilation-expanded cooling greenhouse in Barbados. They recognized dynamic cooling as a need alongside ventilation for all year growing of crops in these districts and demonstrated that this technique utilized considerably less power than customary cooling strategies. But in case of fan-forced artificial ventilation blowers, draught and exhausts are used to lower or match the internal air temperature of the greenhouse to that of the ambient air (Kumar et al. 2009; Ganguly et al. 2011).

Shading

Shading has a great role to control the temperature of a greenhouse. Shading is a lot of explicit for the warm regions. In these zones the normal daytime sun oriented radiation just as temperature is a lot higher in contrast with the ideal necessity of the crop development under greenhouse. 40-half decrease of sun oriented radiation in most elevated light intensity periods can diminish temperature beneath the shade to the degree of 20% of outside.

Utilization of shade-net

Generally polyethylene shade net is utilized for this reason and it is applied and worked in similar design and it is utilized for decrease of effect of strong solar radiation. Aside from PE shade net, aluminum/steel shade net is likewise utilized for this reason. Baily (1998) considered the shading impact and reported that an aluminum plated work diminished within temperature by 6oC in contrast with a greenhouse without concealing at an ambient temperature of 33oC.

Humidity control techniques

Humidity influences plant water status, which thusly impacts all cycles identified with happening, including ion movement, water balance and transpiration cooling (Gruda 2005; Bakker 1989). Vapour pressure deficit (VPD) is the main impetus for transpiration in plants and it changes exponentially with change in the surrounding temperature (Will et al. 2014). High temperature and low humidity as a rule increment VPD, which thusly uplifts stomatal resistance and builds transpiration (Santosh et al. 2017). Thus, low VPD is related with diminished plant transpiration, causing lack of hydration, withering and putrefaction (Santosh et al. 2017). Extreme humidity impacts both plant vegetative development and produce quality and improves the likelihood of diseases (Dorais 2001). Kempkes et al. (2017) evaluated three standard dehumidification strategies for greenhouses in cold climates:

(i) exchange of dry, outside air through ventilation,

(ii) condensation on a cold surface and

(iii) using hygroscopic materials to absorb moisture. Humidity-control methods for greenhouses can be classified as active or passive

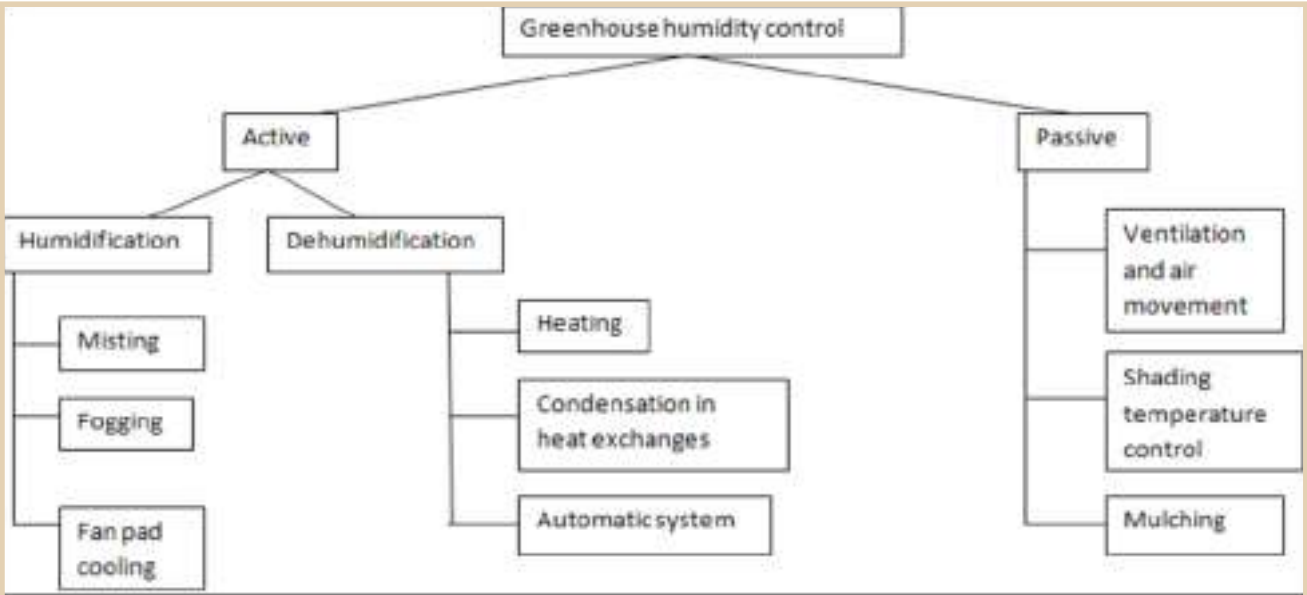


Fig. 3: Active and passive methods of humidity control in greenhouse

Relation between CO2 concentration and photosynthesis

Ghosh (2009) described that plants devour CO2 from air at the hour of photosynthesis, which yields starches for essential development and oxygen that is freed into the air.

Photosynthesis

CO2 + Water (from soil) + Energy (from sun light) → Carbohydrate + O2

Respiration

O2 + Carbohydrate → CO2 + Water + Energy

Vitality produced through respiration is utilized by the plant legitimately for its growth and development. In closed greenhouses, during day time, CO2 level can drop to imperfect level restricting photosynthesis. All in all CO2 level of 300 ppm is adequate to support plant development, yet most plant have the ability to use more prominent convergence of CO2 achieving more fast development. Then again CO2 level under 125 ppm may stop the crop growth. CO2 take-up by green leaf in daylight is a typical proportion of photosynthesis rate. Plant may develop at zero CO2 levels as freed respiration gas (CO2) is used by plants. Be that as it may, development is least and as plant consistent to respire in dim, real loss of weight happen. In closed greenhouses CO2 focus may go up to1000 ppm because of overnight respiration. As daylight becomes available, CO2 level beginnings draining consistently and goes even under 300 ppm much before early afternoon

Advantages of using Green house:

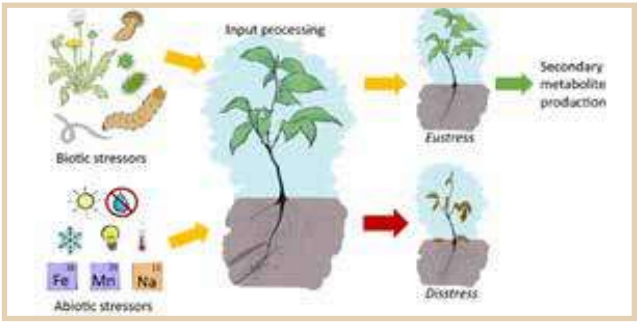
Physical Barrier: Greenhouses act as a physical barrier, preventing pests and pathogens from directly accessing crops. By enclosing the growing area, greenhouses reduce the likelihood of infestations and disease outbreaks.

Temperature and Humidity Control:

reenhouses allow growers to regulate temperature and humidity levels, creating conditions that are less favorable for the proliferation of certain pests and diseases. Additionally, maintaining optimal environmental conditions can enhance plant growth and resilience.

Biological Control:

Integrated pest management (IPM) techniques, such as the introduction of beneficial insects or predatory organisms, can be effectively implemented within greenhouses. Beneficial organisms help control pest populations naturally, reducing the reliance on chemical pesticides and minimizing the risk of resistance development.



Reduced Chemical Inputs:

Greenhouse environments facilitate precision application of pesticides and fertilizers, minimizing off-target effects and reducing environmental pollution. By adopting targeted and judicious use of chemical inputs, growers can effectively manage pests and diseases while minimizing negative impacts on ecosystems and human health.

Crop Rotation and Crop Protection:

reenhouses enable growers to implement crop rotation strategies and deploy physical barriers or exclusion methods to prevent the spread of diseases between successive plantings. This proactive approach helps maintain soil health and reduces the buildup of pathogens over time.

Sensor based abiotic factor control in greenhouse:

Throughout the long term the greenhouse frameworks turned out to be more dependable yet with expanded intricacy. Prior computerized control frameworks considering indoor regulators and clocks gave significant advances in effectiveness and item quality creation cultivators lives easier. Notwithstanding, a significant number of these control gadgets and techniques can't convey the degree of mechanization and proficiency required in the present dynamic and serious condition. A few models have been created to speak to greenhouse situations throughout the long term fluctuating in multifaceted nature and subtleties. As working cost expanded and greenhouses frameworks turned out to be progressively unpredictable, the requests for expanded control ability developed. The PC upset of mid 80s made the chance to address the issues for improved control. In the most recent decade, there has been colossal ascent in the utilization of PC for green houses. So as to plan fruitful control framework understand that these boundaries are reliant (Goswami et al. 2009; Sadati 2008). This venture presents the frameworks that gathers and consequently controls state of greenhouse condition and crops by utilizing various sensors. The current control framework screens temperature, humidity, light intensity, soil moisture. To compensate during the current weak point, this undertaking proposes and gathers the data with respect to these boundaries so the difference in state of crops relying upon inner condition variables of greenhouse can be estimated (Sushma et al. 2012).

Future scope for research:

We found following research outlooks to help the greenhouse farming industry for accepting proper microclimate-control technology: (a) Power saving climate control approaches can be developed. (b) Very few studies have investigated the practical application of these methods. (c) There is scope for research on sensor based climatic control under green house conditions, which is a emerging concept in current agricultural scenario.

Conclusion:

All over the world, crop cultivation in greenhouse has a major role in food security since few decades and its significant contribution can also be expected in near future. Different methods of abiotic factor control under greenhouse system has been discussed here for environmental, social and economic benefits of protected cultivation. Though there are few literature on optimum climate control methods, we conclude that the proper abiotic factor control solutions for particular regions will rely on the increasing the accuracy of methods of climate control and reduced cost of operation.

