ONLY NEWS PAPER PUBLISHED IN INDIA FOR SCIENTIFIC COMMUNITIES

NESA NEWSLETTER

NATIONAL ENVIRONMENTAL SCIENCE ACADEMY (NESA)

Vol. 29 Issue-06 (MONTHLY) June 2026

From the Editor's

Dear Readers,

In the June issue of our Newsletter, we received several popular articles from diverse fields. All the authors deserve great appreciation for sharing articles in huge numbers. Please continue sending articles to our Publication team and share published newsletter with your friends also.

I would like to thank the Editorial team including Print, Designer and Publication committee for their efforts throughout the edition.

Suggestions are always welcome for improvement of newsletter.

Report of World Environment Day 2026 Faculty of Life Sciences, Jamia Millia Islamia Celebrates World Environment Day 2026 in Collaboration with National Environmental Science Academy (NESA)

New Delhi, June 5, 2026: Reinforcing its commitment to environmental sustainability and climate action, the Faculty of Natural Sciences, Jamia Millia Islamia (JMI), in collaboration with the National Environmental Science Academy (NESA), New Delhi organized a symposium on the occasion of World Environment Day 2026 under the theme "Inspired by Nature. For Climate. For Our Future." The event brought together eminent academicians, environmental scientists, researchers, faculty members, and students to deliberate on pressing environmental challenges and sustainable solutions for a greener future. As a symbolic gesture towards environmental conservation, a plantation drive was organized within the Jamia Millia Islamia campus. Faculty members, guests, research scholars, and students enthusiastically participated in the initiative, reaffirming their commitment to increasing green cover and promoting ecological sustainability. The plantation activity served as a reminder that meaningful environmental change begins with collective action at the community level.

The program commenced with a warm welcome address by Prof. Asimul Islam, eminent professor at the Centre for Interdisciplinary Research in Basic Sciences (CIRBSc), Jamia Millia Islamia, who highlighted the significance of World Environment Day as a global platform for promoting environmental awareness and collective responsibility. Emphasizing the role of scientific research and education in addressing contemporary environmental challenges, he encouraged students and researchers to actively contribute towards sustainable development and ecological conservation. The inaugural session was followed with the felicitation of distinguished guests by Prof. Zahid Ashraf, distinguished scientist and Dean, Faculty of Life Sciences, Jamia Millia Islamia. The major highlight of the symposium was an engaging and visually captivating presentation by Dr. Azeem Ahmad. He is currently working as Public

Relations Officer at Jamia Millia Islamia, a noted environmental advocate and media professional associated with leading media organizations. Drawing from his extensive experience in environmental communication and conservation awareness, Dr. Ahmad presented a fascinating account of the rich biodiversity thriving within the Jamia Millia Islamia campus. Through a remarkable collection of photographs and field observations, he showcased the diverse flora and fauna of the university, bringing attention to the ecological wealth often overlooked in urban landscapes.

His presentation featured numerous bird species inhabiting the campus, including several migratory birds that visit the region seasonally, highlighting the significance of Jamia's green spaces as important urban habitats. Emphasizing the delicate relationship between biodiversity and ecosystem health, Dr. Ahmad urged participants to cultivate a deeper appreciation for avian life and environmental conservation. He conveyed a powerful message on the need to protect birds by preserving their natural habitats, safeguarding nesting sites, and promoting environmentally responsible practices. His presentation resonated strongly with the audience, inspiring students and researchers to view conservation not merely as a scientific responsibility but as a collective moral commitment toward future generations.

Professor Tanu Jindal, Vice President, NESA, delivered an introduction to NESA and highlighted its activities for environment protection in 2026. She congratulated the NESA community for its Foundation Day. The session underscored the importance of maintaining biodiversity within urban ecosystems and demonstrated how educational institutions can play a pivotal role in fostering environmental awareness and ecological stewardship. The symposium continued with an insightful Invited Talk by Prof. Tanu Jindal, Vice President of the National Environmental Science Academy (NESA), on the theme "Green Technologies and Systems for Sustainable Development." Beginning her talk with an overview of the vision, mission, and contributions of NESA toward environmental conservation and scientific advancement, Prof. Jindal highlighted the critical role of innovative technologies in addressing contemporary environmental challenges. Drawing from her research and field experiences, she shared fascinating insights into her projects emphasizing the ecological and economic significance of seaweeds as sustainable bioresources with immense potential for environmental restoration and livelihood generation.

She further discussed pressing global concerns, including antimicrobial resistance (AMR), environmental pollution, and the urgent need for effective pollution control strategies, stressing that sustainable development can only be achieved through responsible scientific intervention and public participation. Addressing the younger generation, Prof. Jindal expressed concern about the increasing exposure to mobile phone radiation and its potential implications for human health and the environment. She also highlighted the adverse environmental consequences of the indiscriminate use of pesticides, calling for greater awareness and adoption of eco-friendly agricultural practices.

She encouraged students and young researchers to become active contributors to environmental solutions. Throughout her address, she emphasized the importance of collective action, urging participants to join the drive to save nature. Her message centered on reducing pollutant emissions, minimizing ecological footprints, conserving natural resources, and embracing environmentally responsible lifestyles. Concluding her thought-provoking lecture on an inspiring note, Prof. Jindal shared a poetic reflection on humanity's relationship with nature. Her address received an enthusiastic response from students, faculty members, and researchers alike, leaving the audience motivated to translate environmental awareness into meaningful action.