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Agriculture: A Sustainable Approach for the Future

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B. Sc. (Hons.) Agriculture, 4th year

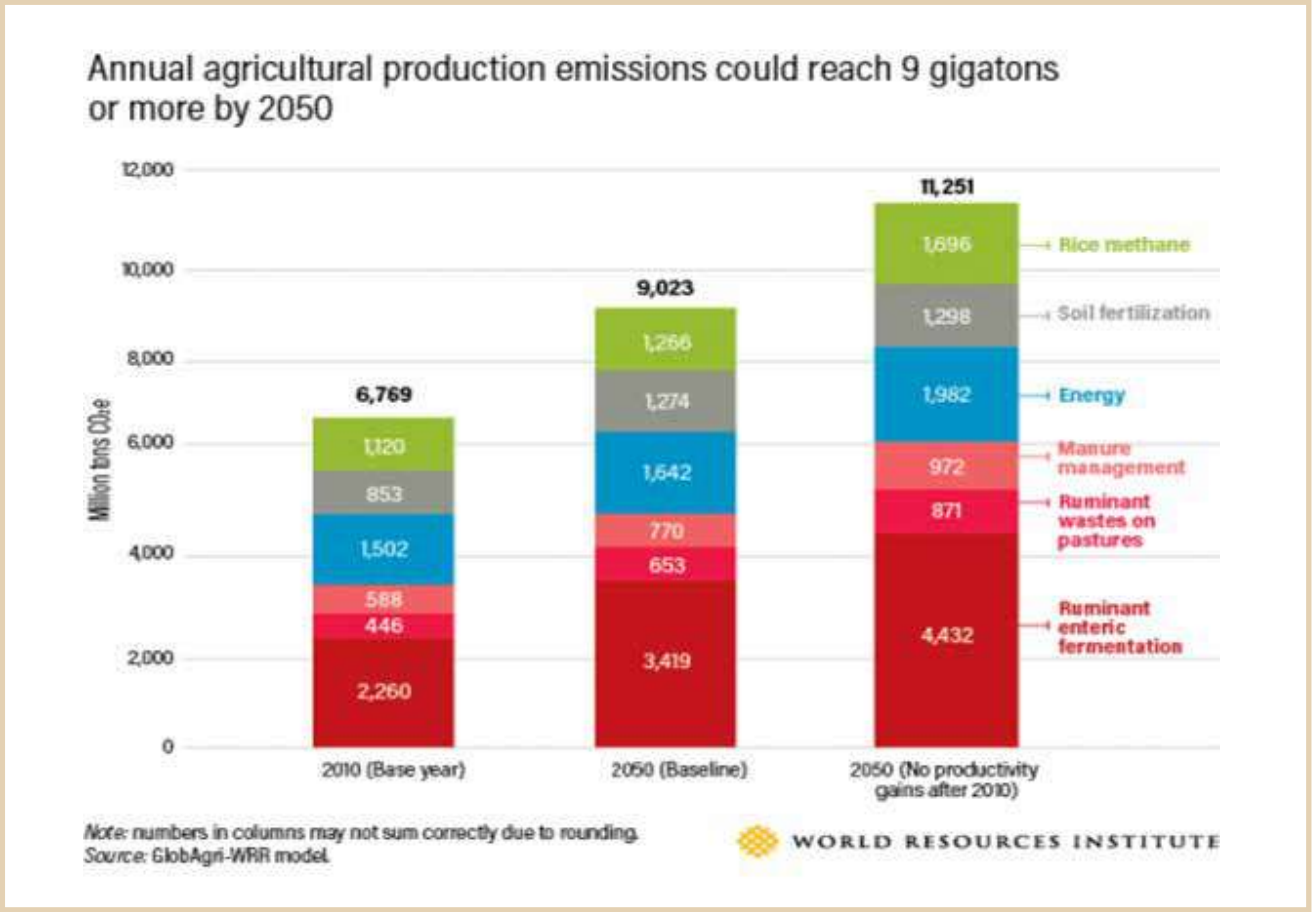
Abstract

With the global population expected to reach 9.7 billion by 2050, the demand for food is expected to increase substantially. However, traditional agricultural practices face challenges such as climate change, land degradation and water scarcity. There is an urgent need to adopt innovative and sustainable approaches in agriculture to ensure food security and environmental sustainability. This article explores various sustainable practices and technologies that can change the future of agriculture, promoting resilience, efficiency and stewardship of the environment.

Keywords: Agriculture, Sustainability, Climate Change, Innovation, Food Security, Environmental Stewardship

Introduction:

Agriculture is the backbone of civilization that provides sustenance and livelihood to billions of people around the world. However, conventional farming methods put enormous pressure on the environment, leading to soil degradation, water pollution, loss of biodiversity and greenhouse gas emissions. As we stand on the brink of unprecedented challenges such as climate change and population growth, it is imperative to rethink our approach to agriculture. Adopting sustainable practices is essential not only to protect the planet, but also to ensure the resilience and productivity of agricultural systems.



1. Climate-smart agriculture
2. Regenerative agriculture practices
3. Precision agriculture and digital technology
4. Agroforestry and sustainable land management
5. Urban agriculture and vertical agriculture
6. Promoting biodiversity and resilience
7. Political support and investment in sustainable agriculture

Climate-Smart Agriculture

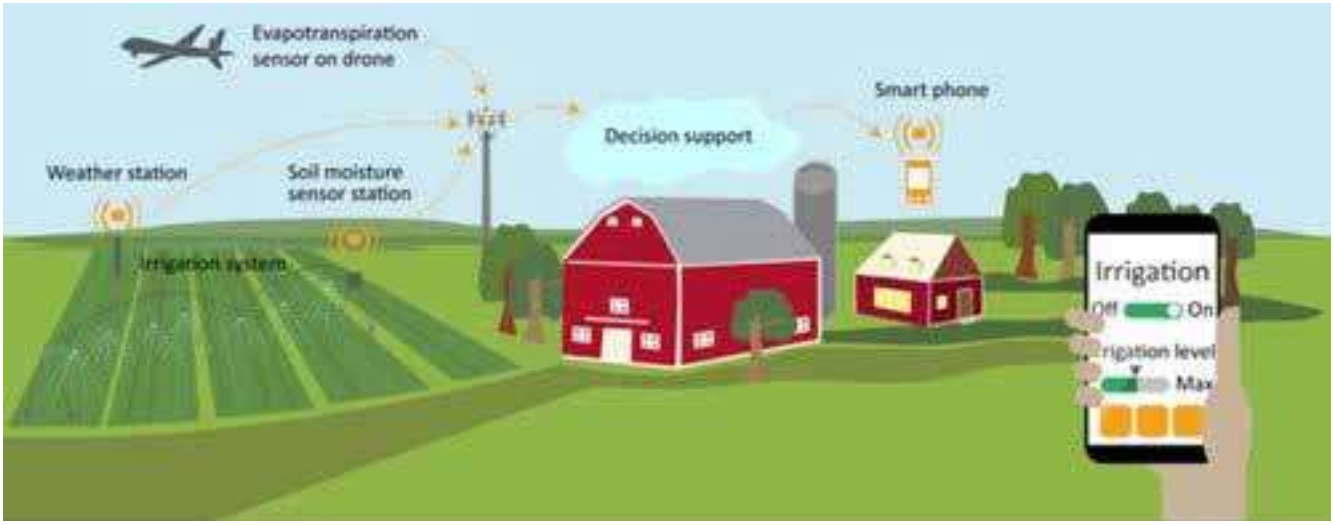
Climate change poses significant challenges to agriculture, altering weather patterns, increasing the frequency of extreme events, and affecting crop yields. Climate-smart agriculture includes practices that reduce greenhouse gas emissions, increase resilience to climate variability, and adapt to changing environmental conditions. Techniques such as conservation tillage, crop rotation and integrated pest management not only reduce the carbon footprint, but also improve soil health and water retention, making farms more resilient to drought and flooding.

Regenerative Agriculture Practices

Regenerative agriculture focuses on restoring and revitalizing the health of ecosystems through holistic agricultural approaches. Practices such as cover crops, crop rotation and composting promote soil fertility, sequester carbon and increase biodiversity. By mimicking natural processes, regenerative agriculture improves ecosystem services, reduces dependence on external inputs, and improves the long-term productivity of farmland.

Precision agriculture and digital technology

Precision agriculture uses advanced technologies such as remote sensing, GPS guidance systems and data analysis to optimize resource use and increase efficiency. By accurately mapping soil variability, monitoring crop health, and automating irrigation and fertilization, farmers can minimize inputs, reduce waste, and maximize yields. Digital platforms and mobile apps further provide farmers with real-time information and decision support tools, enabling them to make informed decisions for sustainable agriculture.



Agroforestry and Sustainable Land Management

Agroforestry integrates trees and shrubs into the agricultural landscape and offers a range of benefits such as improved soil fertility, carbon sequestration and diversified income streams. By planting trees alongside crops or livestock, farmers can increase biodiversity, mitigate climate change and increase resilience to extreme weather fluctuations. Agroforestry systems also provide habitat for wildlife, conserve water resources and contribute to the restoration of degraded land.

Urban agriculture and vertical farming

Urban agriculture has huge potential for enhancing food security, reducing food miles and mitigating the effects of urban heat islands. From rooftop gardens to hydroponic systems, urban farmers are using innovative techniques to produce fresh and nutritious food in densely populated areas. Using stacked layers of crops in a controlled environment, vertical farming minimizes land use, conserves water and maximizes productivity, offering a sustainable solution for urban food production.

Promoting biodiversity and resilience

Biodiversity is essential for the resilience and sustainability of agricultural ecosystems. By promoting different crop varieties, crop rotations, and preserving natural habitats, farmers can improve ecosystem services, suppress pests and diseases, and adapt to changing environmental conditions. Agroecological approaches emphasize the complex relationships between plants, animals and the environment, thereby promoting resilience and stability in agricultural systems.

Policy support and investment in sustainable agriculture

Effective policy frameworks and financial incentives are essential to accelerate the transition to sustainable agriculture. Governments, international organizations and private sector actors must work together to promote research, innovation and knowledge sharing in sustainable agricultural practices. Subsidies for agro-ecological methods, investments in rural infrastructure and market incentives for sustainable products can encourage farmers to adopt environmentally friendly practices and contribute to the global sustainability agenda.

Acknowledgments

We would like to express our gratitude to all researchers, farmers, policy makers and organizations dedicated to the development of sustainable agriculture. Their tireless efforts and contributions are essential to shaping a more resilient, just and sustainable food system for future generations.

Conclusion

In conclusion, sustainable agriculture is the key to solving the interrelated problems of food security, environmental degradation and socio-economic inequality. By prioritizing ecological balance, resource efficiency and social justice, sustainable agriculture practices offer a path to a more resilient and sustainable food system. However, realizing this vision requires a concerted effort by all stakeholders, including governments, farmers, consumers and civil society organizations. Together we can cultivate a future where agriculture not only feeds the world, but also cares for the planet for generations to come.

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PUSA 44 Paddy variety to be banned from next Kharif season: Punjab CM

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Abstract

Rice is one of the most important food crops in India, as it feeds more than half of the country's population. Rice is a kharif crop, which means it is grown during the monsoon season from June to September. It requires high temperature (above 25°C) and high humidity with annual rainfall above 100 cm. In some areas where rainfall is low, irrigation is used to supplement the water supply.

Punjab Chief Minister Bhagwant Mann said the state government has decided to ban sowing of water-guzzling PUSA-44 variety of paddy crop from the next Kharif season. He urged farmers to stop the cultivation of PUSA 44 variety of paddy crop as it takes more time to ripen, besides generating more crop residue. From the next season, PUSA 44 variety will be banned in Punjab, Mann said. It takes 152 days for ripening as against the PR-126 variety which takes just 92 days, the chief minister said, adding that the PUSA variety requires more water for irrigation as compared to other varieties.

Keywords: Punjab Paddy variety banned, Punjab Chief Minister Bhagwant Mann, PUSA-44 Pady Variety , Alternative variety .

Introduction

The Indian Agricultural Research Institute (IARI) bred the Pusa-44 paddy variety, which is a long-duration variety that takes 155–160 days to mature from sowing to harvesting. The Pusa-44 variety is banned

in Punjab because it contributes to stubble burning, has higher costs, and requires more irrigation than other varieties. The Pusa-44 variety's maturity period is 35–40 days longer than other varieties, and its harvesting occurs just before the ideal time for wheat sowing, leaving only 20–25 days for stubble disposal. Punjab also faces severe groundwater depletion, and the government aims to conserve one month of irrigation water by banning Pusa-44.

About PUSA-44

- **Origin:** Developed in 1993 by the Indian Council of Agricultural Research (ICAR), PUSA-44 gradually gained popularity among Punjab's farmers.
- **Rapid Adoption:** Due to its high yield, Punjab's farmers started cultivating it on a larger scale, covering 70 to 80 percent of the area under paddy cultivation.
- Farmers claim that PUSA-44 yields nearly 85 to 100 mann (34 to 40 quintals) per acre, while other varieties' yield average is 28 to 30 quintals per acre.
- Many farmers are able to get a yield of 36 to 40 quintals per acre with PUSA-44 if the weather is favourable.

Key reasons to ban the cultivation of the PUSA-44 paddy variety

1. Water Depletion

PUSA-44 is a long-duration paddy variety that takes around 160 days to mature, which is approximately 35 to 40 days longer than other paddy varieties. This extended growth period requires additional irrigation cycles, putting further pressure on Punjab's already depleting groundwater resources.

Punjab faces severe groundwater depletion, and the government aims to conserve water by banning PUSA-44, which requires more irrigation.

2. Water Intensive Crop

Paddy is inherently a water-intensive crop, and the area under paddy cultivation in Punjab continues to expand. This expansion exacerbates the strain on groundwater resources.

3. Stubble Burning:

PUSA-44 aggravates the problem of stubble burning in Punjab. The extended maturity period of this variety means that it is harvested just before the ideal time for sowing wheat, which is typically on November 1st. Farmers need about 20 to 25 days between paddy harvesting and wheat sowing to manage stubble disposal properly.

The limited timeframe makes it challenging to implement stubble management techniques, leading to an increase in stubble-burning incidents.

4. Increased Stubble Generation:

PUSA-44 varieties generate approximately 2% more stubble than shorter-duration paddy varieties. This increase in stubble volume becomes a significant

concern when cultivated on a large scale, contributing to higher stubble-burning incidents.

5. Alternative Varieties:

Short-duration paddy varieties are available that require less water and have a shorter growth period. These varieties are more suitable for regions with groundwater constraints and can help reduce the risk of stubble burning due to their compatibility with the wheat sowing season.

Which variety is to be used instead of PUSA 44 ?

The Pusa-2090 variety is an alternative to Pusa-44 rice in Punjab as it matures faster, giving farmers more time to prepare their fields for the next crop. IARI Develops Pusa-2090 Paddy Variety to Tackle Stubble Burning in Punjab.

Amid the challenges of paddy stubble burning and air pollution in Delhi-NCR region, the Indian Agricultural Research, Delhi has developed a high-yielding short-duration variety namely Pusa-2090 which will help in dealing with the menace.

Generally, the paddy crop which is transplanted in June is ready for harvest only towards late October. This leaves very little time for farmers to prepare their fields to sow the next wheat crop. Therefore, they resort to burning the stubble. The new paddy variety is an improved version of currently used Pusa-44. Pusa-2090 variety matures in only 120 to 125 days as compared to Pusa-44 which takes 155 to 160 days to mature. The new paddy variety will give around 30 days time to farmers to ready their fields for the next crop. Talking to Akashvani News, IARI scientist, Prolay Kumar Bhowmick highlighted the advantage of Pusa 2090 expressing confidence that it will help in checking the menace of stubble burning. Pusa-2090 is a cross between CB-501 and Pusa-44, CB-501 is an early maturing japonica rice line.

And also PUSA 44 variety takes 152 days for ripening as against the PR-126 variety which takes just 92 days, the chief minister said, adding that the PUSA variety requires more water for irrigation as compared to other varieties.

Comparing water and energy consumption of PUSA-44 with Control variety

Pusa 44, a long-duration and old rice variety is cultivated in Punjab, despite new short-duration varieties and overall technological advances in agriculture. We use farm-household data from a preliminary survey conducted in 2016-17. Pusa 44 yielded an average of 2.5 quintals per hectare more than the competing short-duration variety PR 121. It consumes 16 percent more water in the long run. Since energy for groundwater irrigation is provided duty-free by the state, Pusa 44 farmers get a higher net return even if they pump additional groundwater. As a result, they have little economic incentive to switch to new short-lived varieties. This differential stickiness is an important policy issue considering the ongoing groundwater crisis in the state.

(Average)	Pusa 44	PR 121 (Control)	Difference (Pusa 44 – Control)	Difference as % change over Control
Duration (days) [a]	160	140	20	14.27
Hours of irrigation (hrs/ha) [b]	209.39	229.87	-20.48	-8.91
Total volume of water pumped (m^3/ha) [b]	11176.60	9605.60	1571.00	16.35
Depth of irrigation (m) [c]	1.12	0.96	0.16	16.35
Pump Size (hp) [a]	12.39	8.66	3.73	43.07
Electricity used (kWh/ha) [c]	1945.73	1492.98	452.76	30.33
Unit cost of electricity (Rs/kWh) [d]	6.07	6.07	0.00	0.00
Total cost of electricity (Rs/ha) [c]	11810.60	9062.36	2748.24	30.33

Conclusion

To address concerns related to water conservation, stubble burning and environmental pollution, the Punjab government has decided to ban the cultivation of PUSA-44 rice variety from next year. The decision aims to promote adoption of short-duration rice varieties that require less water and better align with crop rotation schedules, reduce stubble burning and conserve groundwater resources.

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Sustainable Agricultural Practices

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B. Sc. (Hons.) Agriculture, 2nd year

Abstract

With respect to food productivity, sustainable agriculture prioritizes the development of needs, knowledge, skills, social and cultural values, technologies, and practices that are affordable, efficient, and improve farmer quality without compromising environmental goods and services. A basic problem that unites a lot of these strategies is the diversity of sustainable agricultural methods. Anticipating competition for timely change, human activity, and resource consumption is necessary to produce a more satisfying connection between society and the environment in sustainable agriculture and to prevent potential disputes.

Keywords: Sustainable agriculture, skill, knowledge, productivity and environment.

Introduction

The pressing need to shift to sustainable agriculture techniques is highlighted by the growing human population and increasing environmental concerns. The goal of this article is to present a thorough review of

sustainable agriculture techniques, including integrated pest management, biodiversity preservation, water conservation, and soil health management. We hope to shed light on these methods' potential to promote resilient and productive agricultural systems while protecting natural resources by critically analyzing the scientific evidence around them.

What is a Sustainable Agriculture ?

The phrase "sustainable agriculture" refers to agricultural methods based on ecological principles and is a study of the interaction between organisms and their environment as stated in the 1977 National Agricultural Research, Extension and Teaching Policy Act (7). It's a type of farming intended to satisfy modern demands without jeopardizing the supply of resources for next generations. Other names for sustainable agriculture include permaculture, organic, natural, or eco-farming. Sustainability is a broad term with numerous facets, particularly those related to the economy, society, and environment.

What Is the Goal of Sustainable Agriculture?

- Ensuring soil fertility and encouraging biodiversity;
- Improving the ecological conditions and preventing pollution;
- Consuming less non-renewable resources (e.g., fossil fuels);
- Supporting rural economic development;
- Enhancing the quality of farmers' health, rights, and life in general

Sustainable Agriculture Practices

One important factor connecting many of these activities is the diversification of sustainable agriculture practices. "Keep it simple" is often a better advice, but in the case of agriculture, more complex and mixed systems are needed for sustainability and productivity—much like in nature. Following decades of research and application, a number of significant sustainable farming techniques have been identified, including:

a) Irrigation Techniques in Sustainable Agriculture :

Irrigation, which uses a lot of water and energy resources, is crucial to crop production. Sustainability seeks to maximize energy and water use while meeting the needs of hydrated plants. The practice of sustainable water usage in agriculture involves the use of intelligent irrigation techniques and the cultivation of crop species that require less water. Specifically, drip irrigation uses 20–40% less water than furrow (flood) irrigation while yielding 20–50% more crops.

b) Sustainable Agriculture and Cover Crops :

Farmers can prevent soil erosion on their farms by planting cover crops during the off-season. When cover crops are utilized for green manure, the method also aids in increasing the organic matter, lowering fertilizer costs. In addition, cover crops control weeds and hold onto soil moisture. Bee and other pollinator populations are naturally supported by flowering cover crops.

c) Sustainable Agriculture Activities with Minimum or Zero Tillage :

Reduced or no-till farming methods, in contrast to routine plowing in conventional farming, stop soil erosion from wind and water. With the least amount of disturbance to the soil and biota, the no-tilling method recommends seeding directly into the crop residue. No-till agriculture reduces soil compaction, operating time, and fossil fuel emissions by having planters or drillers insert seeds right away after digging, which promotes ecological and economic stability.

d) Permaculture as a Sustainable Agriculture Technique :

Permanent agriculture and culture are the sources of the name “permaculture.” Permaculture mimics the diversity, stability, and harmony of naturally occurring ecosystems. By lowering waste, utilizing renewable resources, combating pollution, and enhancing soil fertility in environmentally responsible ways, the method fosters sustainability.

e) Pest Control And Integrated Pest Management In Sustainable Agriculture :

Integrated pest management (IPM) uses a variety of additional approaches in addition to chemical pest control, which is even more effective when applied in a complicated way. IPM’s function in sustainable agriculture is to reduce harm to non-target animals, humans, and the environment as a whole. Therefore, biological and cultural control are the mainstays of integrated pest management in sustainable agriculture. utilizing predators such as ladybugs to eliminate aphids or utilizing chickens to consume pests, their larvae, and eggs (such as ants, beetles, flies, woodlice, etc.) are examples of biological approaches in specific.

Conclusion

It is believed that sustainable development is a vital ecosystem, home to biodiversity, or the web of life. For a firm to be sustainable, a sustainable society must also be in place for it to prosper. To stay competitive in the market, sustainable businesses need to be creative, employ environmentally friendly technologies, invest in human resources and skill development, and boost productivity. The ultimate conclusion is that timely prediction of changes, human activity, and competition for resource usage are important to avoid possible conflicts and improve the quality of the relationship between society and the environment.