The symposium culminated with an enlightening and thought-provoking lecture by Prof. Suresh Kumar, eminent botanist, former Professor at Ramjas College, University of Delhi, and currently associated with the Cluster Innovation Centre, University of Delhi. Delivering his address on "Ethnobotanical Perspectives on Environmental Conservation,"

Prof. Kumar provided a comprehensive overview of the intricate relationship between traditional knowledge systems and environmental sustainability. Prof. Kumar highlighted the growing urgency of environmental conservation in the face of escalating ecological challenges. He underscored the indispensable role of natural resources in sustaining life on Earth and stressed the need for their judicious utilization and long-term management. Drawing attention to the alarming rise in air pollution levels, he discussed the relevance of the Air Quality Index (AQI) as an indicator of environmental health and emphasized the importance of adopting sustainable practices to improve air quality.

He further elaborated on the role of both indoor and outdoor plants in enhancing environmental quality, improving human well-being, and mitigating pollution. Prof. Kumar also shed light on the transformative potential of bioremediation. Addressing the environmental consequences of industrial effluents, he emphasized the urgent need for eco-friendly technologies and effective waste management strategies to safeguard ecosystems and public health. He discussed his work on medicinal plants with therapeutic potential for the management of diabetes and kidney stone disorders, illustrating how traditional ethnobotanical knowledge can contribute to modern healthcare and sustainable resource utilization. A central theme of his lecture was resource management and the challenges associated with ethnobotanical conservation, particularly in the context of rapid urbanization, habitat loss, and declining traditional ecological knowledge. He urged participants to recognize the value of indigenous wisdom and biodiversity conservation as essential components of sustainable development.

The session concluded with an environmental pledge, where participants collectively resolved to protect natural resources, promote sustainable practices, and contribute actively toward environmental conservation. Leaving the audience with a powerful message, Prof. Kumar encouraged everyone to become agents of change, emphasizing that meaningful societal transformation begins with individual action. Echoing the spirit of personal responsibility, he urged participants to "*be the change they wish to see in others*" and to translate environmental awareness into everyday practice. The symposium concluded with an inspiring address by Prof. Zahid Ashraf, distinguished scientist and Dean, Faculty of Natural Sciences, Jamia Millia Islamia. In his remarks, Prof. Ashraf underscored the importance of integrating scientific innovation with environmental responsibility to address the pressing ecological challenges of the twenty-first century.

The event culminated with a formal Vote of Thanks, wherein heartfelt appreciation was extended to the distinguished speakers, representatives of NESA, faculty members, research scholars, students, and organizing committee members for their invaluable contributions toward the success of the symposium. The invited speakers were felicitated in recognition of their insightful deliberations and dedicated efforts in promoting environmental awareness and sustainability. The program ended on a warm and convivial note with a networking session over refreshments, providing participants an opportunity to engage in meaningful discussions and exchange ideas.

Recommendation of the World Environment Day Symposium 2026

Environmental conservation is not merely an obligation but a mission that requires continuous commitment from individuals, institutions, and society at large.


















WORLD
ENVIRONMENT DAY




ENVIRONMENTAL STEWARDSHIP FOR SUSTAINABLE AGRICULTURE AND CLIMATE CHANGE MITIGATION

Rachana Dubey
ICAR Research Complex for Eastern Region, Patna
E-mail: rachanadwm2014@gmail.com

Abstract
Agriculture occupies a central position in the global discourse on sustainability, grappling with converging challenges that include soaring food demand, erratic climate patterns, land degradation, and biodiversity loss. The concept of environmental stewardship provides a framework for transformation that integrates the pursuit of productivity with a sense of ecological responsibility. This chapter explores the potential of Climate-Smart Agriculture (CSA), Soil Health Management, Land Degradation Neutrality (LDN), Nature-Based Solutions (NbS), and digital innovation in mitigating greenhouse gas (GHG) emissions while enhancing agricultural resilience. The discussion is anchored within the Sustainable Development Goals (SDGs) and the "One Health–One Earth" philosophy. The discussion emphasizes regenerative approaches, carbon sequestration, water stewardship, and inclusive policy mechanisms. By aligning agricultural systems with planetary boundaries and climate justice principles, environmental stewardship can reposition agriculture from a net emitter to a critical contributor to climate solutions.

Keywords: Environmental Stewardship, SDGs, Land Degradation Neutrality, Sustainable Agriculture, Climate Change Mitigation

1. Introduction: Sustainability within Planetary Boundaries

Global food systems must feed an estimated 9.7 billion people by 2050, requiring food production to increase by 60-70% (FAO, 2023). However, agriculture operates within finite ecological limits like declining soil fertility, water scarcity, and climate instability. The concept of environmental stewardship signifies a fundamental shift in agricultural practices, transitioning from a model of input-intensive productivity to one that emphasizes resource-use efficiency, ecosystem restoration, and carbon-conscious agriculture. It aligns strongly with: SDG 2 (Zero Hunger); SDG 6 (Clean Water and Sanitation); SDG 12 (Responsible Consumption and Production); SDG 13 (Climate Action) and SDG 15 (Life on Land)

The interconnected framework of One Health-One Earth underscores the inherent interconnectedness of soil degradation, biodiversity loss, animal health, and human nutrition. Consequently, sustainable agriculture must operate as a holistic ecological system rather than a production silo.

2. Agriculture–Climate Nexus: Emissions and Vulnerability

2.1 Contribution to Greenhouse Gas Emissions

The IPCC Sixth Assessment Report (AR6, 2023 Synthesis Report) corroborates the finding that Agriculture, Forestry and Other Land Use (AFOLU) contributes approximately 22% of total anthropogenic greenhouse gas (GHG) emissions.

- **Methane (CH_4):** As a result of enteric fermentation and the cultivation of rice paddies, the potency of the resulting substance is found to be 28 times greater than that of carbon dioxide over the course of a century.
- **Nitrous Oxide (N_2O):** The primary source of these emissions is nitrogen fertilizers, which are estimated to be nearly 298 times more potent than CO_2.
- **Carbon Dioxide (CO_2):** The phenomenon under consideration is associated with deforestation, biomass burning, and soil carbon oxidation.

According to estimates by the Food and Agriculture Organization (FAO) in 2023, the annual emissions from global agrifood systems reached 16.2 gigatonnes of CO_2-equivalent, underscoring the pressing need for transformative changes within these sectors.

2.2 Climate Vulnerability

The phenomenon of climate change poses a significant threat to agricultural productivity, and this threat is evidenced by the following factors.

- In South Asia, the phenomenon of terminal heat stress has been demonstrated to exert a deleterious effect on wheat yields, with a documented reduction of up to 20% observed in affected regions.
- A rise in the frequency of both floods and droughts has been observed.
- Variable monsoon patterns
- Accelerated land degradation

The IPCC (2023) has indicated that in the absence of adaptation measures, there is a potential for crop yield losses to reach 10-25% by mid-century in regions exhibiting vulnerability.

3. Land Degradation Neutrality and Soil Carbon Stewardship

Nearly 40% of the world's land is degraded due to unsustainable agriculture, deforestation, overgrazing, and climate change, as reported by the United Nations Convention to Combat Desertification (2023). Land degradation leads to declining soil fertility, reduced productivity, biodiversity loss, and impaired water regulation, directly threatening food security and rural livelihoods. The concept of Land Degradation Neutrality (LDN), endorsed under the United Nations Sustainable Development Goals (Target 15.3), seeks to achieve a balance between ongoing land degradation and restoration efforts so that there is no net loss of productive land. LDN is monitored through indicators such as land cover change, land productivity, and soil organic carbon stocks, ensuring measurable and science-based progress.

Central to achieving LDN is Soil Carbon Stewardship, which emphasizes maintaining and enhancing soil organic carbon (SOC) through sustainable land management practices. SOC is critical for soil structure, nutrient cycling, water retention, and resilience to drought and erosion. Practices such as conservation agriculture, residue retention, crop diversification, agroforestry, integrated nutrient management, and restoration of degraded lands help sequester carbon while improving productivity. By strengthening soil carbon stocks, countries can simultaneously restore degraded lands, enhance climate resilience, mitigate greenhouse gas emissions, and ensure long-term agricultural sustainability.

3.1 Soil as a Climate Solution

It is estimated that global soils contain approximately 1,500 gigatonnes of carbon, thereby constituting the most substantial terrestrial carbon sink. The enhancement of soil organic carbon (SOC) has been demonstrated to directly contribute to climate mitigation.

The following strategies have been identified as key:

- The practices of conservation agriculture and minimum tillage are of particular interest in this study.
- The retention of residue and the implementation of cover cropping are pivotal factors in this context.
- The utilization of biochar for the purpose of long-term carbon sequestration is a subject of considerable interest.
- The integration of nutrient management is imperative for effective environmental stewardship.
- Nano-fertilizers have been demonstrated to exhibit enhanced nutrient-use efficiency, with reported values exceeding 80%.

The "4 per 1000" initiative proposes an annual increase in global SOC stocks of 0.4%, with the objective of offsetting a substantial portion of anthropogenic CO2 emissions.

Achieving SDG15, which aims to "protect, restore, and promote the sustainable use of terrestrial ecosystems," as well as maintaining ecosystem integrity, is contingent upon the regeneration of soil.

4. Climate-Smart Agriculture: A Triple-Win Framework

Climate-Smart Agriculture (CSA) is a multifaceted concept that integrates the dimensions of productivity, resilience, and mitigation.

The following section will delineate the key stewardship practices that are to be implemented.

Climate-Smart Agriculture (CSA) integrates productivity, resilience, and mitigation.

4.1 Key Stewardship Practices

Intervention	Mitigation/Adaptation Benefit	Documented Impact
Precision Nutrient Management	Reduced N_2O emissions	15–20% fertilizer savings
Alternate Wetting & Drying (AWD)	Lower methane in rice	Up to 48% CH_4 reduction
Direct Seeded Rice (DSR)	Water & energy saving	20% irrigation reduction
Agroforestry	Carbon sequestration	3–10 t C/ha/year
Integrated Farming Systems	Nutrient recycling	10–20% higher income stability

CSA embodies regenerative agriculture and supports both SDG 2 and SDG 13.

5. Water Stewardship and Hydro-Ecological Security

Agriculture accounts for nearly 70% of freshwater withdrawals (FAO, 2024). Unsustainable extraction threatens long-term food security.