References:

1. UC Sustainable Agriculture Research and Education Program. 2017. Fair Labor Issues. What is Sustainable Agriculture? UC Division of Agriculture and Natural Resources.
2. Ouda, Samiha & Zohry, Abd El-Hafeez & Noreldin, Tahany. (2018). Crop Rotation Maintains Soil Sustainability: An Approach to Secure Future Food. 10.1007/978-3-030-05351-2_4.
3. Sources of Greenhouse Gas Emissions. United States Environmental Protection Agency

Innovations in Farming: Technology's Role in Advancing Regenerative Agriculture

Taushif Ahammed
B. Sc. (Hons.) Agriculture, 3rd year

Regenerative agriculture is the integration of cutting-edge technology, ushering in an era of innovation that promises to revolutionize the way we cultivate our crops and steward our lands. From precision agriculture techniques leveraging GPS, drones, and sensors for precise resource management, to advancements in robotics and automation streamlining labour-intensive tasks, technology is reshaping the agricultural landscape in profound ways.

What is Regenerative agriculture and why it is needed?

Global food system is 'in crisis' or 'broken' and faces a critical crossroads. **Conventional agricultural** practices, while achieving high yields, have also deteriorate the environment. Soil degradation, water pollution, and greenhouse gas emissions (through industrial farming, over dependence on chemical fertilizer and pesticides) threaten the very foundation of agriculture itself.

In response, regenerative agriculture has emerged as an alternative form of food and fibre production, concerns itself with enhancing and restoring resilient systems which prioritizes soil health, biodiversity, and ecosystem services, aiming to heal the land while producing nutritious food.

Role of Technology in Regenerative Agriculture

Technology plays a crucial role in advancing regenerative agriculture. These include **Precision agriculture, Data Analysis and Decision Support Systems, Robotics and Automation, cover crop seeders, no-till planters, and biochar application methods** etc. These technologies can enhance the productivity and made agriculture more climate resilient.

Precision Agriculture

Precision agriculture is an innovative approach to farming that utilizes technology, data, and information management tools to optimize the efficiency, productivity, and sustainability of agricultural practices.

It uses different tools like sensor, drones, satellite imagery etc and give information about **Targeted irrigation, Variable- rate fertilizer application, Precision pesticide application** etc.

Data Analysis and Decision Support Systems

The vast amount of data collected through precision agriculture tools becomes even more powerful when combined with data analysis and decision support systems (DSS). These systems utilize:

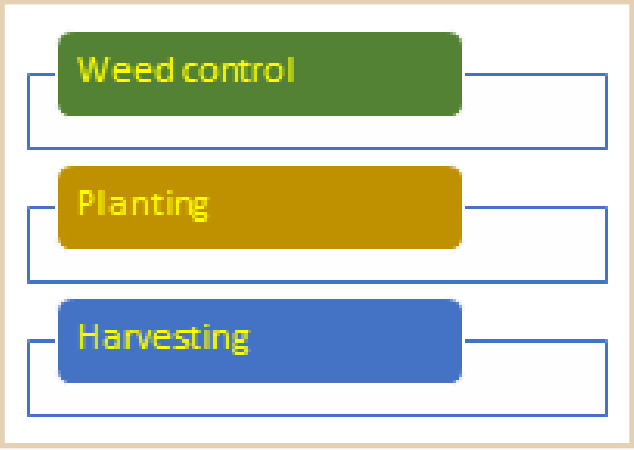
Artificial Intelligence (AI)

AI algorithms can analyse complex datasets to identify patterns and trends that might escape human observation. This allows for:

Forecasting crop yields, potential disease outbreaks, and resource needs based on historical data and current conditions.
*Predictive modeling
Recommending specific actions based on the data analysis, such as adjusting irrigation schedules or applying targeted pest control measures.
*Prescriptive analytics

Robotics and Automation

Repetitive tasks like weed control, planting, and harvesting can be time-consuming and labour-intensive. The arrival of agricultural robots is transforming these aspects of farming. Robots are already being used for-



Beyond this broad categories, specific technologies i.e. **Cover crop seeders, No-till planters, Biochar application methods** can create a powerful toolkit for farmers to implement regenerative practices on a wider scale.

Benefits of Technology-Enabled Regenerative Agriculture

This technology driven farming enabled regenerative farming in many ways i.e

- **Improved Soil Health:** Precision agriculture enhances soil structure and microbial activity through targeted nutrient application and reduced tillage.
- **Increased Carbon Sequestration:** Regenerative practices capture and store carbon in the soil, mitigating climate change effects.
- **Enhanced Farm Profitability:** Robotics and data analysis tools reduce labour costs and optimize resource use, boosting profitability.
- **Increased Biodiversity:** Regenerative practices support diverse plant communities and beneficial insects, fostering ecosystem balance.

Challenges of Technology Adoption

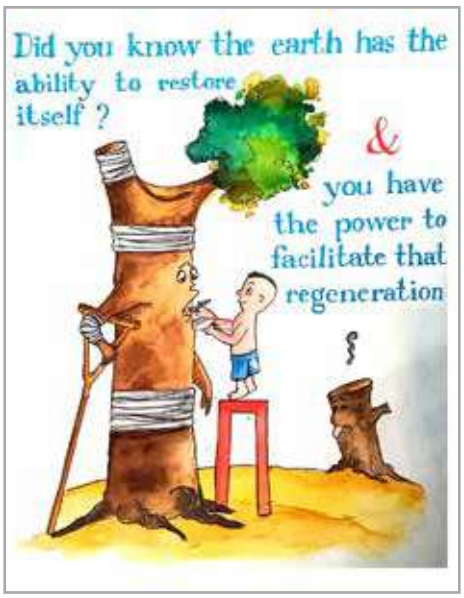
Also, there is multiple challenges in adopting the technologies in farming sector. Those are-

- **High Initial Costs:** Expensive technology may hinder adoption, especially for small farms.
- **Training and Support Needs:** Farmers require training on technology use and data interpretation, along with technical support.
- **Digital Divide:** Limited internet access in rural areas impedes technology adoption.
- **Data Security Concerns:** Addressing data security and privacy issues is crucial for building trust in technology.

Conclusion

The embrace of technology marks a pivotal moment for regenerative agriculture. From the precision of data-driven practices to the efficiency of robotics, these advancements empower farmers to implement regenerative principles more effectively and achieve their sustainability goals. While challenges like affordability and accessibility remain, ongoing research and collaboration hold the key to unlocking the full potential of this technological revolution. As we move forward, let's embrace innovation as a powerful tool to cultivate a future where healthy soil, thriving ecosystems, and a resilient agricultural system flourish for generations to come.

Animation / Drawing Division



Trishita Bera
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Subhasish Das
B.Sc. (Hons.) Agriculture, 4th year

Soumik Dey
B.Sc. (Hons.) Agriculture, 4th Year

Students Corner

অন্ন চাই

শোন শোন সুধী জনে
শোন দিয়া মন!
চাষীর দেশের ভবিষ্যৎ বাণী
আজি করিব বর্ণন।
সবুজ সুফল বাংলা মোদের
তখন হবে ধু ধু প্রান্তর।
গ্রামে কোথাও চাষবাস নেই,
উঠে যাবে চাষির কদর।
শিক্ষিত সব জোয়ান ছেলেরা
কেন করবে বীজ বপন?
চাকরি না পেলে ধর্না দেবে,
শুরু করবে আন্দোলন।
তবু তারা ধরবে না লাঙল,
বেগার খাটুনির কি দরকার?
বিনামূল্যে রেশন ব্যাবস্থার তো
বাংলা জুড়ে জয় জয় কার।

বারো বিঘা জমি পতিত থাকুক,
তবুও ছেলে করুক কেরানি গিরি -
কাদায় নেমে ফসল ফলালে যে
স্টেটাস টার আর থাকবে না ছিরি।
তাই বাবার ধমক, 'পড়াশোনা করবি না?
তবে গরু নিয়ে আসি?'
ভয়ে ভয়ে প্রশ্ন ছেলের,
'পড়াশুনা করে বুঝি হওয়া যায় না চাষি?'
বাবার মাথায় উঠলো রাগ,
ছেলেকে করলেন তীব্র প্রহার -
সেই থেকে ছেলে প্রশ্ন করা ছেড়ে,
মন দিয়ে পড়ে আজ মস্ত অফিসার।
বস্ত্র বাসস্থান বিলাস বহুল,
লাখ টাকা বেতন, অভাব নাই।
তবুও, রাস্তায় একদিন নামছে ছেলে-
শ্লোগান দিচ্ছে ' অন্ন চাই। '

Nishantika Dhara
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Photography and Image Gallery

Amit Ghosh
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Ritam Bera
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Ishita Roy
B. Sc. Agriculture (Hons.), 2nd year

Soumojit Chandra
B. Sc. (Hons.) Agriculture, 3rd Year

Ritwik Bera
B. Sc. (Hons.) Agriculture, 4th year

Shayanendra Bera
B. Sc. (Hons.) Agriculture, 2nd Year

Priyabrata Shit
B. Sc. (Hons.) Agriculture, 4th Year

Suman Nandi
B. Sc. (Hons.) Agriculture, 4th Year

Sneha Shil
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Prof Samir Kumar Samanta
Visiting Professor, SAAS, TNU

Prof. Samir Kumar Samanta
Visiting Professor, SAAS, TNU

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B. Sc. Agriculture (Hons.), 2nd year

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B. Sc. (Hons) Agriculture,1st year

Ritwik Bera
B. Sc. (Hons.) Agriculture, 4th year

Subhadip Ghosh
B. Sc. (Hons.), Agriculture, 2nd year

Fahim Sakib Laskar
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Field Activities

Amit Ghosh
B.Sc. (Hons.) Agriculture

Amit Ghosh
B.Sc. (Hons.) Agriculture

Arikshit Manna
B.Sc. (Hons.) Agriculture, 4th Year

Amit Ghosh
B.Sc. (Hons.) Agriculture

Field Activities

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B.Sc. (Hons.) Agriculture

Arikshit Manna
B.Sc. (Hons.) Agriculture, 4th Year

Amit Ghosh
B.Sc. (Hons.) Agriculture

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B.Sc. (Hons.) Agriculture

Amit Ghosh
B.Sc. (Hons.) Agriculture

Events and Activities

MoU signing between The Neotia University (TNU) with Calcutta Society for Professional Action in Development (SPADE)

Our esteemed university nurtures a futuristic vision regarding the progress of the rural community of West Bengal as well as India has initiated an association with Calcutta Society for Professional Action in Development (SPADE) on 27th day of February, 2024 by signing a MoU covering consultancy, research, internship and placement opportunities. This association will enhance our commitment and contribution towards rural community by collaboration with SPADE as well the Farmer Producer Companies (FPCs) promoted by them. The elementary discussion was initiated seven months back on training of betel leaf farmers on essential oil extraction from waste leaves. The array of discussions culminated into an augmented association enveloping provisions for joint work on betel leaf essential oil extraction and value addition, bee-keeping and honey collection, animal husbandry related activities.