Sustainable Water Strategies are:

- Drip and sprinkler irrigation (efficiency up to 90%)
- Rainwater harvesting and watershed development
- Crop diversification toward less water-intensive species
- Digital irrigation scheduling using remote sensing

Water stewardship contributes to SDG 6 and reduces vulnerability to climate-induced drought.

6 . Biodiversity, Nature-Based Solutions and Circular Bioeconomy

Biodiversity underpins ecosystem services such as pollination, pest regulation, and nutrient cycling.

Nature-Based Solutions (NbS) include:

- Agroforestry and silvopastoral systems
- Pollinator conservation corridors
- Biological pest management
- Restoration of degraded lands

Pollinators alone support nearly 75% of food crop production (FAO, 2023). Integrating biodiversity enhances resilience and reduces dependency on chemical inputs. The circular bioeconomy further promotes nutrient recycling, waste valorization, and renewable energy integration in agricultural systems.

7. Livestock Systems and Emission Intensity Reduction

Livestock contributes about 14–15% of global GHG emissions (FAO, 2023). Mitigation options include:

- Improved feed digestibility
- Methane inhibitors (e.g., 3-NOP)
- Biogas generation from manure
- Integrated crop-livestock systems

Reducing emission intensity per unit of production aligns livestock systems with climate neutrality pathways.

8. Digital Agriculture, Climate Justice and Inclusive Stewardship

Digital innovations strengthen stewardship through:

- AI-driven climate advisories
- Satellite-based NDVI crop monitoring
- Carbon accounting and MRV systems
- IoT-enabled soil and water sensors

However, stewardship must also address climate justice. Smallholders contribute minimally to emissions yet face disproportionate risks. Women constitute over 40% of the agricultural labor force globally; inclusive policy design is essential for equitable sustainability transitions.

9. Aligning Environmental Stewardship with the SDGs

Environmental stewardship contributes directly to:

- **SDG 1:** Poverty reduction
- **SDG 2:** Sustainable food systems
- **SDG 6:** Water conservation
- **SDG 12:** Sustainable production
- **SDG 13:** Climate mitigation and adaptation
- **SDG 15:** Land restoration and biodiversity protection

Integrating stewardship principles into national agricultural policies accelerates progress toward carbon neutrality and resilience goals.

Conclusion: Toward a Regenerative Agricultural Future

The transition from a high-input "Green Revolution" model to a regenerative and stewardship-based paradigm signifies the subsequent transformation in global agriculture. Integration of climate-smart agriculture, soil carbon sequestration, nature-based solutions, and digital innovation has the potential to transform agriculture from a net emitter into a significant climate solution. The imperative for environmental stewardship is firmly rooted in the Sustainable Development Goals (SDGs), the concept of One Health–One Earth, the principle of Land Degradation Neutrality, and the tenets of climate justice. This stewardship is not merely a choice—it is an obligation indispensable for the continued existence of life on Earth. The collective engagement of researchers, policymakers, institutions, and farmers worldwide will determine whether agriculture becomes a driver of ecological recovery or environmental decline.

References

- FAO. (2023). *The State of Food and Agriculture 2023: Agrifood Systems Transformation and Climate Action.* Rome: FAO.
- FAO. (2024). *Global Agrifood Systems Emissions Database (FAOSTAT Update 2024).* Rome.
- IPCC. (2023). *AR6 Synthesis Report: Climate Change 2023.* Intergovernmental Panel on Climate Change.
- UNCCD. (2023). *Global Land Outlook 2 – 2023 Update.* United Nations Convention to Combat Desertification.
- United Nations. (2015). *Transforming our World: The 2030 Agenda for Sustainable Development.*

PROTECTING GREEN WEALTH: FOREST FIRE AWARENESS AND MANAGEMENT ON WORLD ENVIRONMENT DAY

S. K. Basu
PFS, Lethbridge, Alberta, Canada
Email: saikat.basu@alumni.uleth.ca

A forest fire (or wildfire) is an uncontrolled, unplanned, and rapidly spreading fire in an area, such as a forest, grassland, or shrub land, more accompanied by dry vegetation such as dead trees and plants. Triggered by lightning, human negligence towards fire, or arson, these fires require fuel such as dry wood and dry leaves, oxygen, and heat to spread. They destroy ecosystems, human property, and endanger lives of humans. Traditional Indian forests have been affected by Fires. The Menace has been aggravated with rising human and cattle population and the consequent increase in demand for forest products by individuals and communities. Causes of forest fires can be divided into two broad categories: 1. ENVIRONMENTAL (which are beyond control) and 2. HUMAN RELATED (which are controllable).

ENVIRONMENTAL CAUSES

These are largely related to climatic conditions such as temperature, wind speed and direction, level of moisture in soil and atmosphere and duration of dry spells. Other natural causes are the friction of bamboos swaying due to high wind velocity, rolling stones that result in sparks setting off fires in highly inflammable leaf litter on the forest floor, volcanic eruption, and lightning etc.

HUMAN-RELATED CAUSES

These result from human activity as well as methods of forest management. These can be intentional or unintentional, for example-

Fire set by grazers and gatherers of various forest products to facilitate gathering of minor forest produce like flowers of *Madhuca indica* and leaves of *Diospyros melanoxylon*.

The centuries old practice of shifting cultivated land by firing forest.

The use of fires by villagers to ward off wild animals.

Fires lit intentionally by people living around forests for cooking.

Accidental Negligence: Most Human-caused Wild-Fires are the result of unwanted sparks and flames in the forest. One of the most common sources is the improper disposal of smoking materials, such as cigarette butts and matchsticks, which can stay in dry leaf litter for hours before igniting. Similarly, unattended campfires pose a

massive risk; campers often fail to properly extinguish fire with water, allowing wind to carry fire sparks into surrounding vegetation. Beyond recreational errors, yard waste or trash burning is a leading cause in many regions. Small fire sparks from these residential fires can easily escape on windy days, especially when fire danger ratings are high and humidity is low.

IMPACTS OF FOREST FIRES

Fires are a major cause of forest degradation and have wide ranging adverse ecological, economic and social impacts, including:

(i) Loss of valuable timber resources,

(ii) Loss of biodiversity and extinction of plants and animals,

(iii) Loss of wildlife habitat and depletion of wildlife: -The most immediate ecological consequence is the destruction of habitats, which can displace their living place or kill billions of wild animals; for instance, the 2019–2020 Australian bushfires affected nearly 3 billion animals. While some ecosystems rely on low-intensity fires for cycling of nutrition in the forest, and seed germination; high-intensity "stand-replacing" fires can permanently alter forest structures (i.e. their ecosystem) sometimes preventing trees from regrowing at all (i.e. prevent healing of the trees). These fires also reduce the land of vegetation, leading to massive soil erosion and water contamination as ash and sediment runoff to pollute rivers and local water supplies.

(iv) Loss of natural regeneration and reduction in forest cover,

(v) Loss of carbon sink resource and increase in percentage of CO_2 in atmosphere,

(vi) Ozone layer depletion, soil erosion, frequent flooding, climate change etc.

(vii) **Health problems leading to diseases in Human beings:** Human health is severely impacted by wildfire smoke, which contains toxic fine particulate matter (PM2.5). Recent estimates suggest that dangerous smoke contributes to more than 1.5 million deaths annually worldwide. Exposure of this leads to respiratory diseases like asthma, COPD (Chronic Obstructive Pulmonary Disease), cardiovascular issues such as strokes and heart attacks and even cognitive impairment. Beyond Physical Health, some individuals face even Psychological Trauma with people often experiencing post-traumatic stress disorder (PTSD), depression, and anxiety due to the loss of homes and livelihoods.

(viii) Loss of livelihood for tribal people

(ix) Economic and Macroeconomic Impacts: -The economic burden of forest fires has reached a "macroeconomic emergency" level. Globally, economic losses from wildfires between 2010 and 2020 totalled approximately $82 billion, a fourfold increase from the previous decade. These costs include direct damage to infrastructure and property—such as the $44 billion in physical things exposed in India during the 2024–25 season—and indirect losses from business interruptions, reduced tourism, and staggering healthcare expenses. In the U.S. alone, annual wildfire costs are now estimated between $394 billion and $893 billion when accounting for factors like diminished real estate value and long-term health impacts.

(x) Equipment and Infrastructure: -Industrial and mechanical failures can also play a significant role in forest fire ignition. Sparks from chainsaws, mowers, or heavy machinery frequently ignite dry vegetation. On roadways, automobile vehicles can trigger fires through flat tire rims scraping the asphalt or malfunctioning catalytic converters. Large-scale infrastructure is another major factor, specifically power line failures. High winds can knock down utility poles or cause "conductor slap," where lines touch and send molten metal into flammable brush below, often starting fires in remote, hard-to-reach areas. It has been estimated that 90% of forest fires in India are man-made.

PREVENTION OF FOREST FORES

While natural causes of forest fire can't be prevented. We the humans could probably take some safety measures from our side to prevent and reduce forest fire as much as possible to save and protect biodiversity and ecosystems; and save as well as preserve valuable resources which the forest gives us, for our future generations. Here are some ways which will help in reducing forest fire from our side: -

(i) **Try to avoid Fireworks and open Flames:-** Fireworks can easily ignite dry vegetation,(i.e. dry branches and leaves)especially during dry and drought conditions. Avoid using them where the area is highly flammable.

(ii) **Proper Disposal of Smoking and Igniting Materials: -** Always put Cigarette Butts and other smoking materials inside a Fire-proof container filled with sand or water. Don't just toss them on the ground, or else it may cause fire from dry leaves and grass.

(iii) **Campfire Safety:** If you plan to have a campfire, ensure it is built in a safe location, away from flammable materials. Always check for fire bans in the area and have water or a shovel nearby to extinguish the fire properly.

(iv) **Properly check Weather Conditions: -**Be aware of local drought conditions where you want to go. Avoid any fire-related activities during hot and dry days, as these conditions increase the risk of wildfires.

(v) **Educate and Raise Awareness:** Communities should be educated about the causes of forest fires and the importance of prevention. Understanding the fire …triangle (oxygen, heat, and fuel) can help everyone recognize how to prevent wild fires from starting.

(vi) **Use Fire-Resistant Landscaping: I**f you live in a fire-prone area, consider planting fire-resistant plants and materials in your landscaping area to create defensible and protective space around your home.

(vii) **Report Suspicious Activity:** If you notice any suspicious behaviour that could lead to arson or accidental fires, report it to local authorities immediately.