Glimpses of the interaction: Circulated flyer, b. display of banner in the main gate of the university, process of interaction, display of MoU documents after the signing ceremony

SPADE is a Cluster Based Business Organization empaneled to NAFED, Govt. of India for promotion of Farmer Producers Organization (FPO) under Central Sector Scheme. They had association with eight FPCs of South 24 Parganas, Murshidabad, Dakshin Dinajpur, Purulia and also covers state of Tripura. This prestigious MoU additionally included Alordisa Agro Fed Farmers Producer Company Limited, Namkhana Kalpataru Agro Fed Farmers Producer Company Limited, Jeebika Agro Fed Farmers Producer Company Limited from Kakdwip, Namkhana and Patharpratima Blocks in South 24 Parganas covering around 1000 farmers mainly cultivating betel-leaves and other vegetables.

The eminent dignitaries of the university witnessed the signing ceremony. Honorable Vice Chancellor, Registrar, Dean, School of Agriculture & Allied Sciences, Deputy Dean, School of Agriculture & Allied Sciences, Dr. Bidisha Mondal, Associate Professor & Head Genetics and Plant Breeding along with Anjan Ghosh, Placement Officer of SAAS were present at the meeting. SPADE was represented by Mr. Subhashis Debnath, CEO & Director, Project Coordinator Mr. Sankar Mandal, Project Manager, Mr. Rajkumar Laskar. The meeting was initiated by a brief address of Vice Chancellor succeeded by briefing of Mr. Debnath from SPADE. The interim discussions covered diverse aspects of mutual activities on farmer and student welfare.

The post-lunch discussion on the future roadmap included joint initiative for training of betel-farmers of South 24 Parganas leaf essential oil extraction and placement venture from SPADE to be conducted in the month of March-April, 2024. The other objectives of the collaboration including internship and experiential learning to be initiated in near future. This association will be extremely beneficial for the farming community of West Bengal as well as the huge student base of our prestigious university. Our renowned university believes that agriculture is the backbone of Indian economy and takes firm steps for progress of rural sector. This association is a portrayal of that benevolent resolution of our esteemed university.

Signing Memorandum of Understanding (MOU) between School of Agriculture and Allied Sciences, The Neotia University and Arogyam Medisoft Solutions Pvt. Ltd.

Arogyam Medisoft is an IOT-based digital solutions company focused in the healthcare & agriculture industry. The SOIL SATHI devices and Advisory Platform runs on rechargeable batteries, tracks GPS, enables near-field testing, and transmits results to a cloud-based platform. Agriculturists can use the platform to identify soil nutrients and plant diseases remotely and can advise farmers in real-time. It ensures real-time monitoring of nutrient & soil fertility and optimum use of fertilizer application.

This information encouraged us to go for a collaborative relationship with Arogyam Medisoft Solutions Pvt. Ltd., to organize R& D works, for placing our students in that organization as interns or freshers. We may use the SOIL SATHI devices during the RAWE programme to easily test the soil of the farmers' location and advise them as and when required. Respected Registrar, The Neotia University, Dr. Manish signed the MoU as an authorized signatory, followed by Prof. (Dr.) Sushil Kumar Kothari (Dean, SAAS, TNU), Dr. Trisha Manna (Assistant Professor, Dept. of Soil Science and Agricultural Chemistry, SAAS, TNU) and Mr. Anjan Ghosh (Placement Officer, SAAS, TNU). From Arogyam Medisoft Solution Pvt. Ltd., Rajiv Mondal, Director signed as an authorized signatory, and Amrita Mukherjee Ganguli, Trina Dey and Moumita Dhara signed the memorandum as members.

Outreach Programme

TNU Sponsored Outreach Project

Sustainable development of Amphan affected Indranarayanpur village in South 24 Parganas for improving the livelihood of farming communities

The project aims to improve farmers' livelihood through various need based agro-technological and other interventions. The objectives in brief are given below:

- Sustainable management of natural resources.
- Organizing training programmes on value-added bakery products, vermicompost, etc. and providing marketing assistance.
- Introduction of high-yielding varieties of major field & fruit crops and improved animal farming practices.
- Ecological restoration through tree plantation.

Photographs related to outreach programme undertaken by SAAS, TNU at Indranarayanpur village

Outreach Programme

As part of the aforesaid project, various training programmes on food processing, vermicompost packing, seedling distribution and animal vaccination camp were organized for the farmer of Indranarayanpur Village, Pathar Pratima block. Experts of SAAS gave training to 41 villagers on the basics of baking technology, different tools and ingredients required for the preparation of different bakery products such as bread, cookies, cake, etc as well as the food safety measures to be taken before, during, and after preparation of different baked food items. Live demonstration for such product preparations (Bread, cookies, cake) was done after the training session.

Soil (10) and water (4) samples were collected from different farmers' fields of the village and analyzed in our laboratory.

The mangrove plantation programme was done with the help of the villagers who planted 430 seedlings of Bruguieragymnorhiza covering an area of 206 sq.m. on 18/03/2024 and 20/03/2024 at the riverbank of Uttar Mahendrapur village under Digambarpur gram panchayat, Pathar Pratima block, South 24 Paraganas, West Bengal.

A total of 36 women of local self-help groups (SHGs) participated in the training programme on "Clean milk production and animal health care" in the meeting hall of Digambarpur gram panchayat. Then the actual vaccination programme started. Triovac vaccine (3 in 1) against Foot and mouth disease, Haemorrhagic septicaemia, and Black quarter was administered to 70 cattle brought by the different farmers. PPR vaccine against Peste des petits ruminant's disease was administered to 100 goats.

Activity	Date	Number of farmer involved	Venue
Baseline survey and primary data collection	23/09/23	Panchayat official and 64 farmers	Digambarpur Gram Panchayat office
Distribution of fruit tree saplings	23/09/23	20	Digambarpur
Introduction and demonstration of six improved rice varieties	04/03/2024		Mr Bikash Mondal field,Digambarpur
Training programme conducted on preparation of different bakery products	18/03/2024	41 (women)	Digambarpur Gram Panchayat office
Training programme conducted on marketing strategy of vermicompost	18/03/2024	41	Digambarpur Gram Panchayat office
Soil and water sample collection from various parts of the village	18/03/2024	14 farmers field (10 crop field and 4 water sample)	Digambarpur
Plantation of 430 Mangrove seedlings	18/03/2024 and 20/03/2023	area of 206 sq.m.	Uttar mahendrapur
Training programme on heath care of domestic animals and clean milk production	20/03/2023	36	Digambarpur Gram Panchayat office
Animal Vaccination Camp (Triovac vaccine (3 in 1) against Foot and mouth disease, Haemorrhagic septicaemia, and Black quarter for cattle and PPR vaccine against Peste des petits ruminant's disease for goat.)	20/03/2023	70 Cattle and 100 Goat	Digambarpur

Seminar

Orientation Programme: "Food Security, Nutrient Management & Specialty Fertilizer" by Indorama India Pvt. Ltd.

The programme was organized on 18th March, 2024 in the SB III Seminar Hall, The Neotia University, Sarisha, South 24 Parganas, West Bengal. This programme was attended by Mr. Saumitra Kesh Pandey, and team Indorama India Pvt Ltd (Fertilizer Division), Kolkata and Dean of School of Agriculture and Allied Sciences, Deputy Dean of School of Agriculture and Allied Sciences, and Hon'ble Vice Chancellor, of The Neotia University and Assistant Professors and others. The orientation programme was attended by 105 students along with the faculty members.

The programme was anchored by Dr. Madhurima Banik, Agriculture faculty and started at 12:30 am with the felicitation of the guests followed by Lighting of the Lamp.

The list of the guest members who attended the program and delivered their valuable talk and presentations are mentioned below:

1.Prof. Biswajit Ghosh

Vice Chancellor, The Neotia University, South 24 Parganas, West Bengal

He addressed the programme as well as welcomed all the guests from Indorama India Pvt. Ltd.

2. Prof. Sushil Kumar Kothari

Dean, School of Agriculture and Allied Science, The Neotia University, South 24 Parganas, West Bengal

He addressed the programme as well as welcomed all the guests invited in the Orientation Programme. He delivered closing speech and thanked all the delegates, faculty members & students at the end of the programme.

3. Mr. Saumitra Kesh Pandey

Customer Relationship Manager, and Digitalization Specialist, Indorama India Pvt. Ltd, (Fertilizer Division), Kolkata

He delivered a presentation on the topic of "Various products of Indorama India Pvt. Ltd". He shared valuable talks on "Food Security & Nutrient Management". He emphasized the importance to know about fertilizer industry, logistic chain, soluble & non-soluble products and consumption, subsidy on fertilizer, different government schemes for farmers, etc.

4. Dr. Shirsendu Das Roy

Zonal Agronomist, East Zone, Indorama India Pvt. Ltd.

He delivered a presentation on the topic of "Specialty Fertilizer". He also organised question-answer session with the students.

Finally, the Orientation programme ended at 3:45 pm with a vote of thanks by the Dean, SAAS to all the guests as well the committee members who have devoted their immense patience and cooperation in successfully organizing the programme.

Seminar

THE NEOTIA UNIVERSITY

www.tnu.in

INSTITUTION'S INNOVATION COUNCIL

MoE's INNOVATION CELL

Agriculture Unit, School of Agriculture and Allied Sciences, The Neotia University

Orientation Programme On **"Food Security, Nutrient Management & Specialty Fertilizer" by Indorama India Pvt. Ltd."**

18th March 2024 at 12 P.M

SB III Seminar Hall, The Neotia University

Hybrid

Chief Patron

Mr. PradipJyoti Agrawal
(Hon'ble Pro Chancellor, The Neotia University)

Patron

Professor Biswajit Ghosh
(Hon'ble Vice Chancellor, The Neotia University)

Dr. Manish Jha
(Registrar, The Neotia University)

Convener

Prof. (Dr.) Sushil Kumar Kothari
(Dean, SAAS, The Neotia University)

Speakers Profile

Mr. U.C Dixit
(Chief Customer Officer)

Ms. Philomina Linda Gomes
(Senior Manager – Human Resources)

Mr. Saumitra Kesh Pandey
(Customer Relationship Manager, and Digitalization Specialist)

Dr. Shirsendu Das Roy
(Zonal Agronomist, East Zone)

Organizing Secretary

Mr. Anjan Ghosh
(Training and Placement Officer, SAAS, TNU)

Organizing Committee: **Dr. Pragun Pal, Dr. Sourav Mullick, Mr. Aminul Islam**

Seminar


GPS Map Camera
Jhinga, West Bengal, India
sb-3 or library of tnu and nitmas, Jhinga, Sarisha, West Bengal 743368, India
Lat 22.261498°
Long 88.197836°
18/03/24 03:09 PM GMT +05:30
Google


GPS Map Camera
Jhinga, West Bengal, India
sb-3 or library of tnu and nitmas, Jhinga, Sarisha, West Bengal 743368, India
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Long 88.197808°
18/03/24 12:49 PM GMT +05:30
Google


INDORAMA

Seminar

Orientation Programme on Genetics and Plant Breeding

The Department of Genetics and Plant Breeding, School of Agriculture and Allied Sciences, The Neotia University organized an orientation program on “Master of Science (M. Sc.) in Genetics and Plant Breeding: Course, Curriculum, Scope, Future Prospects, Challenges and Career Opportunities” on May 15, 2024, from 2.30 pm onwards in SB-III Seminar Hall. Renowned experts in Genetics and Plant Breeding from academia, industry and faculty members of GPB department, The Neotia University enlightened the event with their insightful lectures. They encouraged the final year B.Sc (Hons.) Agriculture students to opt Genetics and Plant Breeding in M. Sc at TNU in the future.