THE CHEMISTRY OF COMUSTON

At its bottom, a forest fire is a rapid aerobic oxidation reaction. It is the reverse of photosynthesis. While plants use solar energy to turn CO_2 and water into cellulose (fuel), fire breaks that cellulose down to release energy.The Fire Triangle: To have a fire, three elements must be present equally. If you remove one or it doesn't get one, the fire goes out:

- **Fuel:** In a forest, this is "biomass" (leaves, twigs, dry grass, and logs). The moisture content of the fuel determines how easily it ignites.
- **Oxygen:** Earth's atmosphere is roughly 21% oxygen. Fire generally requires at least 16% oxygen to sustain a flame.
- **Heat:** This is the "activation energy." It can come from a lightning strike, a discarded cigarette, or even the radiant heat from a nearby burning tree.

PHASES OF CMBUSTION

A forest fire doesn't just "happen" all at once; it moves through different chemical stages as it consumes wood and organic matter.

Pre-ignition (Dehydration): Before a log can actually burn, the water inside it must be removed.

- **Process:** Heat from the approaching fire in front raises the temperature of the fuel.

- **Chemistry:** Water molecules absorb the heat and evaporate ($H_2O_{(l)} \rightarrow H_2O_{(g)}$). This is why "green" or wet wood is so hard to burn—the energy is wasted drying it out rather than igniting it.

Pyrolysis: This is the "chemical decomposition" of the wood caused by heat, occurring before there is an actual flame.

- **The Reaction:** Complex molecules like cellulose, hemicellulose, and lignin break down into simpler volatile gases, tars, and solid charcoal (carbon).
- **Significance:** These volatile gases are what actually catch fire, not the solid wood itself.

Flaming Combustion: This is the visible stage. The volatile gases released during pyrolysis mix with oxygen and ignite.

- **Equation:** The simplified chemical equation for burning cellulose is:
  $C_6H_{10}O_5 + 6O_2 \rightarrow 6CO_2 + 5H_2O + \text{HEAT}$

  This stage is highly exothermic, meaning it releases a massive amount of heat that then "pre-heats" the next patch of forest, creating a chain reaction of fire.

Smouldering (Glowing) Combustion: Once the volatile gases are used up, the flames disappear, but the fire isn't gone.

- **Process:** Oxygen reacts directly with the surface of the solid carbon (charcoal).
- **Danger:** This stage is much slower and cooler than flaming, but it can last for weeks and move underground through root systems (peat fires), making it very difficult for fire fighters to fully extinguish the forest fire.

FIRE ECOLOGY: THE RISE OF THE PYROPHYTES
Plants in fire-prone ecosystems have developed "functional traits" to deal with high-heat events. We categorize these plants into passive pyrophytes (which resist fire) and active pyrophytes (which actually encourage or need fire to reproduce).

Serotiny: The "Fire-Locked" Seed

Serotiny is a survival strategy where seed release is triggered by an environmental cause rather than plant maturity. In the case of the Lodgepole Pine (*Pinus contorta*) or the Banksia of Australia, this cause is intense heat.

- **The Mechanism:** The cones are sealed and shut with a specialized resin that only melts at temperatures between 45°C and 60°C.
- **The Biological Advantage:** By waiting for a fire to release seeds, the tree ensures that the "seed rain" falls onto a mineral-rich ash bed with no competing canopy shade. The fire essentially "cleans the slate" for the next generation.

Epicormic Shoots: Regeneration from Within
Some trees don't die when their leaves are burned off; they have a "backup plan" hidden under their skin.

- **The Anatomy:** Most trees grow from the tips (apical buds). However, trees like the Eucalyptus have epicormic buds tucked deep beneath the bark.
- **The Trigger:** When a fire destroys the main branches, the surge of hormones (specifically a drop in *auxins* from the dead tips) signals these "sleeping" buds to wake up.
- **The Result:** Within weeks of a fire, the blackened trunk begins to sprout bright green leaves directly from its sides.

Fire-Resistant Bark: The Living Shield
For long-lived giants like the Giant Sequoia (*Sequoiadendron giganteum*) or the Ponderosa Pine, the goal is to protect the Cambium (the living, growing layer of the tree just under the bark).

- **Insulation:** The bark of a Sequoia can be up to 2 feet thick. It is fibrous, full of air pockets, and lacks flammable resins. It acts like a thermal blanket.
- **Self-Pruning:** These trees often drop their lower branches as they grow (a process called *self-pruning*). This prevents "ladder fuels" from allowing a ground fire to climb up into the sensitive crown of the tree.

POST FIRE SUCCESSION: THE F0REST REBIRTH
Ecological succession is the process by which the structure of a biological community evolves over time. Forest fires typically trigger Secondary Succession because, while the living plants are gone, the soil remains intact.

The Stages of Recovery

(i) **Pioneer Species (0–5 years):** The first to arrive are "opportunists."
   - Fireweed (*Chamaenerion angustifolium*): This plant is famous for carpeting burnt lands in pink flowers. It thrives in high-light, high-nutrient environments.
   - Fungi and Mosses: Pyrophilous (fire-loving) fungi germinate only after heat exposure, helping to stabilize the soil.

(ii) **Intermediate Species (5–150 years):** As the ancestors die, they add organic matter to the soil. Grasses give way to shrubs, followed by fast-growing, sun-loving trees like Birch or Aspen.

(iii) **Climax Community (150+ years):** Eventually, slow-growing, shade-tolerant trees like

Oak, Spruce, or Hickory take over it. This is a stable community that remains until the next major disturbance (like another forest fire).