The Speakers included Dr. Pritam Das (Senior Scientist (Seed), Krishi Rasayan Lifesciences Pvt. Ltd. Kolkata West Bengal) Mr. Sk. Mosaraf Hossain, (Consultant Agronomist, Grant Thronton Bharat LLP, Kolkata, West Bengal) and Mrs. Sudipa Das (Rice Breeder, Pallishree Ltd. Hooghly, West Bengal) Dr. Bidisha Mondal, HoD, Associate Professor, Department of Genetics and Plant Breeding, The Neotia University, West Bengal.

Around 90 final year B.Sc (Hons.) Agriculture students participated in the program. They were enriched with the laboratory, field and mentoring facilities of the Genetics and Plant Breeding department, SAAS, TNU. The lectures served as a catalyst for the students to pursuit their carrier in Genetics and Plant Breeding.

Seminar

Orientation on "Krishi Veer" Training Programme by Indorama India Pvt. Ltd."

The programme was organized on 06th November, 2023 in the SBIII Seminar, The Neotia University, Sarisha, South 24 Parganas, West Bengal. This programme was attended by the Mr. U C Dixit, Ms. Philomina Linda Gomes, Mr. Saumitra Kesh Pandey, and team Indorama India Pvt Ltd (Fertilizer Division), Kolkata and Deputy Dean of School of Agriculture and Allied Sciences, and Hon'ble Vice Chancellor, of The Neotia University and Assistant Professors and others. The orientation programme was attended by 52 students along with the faculty members.

The programme was anchored by Mr. Pragun Pal, Agriculture faculty and started at 11:30 am with the felicitation of the guests followed by Lighting of the Lamp.

The list of the guest members who attended the programme and delivered their valuable talk and presentations are mentioned below:

1. Prof. Biswajit Ghosh

Vice Chancellor, The Neotia University, South 24 Parganas, West Bengal

He addressed the programme as well as welcomed all the guests from Indorama India Pvt. Ltd.

2. Mr. U C Dixit

Chief Customer Officer, Indorama India Pvt. Ltd, (Fertilizer Division), Kolkata

He delivered the welcome address and complete introduction of the programme. He delivered a presentation on the topic of "Indian Agriculture and Agri input Industry".

3. Ms. Philomina Linda Gomes

Senior Manager – Human Resources, Indorama India Pvt. Ltd, (Fertilizer Division), Kolkata

She delivered a detailed presentation on the company profile. She discussed about "Various products of Indorama India Pvt. Ltd."

4. Mr. Saumitra Kesh Pandey

Customer Relationship Manager, and Digitalization Specialist, Indorama India Pvt. Ltd, (Fertilizer Division), Kolkata

He delivered a presentation on the topic of "Role & Responsibility of Agri-Professionals". He discussed about the Brand Architecture & Survey Questionnaire with the students. He also organised question-answer session with the students.

Finally, the Orientation cum training programme ended at 4:45 pm with a vote of thanks by Mr. Pragun Pal to all the guests as well the committee members who have devoted their immense patience and cooperation in successfully organizing the programme.

Seminar


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Farmers Training Programme on "Farmers capacity building in terms of Crop Yield Improvement"

Farmers Training Programme

The department of Genetics and Plant Breeding, School of Agriculture and Allied Sciences, The Neotia University proudly hosted a Farmers Training Programme entitled “Farmers capacity building in terms of Crop Yield Improvement” on May 15 (Wednesday), 2024, from 10 am onwards in SB-III Seminar Hall. The day began with a soothing plant watering ceremony concurrence with the green initiatives taken by the esteemed university.

Fig 1. The inaugural plant watering ceremony, and dignitaries on the stage.

Several eminent speakers from academia and industry were present at the event, encouraging the farmers and final year B.Sc (Hons.) Agriculture students with their speeches. The Speakers included Dr. Indrani Dana, Joint Director of Agriculture (Rice development), Chinsura Rice Research Station, West Bengal, Mr. Sudarshan Mondal (Plant Breeder, Parasmoni Organic & Agri Products Pvt. Ltd., Bankura, West Bengal), Dr. Pritam Das (Senior Scientist (Seed), Krishi Rasayan Lifesciences Pvt. Ltd. Kolkata West Bengal) Mr. Sk. Mosaraf Hossain, (Consultant Agronomist, Grant Thronton Bharat LLP, Kolkata, West Bengal) and Mrs. Sudipa Das (Rice Breeder, Pallishree Ltd. Hooghly, West Bengal).

Farmers Training Programme

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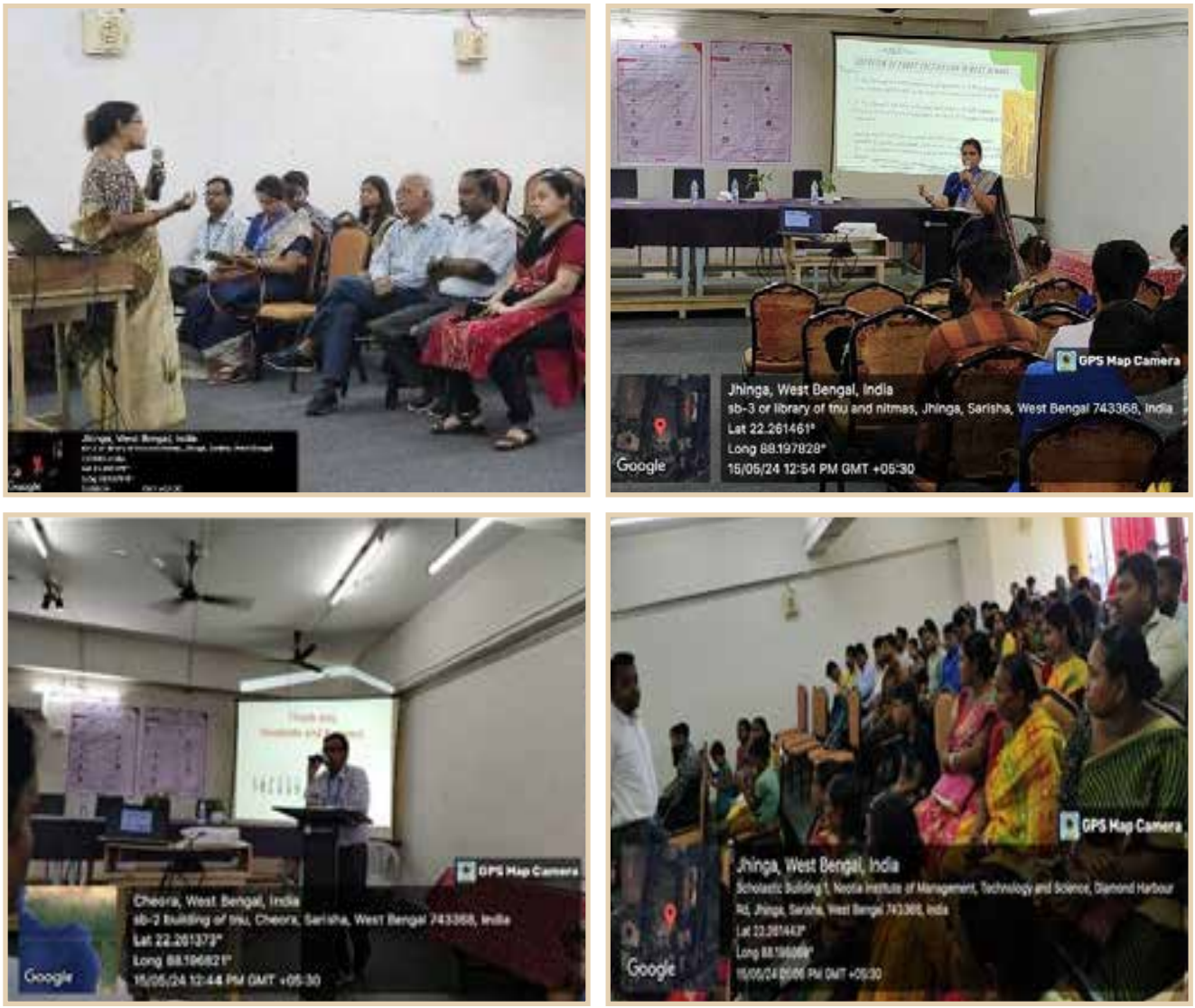


Fig 2: Striking lectures of eminent Plant Breeders

The training programme was initiated 1) to enrich the farmers from the adopted village in South 24 Paraganas by The Neotia University, especially, under saline submerged conditions, with emerging technologies for crop yield improvement. 2) to train our final year B.Sc (Hons.) Agriculture students on how to address ground level field-related problems of farmers. 3) to provide the opportunity for interaction among farmers, students, industry professionals and distinguished plant breeders.

A total of 26 farmers from the adopted villages of South 24 Parganas by The Neotia University and around 90 final year B.Sc (Hons.) Agriculture students participated in the training programme. In the first session of the training programme, our speakers shared their views on promising and emerging technologies in crop yield improvement with the audience. Later, in the interaction session our dignitaries, faculty members and students interacted with famers and tried to solve the problems they face in their fields. Finally, our

Farmers Training Programme

students provided the seeds of green gram (variety: Samrat) and black gram (Variety: Kalindi), 100 grams each, to grow in their fields in the next season. These crop seeds were produced by the 8th semester B.Sc (Hons.) Agriculture students in the ELP course of Seed Production and Technology. The training programme enriched the participants with innovative technologies to improve crop yield, especially in saline submerged areas like south 24 parganas. Moreover, participants acquired effective solutions to farming problems.

Fig 3: Glimpses of the Farmers Training Programme, interaction session and seed distribution to the farmers.

5th World DNA Day Celebration

Theme: DNA - The journey of the magical molecule

The School of Agriculture & Allied Sciences, The Neotia University commemorated the World DNA Day on 16th, May, 2024 (Thursday). The event is celebrated for five successive years with utmost enthusiasm and diligence. This year a post-dated celebration of the event took place in the Sarisha campus of the university due to the online academic session in last week of April. The School took the decision to celebrate the event in offline mode ensure adequate student participation and engagement. The day began with a pure and serene chorus song of Rabindranath Tagore presented by the B. Sc Agriculture students succeeded by a tranquil plant watering ceremony to ensure a green and sustainable future for the coming generations on earth.

The welcome speech was delivered by Prof, Sushil Kumar Kothari, Dean, School of Agriculture & Allied Sciences featuring the contribution of nucleic acid (DNA and RNA) in transmission of heredity from ancient period along with its essential role in agricultural research and crop improvement. He also emphasized the importance of advance studies for our students, the opening of PG courses and mentioned the importance of the day.

Fig 1: Moments of the inaugural session along with post inauguration Key note address by Prof. Barid Baran Bandyopadhyay

The message of the university was delivered by Dr. Manish Jha, Registrar, The Neotia University. His brief lecture was highly informative, covered the diverse aspect of discovery of DNA, its application in agriculture and the importance of genomic research as an integral part of higher studies in agriculture. He also advised the students to imbibe the essence of the programme with utmost concentration.

The notable message of the Vice President, Mr. Suhas Mukherjee, The Neotia University covered the renowned scientists including Dr. Rosalind Franklin and the details of present Indian agricultural scenario. Mr. Suhas Mukherjee fostered all the students and advised them to maintain discipline in campus and encouraged the student for higher studies and research.

In the inaugural session the stellar deliberation from Dr. Uttam Pal, Deputy Dean, School of Agriculture & Allied Sciences and Dr. Bharat Chandra Saha, Professor, Genetics & Plant Breeding inspired all the students on dynamic role of DNA and applicability of genetics in all sphere of agriculture.

The departmental message was presented by Dr. Bidisha Mondal, Head, Genetics & Plant Breeding and Convener of the programme. Her deliberation covered the details of the cascading programmes with introduction of key-note speaker and idea about the succeeding scientific deliberations. She also encouraged all the graduate students to participate in scientific events to nourish the young minds on importance of both conventional and advance academic studies and to pursue higher studies.

The magnificent lecture of eminent Prof. Barid Baran Bandyopadhyay highlighted recent developments in new avenues of application of DNA technologies. The lecture entitled “DNA – journey of the magical molecule” covered the discovery of DNA, its application in crop improvement including several sophisticated technologies covering Genomics, TILLING, CRISPR/Cas9 technologies etc. The guest of Honour presented the alarming note on the dwindling of crop genetic resources and urgent need for characterization

5th World DNA Day Celebration

of the unconventional resources. His Excellency also highlighted the importance of higher studies in Genetics & Plant Breeding to aid the world population in mitigation of global hunger and climate changes. The deliberation provided some smart, modern era technologies for combating challenges of climate change with sustainable farming.

Fig 2: The announcement team, inaugural song, House full of students, deliberation of Prof. Bharat Chandra Saha, The delegates in the Dias, The pristine plant watering ceremony

The invited lecture was succeeded by diverse student deliberations and presentations with intermittent video-graphic display of success stories and innovations of agriculture and allied fields were part of the celebration. The student presentations were fabulous and very informative. The second scientific session was moderated by Dr. Bidisha Mondal. The poster and model presentation by the agriculture students were judged by the scholastic panel of respected faculty members from the department along with the invited speaker. The panel of judges included Prof. Barid Baran Bandyopadhyay, Prof. Bharat Chandra Saha, Dr. Sarita Pandey, Dr. Sruba Saha, Dr. Sudeshna Panja. The name of five winning groups was announced at the end of the function succeeded by the prize distribution ceremony.

The industry partner of the programme was Srishti Biotech Pvt. Ltd., the department included the company logo in the banner and flex. The event witnessed a huge participation of 126 agriculture students. The refreshment of the students and prizes were sponsored by the partnering company. The convener also acknowledges the effort and assistance of Dr. Subhadip Pal, Assistant Professor, Agricultural Economics and Mr. Kaushik Mandal for successful organization of the pre and post event formalities.

Fig 3: The poster and model display by the students and critical evaluation by the panel of judges

Table 1: Student Presentations covering conventional & modern Genetics

Role of heat shock protein in climate-smart crop production	DNA barcoding for identification of minor crops
Role of proteomics in abiotic and biotic stress tolerance	Genetic modification of medicinal plants for alkaloid production
Submergence tolerant genes of cereal crop	role of heat stock protein in climate smart crop production
Harnessing CRISPR (Cas9) Technology for Precision Agriculture: Opportunities and Challenges	General Mechanism of Salinity Tolerance Genes in Rice
Cold tolerance in rice	Mendelian Back cross

YouTube Video story presented at World DNA Day, 25th April, 2025

1. DNA animation by Drew Berry and Etsuko Uno-wehi.tv_ScienceArt
2. Can we create the perfect farm_Brent Loken
3. The amazing ways plant defend themselves-Valentin Hammoudi

5th World DNA Day Celebration

The celebration ended with a meticulous vote of thanks offered by Prof. Bharat Chandra Saha on behalf of the School of Agriculture and Allied Sciences. The World DNA Day celebration was a great success for the school and the school wishes to celebrate this day in future with equivalent zeal and devotedness. The department is indebted to the university management for the approval and fund sanctioning of the fund.

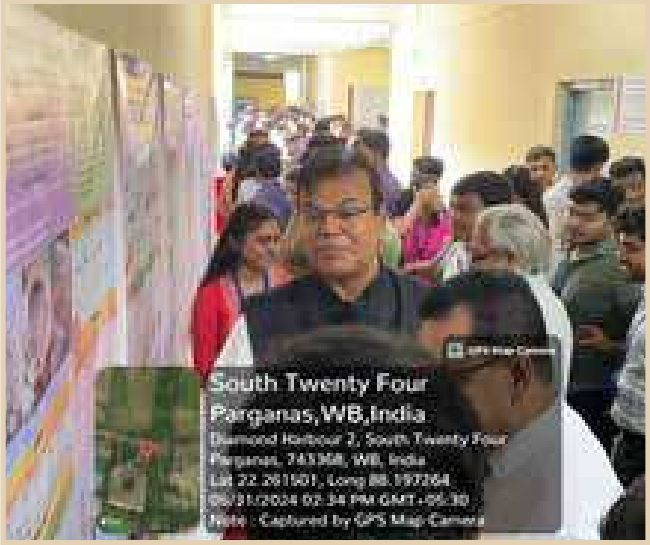
Figure 4: The Banner of World DNA Day Celebration, 2025

Figure 5: Banner of World DNA Day, 2024

Seminar

International Sun Day

We are happy to share that School of Agriculture & Allied Sciences has successfully organized the International Sun Day on 31st May, 2024. The seminar was immensely successful in the presence of our eminent guests Mr Subrata Mandal (Ex CGM, NABARD) and Mr Aurobinda Sarkar (GM, BIRD). We witnessed magnificent deliberations and excellent presentations on the topics of Promotion of Farmers Producer Companies and its Significance in Indian Agriculture and Role of NABARD & BIRD in Promotion of Indian Agriculture. The program became far more engaging with the beautiful presentations on the agri-business ideas by our final year students. The program ended with prize distribution to the poster presentation winners in the presence of our eminent guests.



Study Tour

Visit to Ramkrishna Asram Krishi Vigyan Kendra (RAKVK), Nimpith

This exposure visit pertains to course CCAGP 649, Crop Improvement II (Rabi crops). A total 140 students of 6th semester accompanied by Dr. Sruba Saha visited the above mentioned institute on 18th and 19th April, 2024. Each day, the tour started in two buses from the TNU campus in morning (9.30 am) and we reached the Nimpith RAKVK campus around 11.30 am.

Objective:

The visit to Nimpith RAKVK on 18th and 19th April, 2024, aimed to provide our 6th Semester B.Sc. (Hons.) Agriculture students with practical exposure to various aspects of crop Improvement II (Rabi Crops). The visit included insightful demonstrations and presentations by Dr. Syamsundar Laxman (Senior Plant Breeder) Dr. Somnath Smaddar (Subject Matter Specialist, Agronomy), Dr. Aritra Sarkar (Subject Matter Specialist, Horticulture), and Mr. Tapash Sahana (Technical Assistance)

Activities and Demonstrations:

AICRP Plot of Sunflower:

The visit included an informative tour of the All India Coordinated Research Project (AICRP) plot dedicated to sunflower cultivation. Dr. Laxman elucidated the ongoing research activities and advancements in sunflower cultivation, highlighting the significance of AICRP in contributingto agricultural research and development.

Seed Processing Unit:

Dr. Laxman conducted a detailed demonstration of the seed processing unit, providing students with hands-on experience in the processing techniques essential for maintaining seed quality. The session covered key aspects such as cleaning, grading, and packaging,emphasizing the importance of quality control in seed production.

Educational Insights:

During the visit, students were enlightened about the mandate of AICRP activities and the broader activities of KVK. The speakers emphasized the pivotal role of AICRP in coordinating research efforts across the country to address challenges in agriculture. Additionally, students gained insights into the diverse activities of KVK, which encompass agricultural extension services, training programs, and technology dissemination.

The visit to Ramkrishna Asram Krishi Vigyan Kendra (RAKVK), Nimpith proved to be a valuable and enriching experience for our students. The combination of theoretical knowledge and practical demonstrations provided a holistic understanding of crop improvement and plant breeding. We express our gratitude to Dr. Syamsundar Laxman Dr. Somnath Smaddar, Dr. Aritra Sarkar and Mr. Tapash Sahana for their informative sessions and to KVK for facilitating this educational excursion. Such experiences play a pivotal role in shaping the knowledge and perspectivesof our future agricultural professionals.

After the completion of the visit, we started at around 3.00 PM and reached back to TNU campus at 5.00pm.

Some glimpses of the visit are given below.

Visit To Ramkrishna Asram Krishi Vigyan Kendra (Rakvk), Nimpith

Study Tour

Visit to Krishi Vigyan Kendra (KVK) Sasya Shyamla, Narendrapur, Kolkata

On April 18, 2024, coordinated by Dr. Sarita Pandey, the 4th semester B.Sc. (Ag) students embarked on a study tour to KVK Sasya Shyamla, Narendrapur, Kolkata. The visit aimed to provide practical insights into agricultural practices, specifically focusing on seed technology under the guidance of Dr. Anupam Mukherjee, Farm Manager at KVK Sasya Shyamla.