NUTRIENT CYCLING: THE CHEMICAL RESET

In a cold or temperate forest, decomposition is very slow. Dead leaves and logs can sit on the ground for decades, "locking up" essential nutrients. Fire acts as a rapid decomposer.

The Role of Ash: When biomass burns, it is converted into ash, which is a concentrated "mineral cocktail" for the soil.

- Phosphorus and Potassium: These minerals are non-volatile. They remain in the ash and are immediately available for new seedlings to absorb through their roots.
- **Nitrogen Paradox:** While much nitrogen is lost to the atmosphere as gas during a fire, the fire often encourages the growth of nitrogen-fixing plants (like lupines or alders) afterward, which actually ends up increasing the soil's long-term nitrogen levels.

The forest floor becomes "clogged" with dead matter, preventing new seeds from reaching the mineral soil. Fire "unlocks" these nutrients, essentially fertilizing the next generation of the forest.

MODERN MANGAEMENT: SCENCE IN ACTION

Managing a forest is no longer just about putting out fires; it's about using data to predict them and biology to prevent them.

Prescribed Burns: Fighting Fire with Fire. It sounds like a contradiction, but biologists often start fires to save forests.

The Goal: To reduce the "Fuel Load." In forests where fires have been suppressed for decades, dead leaves, fallen branches, and dense undergrowth act like a giant pile of kindling.

The Science: By setting a "cool" fire during the damp spring or fall, experts burn away this excess debris without killing the large, healthy trees.

The "Sweet Spot": Research (as of 2026) shows that wood with a moisture content of 20–30% is ideal for these burns. It burns slowly enough to be controlled but hot enough to clear out invasive species.

Result: When a natural lightning fire starts later in the summer, it has no "fuel" to climb into the treetops, keeping the

SATELLITE MONITORING: THE EYW IN THE SKY

We now use a "constellation" of satellites (like the 2025 Fire

Sat project) to track fires in real-time.

- **Infrared Sensors (IR):** Visible cameras are useless when there is heavy smoke. However, Mid-wave Infrared sensors can "see" through the smoke to detect the heat signatures of the flames themselves.
- **Super-Resolution Imaging:** Modern satellites can detect a fire as small as 16x16 feet from hundreds of miles above the Earth.
- **AI Integration:** Satellites now use Onboard AI to analyse data instantly. Instead of waiting for a human to look at a picture, the satellite detects a "thermal anomaly" and sends an automatic alert to local fire departments within minutes.

The Future: AI and Robotics: "Dragon Eggs":Drones are now used to drop small delayed-ignition spheres (nicknamed dragon eggs) to start prescribed burns in dangerous, steep terrain where humans can't go.

Predictive Modelling: Using Convolutional Neural Networks (CNNs), computers can combine satellite data, wind speed, and soil moisture to create a "heat map" of where a fire is most likely to move in the next 12 HOURS.

COMPARATIVE CASE STUDY: A TALE OF TWO ECOSYSTEMS

The impact of fire is not universal; it depends entirely on the evolutionary history of the plants in that specific biome.

The Amazon Rainforest: A 'Fire-Sensitive' Ecosystem: The Amazon is a high-humidity, closed-canopy system. Historically, natural fires here were incredibly rare (occurring perhaps once every several hundred years).

- **Lack of Adaptation:** Most Amazonian trees have thin bark and no ability to resprout after a fire. Their seeds are usually large, fleshy fruits that are destroyed by heat.
- The Positive Feedback Loop (The "Death Spiral"):

a) A fire kills the thin-barked trees.

b) The canopy opens up, allowing sunlight to reach the forest floor.

c) The forest floor dries out, turning the once-damp leaf litter into dry fuel.

d) The next fire burns hotter and faster, eventually converting the rainforest into a dry savanna.

- Biological Impact: Even a low-intensity surface fire can kill 50% of the trees in a tropical rainforest because they have no "defence budget" spent on fire protection.

The Australian Bush: A 'Fire-Dependent' Ecosystem: In contrast, much of the Australian landscape (Sclerophyll forests) has co-evolved with fire for millions of years.

- **Flammable by Design:** Many Eucalyptus trees produce volatile oils (eucalyptol) that actually make the fire burn hotter. Biologists believe this is an evolutionary tactic to kill off "invading" plant species that aren't fire-resistant.
- **The "Lignotuber" Strategy:** Many Australian plants have a woody swelling at the base of the stem called a lignotuber, hidden underground. If the entire top of the plant burns, the lignotuber stays safe in the soil and sends up fresh green shoots above the ground within days.
- **Seed Banks:** Australia uses "Soil Seed Banks." Seeds stay dormant in the dirt for years, protected by a hard outer shell that only cracks open when the heat of a fire "shouts" at them to wake up.

CONCLUSION

In conclusion, the study of forest fires reveals a complex biological paradox: an event that appears to be a scene of total destruction is, in fact, a vital mechanism for ecological mineral renewal. By analysing fire through chemistry, biology, and modern management, we can move away from the simplistic view that fire is merely a disaster. The contrast between the Amazon and the Australian Bush teaches us that fire sensitivity is a matter of evolutionary history. As global temperatures rise, the human role in forest management must shift from total suppression to scientific cooperation. By utilizing prescribed burns to manage fuel loads and satellite infrared technology for real-time monitoring, we can protect vulnerable biomes while allowing fire-dependent ecosystems to maintain their natural cycles.