The tour commenced at 8:30 am with the students and faculty boarding the buses. Enthusiast ic chatter filled the air as the journey to KVK Sasya Shyamla began, setting the tone for an educational and enlightening experience. Upon arrival, the students were warmly greeted by Dr. Anupam Mukherjee, who led them to the seed processing unit. Dr. Mukherjee provided a brief overview of the unit's operations and objectives, setting the stage for the demonstrat ions to follow.

Activities and Learning Sessions:

Seed Processing Unit Demonstration:

Dr. Mukherjee conducted a comprehens ive demonstration of the seed processing unit, showcasing the processes of seed cleaning, grading, and treatment for the variety Shreya. The students observed firsthand the intricate procedures involved in ensuring seed quality and purity.

Field Visits:

Following the demonstration, the students were guided to sesame and maize seed production plots. Here, they witnessed the practical application of seed production techniques, including seed selection, sowing, and crop management practices. Dr. Mukherjee provided valuable insights into the challenges and opportunities associated with seed production in diverse agricultural settings.

Interactive Sessions:

Throughout the visit, Dr. Mukherjee engaged the students in interactive sessions, encouraging questions and facilitating discussions on various aspects of seed technology. Students had the opportunity to clarify doubts, exchange ideas, and deepen their understanding of seed processing and production methodologies.

Conclusion:

The study tour to KVK Sasya Shyamla provided the students with a holistic understanding of seed technology and its significance in modern agriculture. Under the expert guidance of Dr. Anupam Mukherjee, they gained practical insights into seed processing, production, and quality management. The visit not only enriched their academic knowledge but also inspired them to explore careers in agricultural research and development.

Acknowledgments:

We extend our sincere gratitude to Dr. Anupam Mukherjee and the staff of KVK Sasya Shyamla for their hospitality and invaluable guidance during the study tour.

Visit To Krishi Vigyan Kendra (KVK) Sasya Shyamla, Narendrapur, Kolkata

Study Tour

Visit to Ramkrishna Asram Krishi Vigyan Kendra (KVK), Nimpith, South 24 Parganas

The School of Agriculture & Allied Sciences, the Neotia University conducted an Educational visit to Ramakrishna Ashram Krishi Vigyan Kendra, NIMPITH, West Bengal. This visit was scheduled on 18.04.2024 and 19.04.2024 for the course "PRINCIPLES OF ORGANIC FARMING" (POF) (CC-AGL 651) and conducted by the course instructors Dr. Mousumi Mondal and Ms. Shobhanika Barik for the agriculture undergraduate students of 6th Semester.

The visit was conducted with all four sections of the 6th semester on the above dates, covering two sections each day. A total of 200 students visited NIMPITH KVK. The students were introduced to Mr. Tapas Kumar Sahana and Somnath Sardar.

Mr. Sardar gave a speech to our students about NIMPITH KVK and the Sundarban area and which crops are growing in the Sundarban area. Mr. Tapas Kumar Sahana delivered a speech about fish breeding to our students.

After completion of the speech students along with the faculty members were served wholesome lunch. Post lunch break, the students were taken to the Biocontrol laboratory where they were shown different biofertilizer preparation units.

Then Kushal Dasgupta sir showed our students the vermicompost unit, the vermi species, the vermicompost unit structure, and the benefits of vermicompost.

The educational visit ended around 4.00 pm after which the students along with the faculty headed towards The Neotia University, marking the end of the successful visit program.

Fig 1: Speech by KVK Scientists

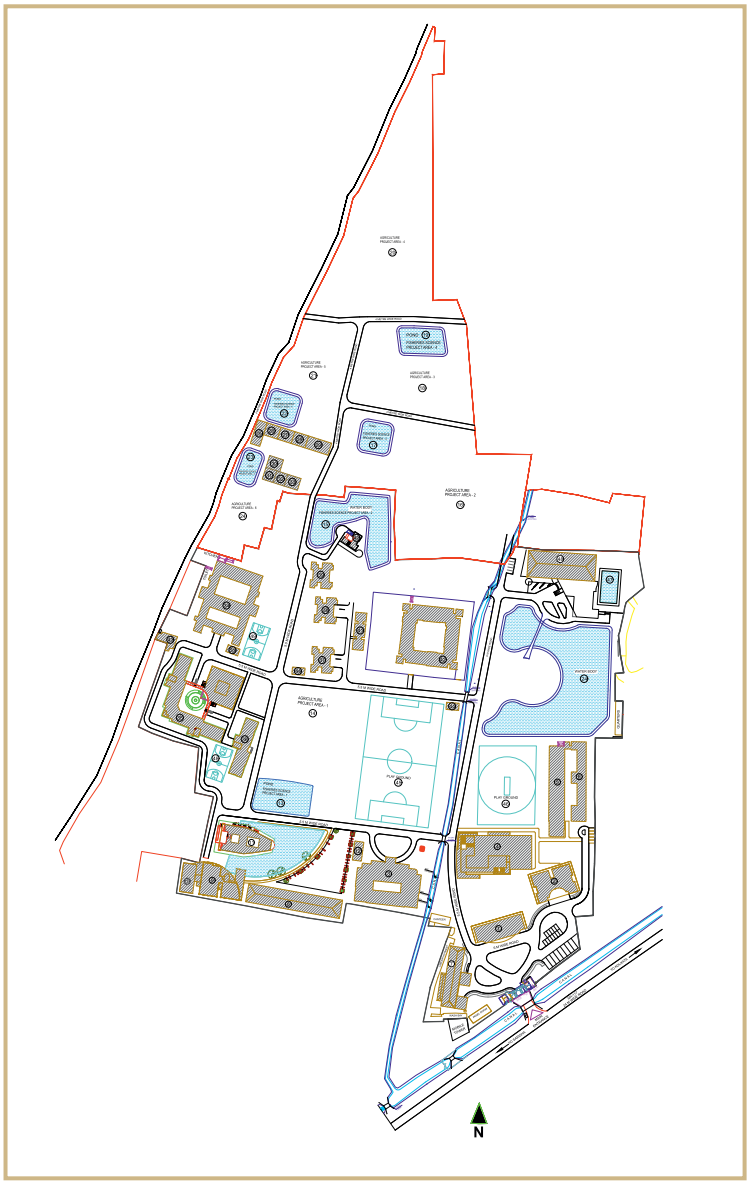
Visit to Ramkrishna Asram Krishi Vigyan Kendra (Kvk), Nimpith, South 24 Parganas

Fig 2: Demonstration of Vermi unit

Fig 3: Students of 6th Semester along with faculty at NIMPITH, KVK

Visit to Ramkrishna Asram Krishi Vigyan Kendra (Kvk), Nimpith, South 24 Parganas

Fig 4: Students of 6th Semester at biofertilizer unit



LEGEND- BUILDING

A. ADMINISTRATIVE BLOCK

1. ADMINISTRATIVE BUILDING (G + V)

B. ACADEMICS BLOCK

2. SCHOLASTIC BUILDING - 1 (G + III)
3. SCHOLASTIC BUILDING - 2 (G + II)
4. SCHOLASTIC BUILDING - 3 (G + III)
5. SCHOLASTIC BUILDING - 4 (G + III)
6. SCHOLASTIC BUILDING - 5 (G + III)
7. WORKSHOP BUILDING
8. NEW WORKSHOP BUILDING
9. NEW PHARMACY BUILDING (G + III)
10. PHARMACY BUILDING (G + III)
11. SHIP IN CAMPUS (G + III)

C. AGRICULTURE & FISHERY SCIENCE BLOCK

12. POLY HOUSE & NET HOUSE
13. FISHERY SCIENCE PROJECT AREA - 1
14. AGRICULTURE PROJECT AREA - 1
15. FISHERY SCIENCE PROJECT AREA - 2
16. AGRICULTURE PROJECT AREA - 2
17. FISHERY SCIENCE PROJECT AREA - 3
18. AGRICULTURE PROJECT AREA - 3
19. FISHERY SCIENCE PROJECT AREA - 4
20. AGRICULTURE PROJECT AREA - 4
21. AGRICULTURE PROJECT AREA - 5
22. FISHERY SCIENCE PROJECT AREA - 5
23. FISHERY SCIENCE PROJECT AREA - 6
24. AGRICULTURE PROJECT AREA - 6
25. MUSHROOM UNIT
26. FIELD LAB
27. STORE HOUSE
28. SERICULTURE UNIT
29. THRESHING FLOOR
30. BIO GAS PLANT
31. CATTLE SHED
32. VERMI COMPOST PIT
33. BIO FERTILIZER PLANT

D. RESIDENTIAL BLOCK

34. BOY'S HOSTEL - 1 & 2 (G + III)
35. BOY'S HOSTEL - 1 & 2 (G + III)
36. BOY'S HOSTEL - 1 & 2 (G + III)
37. OLD STAFF QUARTERS (G + III)
38. NEW STAFF QUARTERS (G + III)
39. NEW STAFF QUARTERS (G + III)
40. DIRECTOR'S RESIDENCE (G + I)
41. OLD STAFF QUARTERS (G + III)
42. GIRL'S HOSTEL - 3 (G + II)

E. UTILITY & SERVICES BLOCK

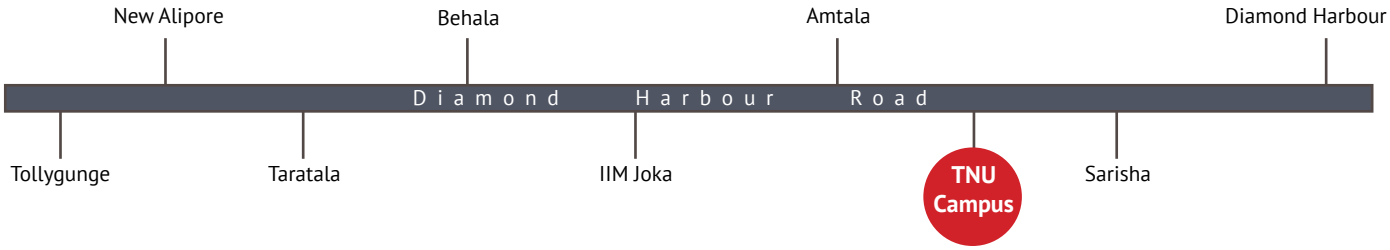
43. ELECTRICAL ROOM
44. PUMP ROOM

F. RECREATIONAL BLOCK

45. FOOTBALL GROUND
46. CRICKET GROUND
47. SWIMMING POOL
48. MULTI PURPOSE HALL
49. BASKETBALL COURT (3 NOS.)

G. HEALTH BLOCK

50. MEDICAL UNIT



AmbujaNeotia

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ज्ञानम् आत्म प्रदीपाय
UGC Enlisted & Recognised

NEOTIA INSTITUTE OF TECHNOLOGY MANAGEMENT AND SCIENCE
(Formerly ITME. Since 2002.)

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