Ultimately, forest fires are a cure to the resilience of the biosphere. While fire possesses a massive capacity for destruction, it is also a powerful force of regeneration for biodiversity. Understanding the biology of fire is not just an academic exercise—it is essential for the survival of our planet's forests in an era of rapid environmental change. “To protect the forest, we must first understand the flame.” Forest fire is not a curse as just we think, it's a blessing for both of us- the forests as well as the humans. Forest fire even though looking simply is a complex biological phenomenon occurring in forests by natural or manmade causes; results in the renewal of mineral ecology and the regeneration of biodiversity. But we also need to take care of the safety measures for humans of forest fire and try to practice them whenever we will go to jungle for both of us and Mother Nature.

INSTRUMENTS: REDEFINING FRONTIERS OF RESEARCH

Dhananjay Pandey[1*] and Renu Tripathi[2]

[1]Department of Botany, Govt. Naveen Girls College, Surajpur-497229, Chhattisgarh, India

[2]Department of Home Science, Govt. Kamla Devi Rathi Mahila P.G. Mahavidyalaya, Rajnandgaon-491441, Chhattisgarh, India

*Email: pandey.dhananjay333@gmail.com

Introduction:

Instruments are the backbone of any scientific discovery and lays the strong foundation of research and innovation. The need of the hour is to acquaint the researchers with general lab facilities, instruments and basic tools & techniques which in turn also envisages in developing problem-solving skills and caters research zeal among all its aspirants. These instrumentation skills help the researchers to acquire the ability to identify a problem, design and set up the experiment, collect and analyze data and interpret data to arrive at the plausible solution in due course of time. In fact, these are the long-term objectives of laboratory work and become the nucleus of the philosophy for the construction of advance knowledge. The various instruments used in the laboratory are the basic foundation of research and development (Figure 1). The format for description of experiments includes the aim, principle, materials required, procedure, observations results, interpretation and precautions. An emphasis on drawing conclusions and discussions of results is also the mandatory part of any research investigation. Moreover, the researchers must also understand the safety measures along with Do's and Dont's while performing the laboratory instrument-based research experiments. However, there are certain laboratory rules, regulations and guidelines that the researchers must be accustomed with before undertaking research endeavours in the laboratory.

(A) BOD Incubator: A BOD incubator (Biochemical Oxygen Demand incubator), is specialized laboratory instrument designed to maintain stable environment and low-temperature (typically 5°C to 60°C) for testing microbial growth, water pollution levels, and sample preservation. It employs cooling and heating systems to ensure accurate and stable incubation. It utilizes a combined refrigeration and heating system, managed by a PID controller, along with air circulation to ensure consistent temperature, allowing for accurate measurement of oxygen consumption levels.

(A) BOD Incubator

(B) Binocular Microscope

© Centrifuge

(D) Column Chromatography

(E) Sonicator

(F) Electrophoresis Unit

(G) Magnetic Stirrer

(H) pH Meter

(I) Inverted Microscope

(J) Spectrophotometer

(K) UV Cabinet

(L) Water Bath

Fig. 1: Instruments for Biological Analysis (A) BOD Incubator (B) Binocular Microscope (C) Centrifuge (D) Column Chromatography (E) Sonicator (F) Electrophoresis Unit (G) Magnetic Stirrer (H) pH Meter (I) Inverted Microscope (J) Spectrophotometer (K) UV Cabinet (L) Water Bath.

(B) Binocular Microscope: A binocular microscope is an optical instrument possessing two eyepieces, manufactured to minimize eye strain and provide increased and comfortable viewing for extended observation of microbial specimens. A binocular microscope operates on the principle of optical magnification and stereoscopic viewing, using two ocular lenses to view a single specimen simultaneously. It splits light from the objective lens into two separate paths through a prism system, allowing both eyes to see enhanced image and increasing depth perception.

(C) Centrifuge: A centrifuge is an instrument that employs high-speed rotation to apply sustained centrifugal force, separating substances of different densities, such as solids from liquids or liquids from liquids. It works by spinning samples, causing denser materials to move outward to the bottom of the tube (pellet), while lighter materials remain towards the center (supernatant). The centrifuge operates on the sedimentation principle, by rapid rotation to generate high centrifugal force, which separates particles in a liquid based on density, size, shape, and viscosity.

(D) Column Chromatography: Column chromatography is a laboratory technique used for separating and purifying individual components from liquid or solid mixtures based on their differential affinity for a solid stationary phase and a moving liquid mobile phase. It separates compounds by polarity or size, with less strongly adsorbed components eluting first. Column chromatography separates mixture components based on their differential affinity for a stationary phase and a mobile phase as they move through a column. Compounds with weaker affinity for the stationary phase move faster, while those with higher affinity move slower, leading to separation.

(E) Sonicator: A sonicator is a laboratory instrument that uses high-frequency sound waves to generate cavitation bubbles in a liquid, which collapse and produce intense shear forces. Primarily used for cell disruption, homogenizing samples, dissolving solids, and cleaning small, delicate, or intricate items, they are very useful in pharmaceutical research and manufacturing industries. A sonicator operates on the principle of acoustic cavitation, using high-frequency sound waves (typically 20 kHz-1 MHz) to induce rapid pressure changes in a liquid. These waves produce intense localized heat, high pressure, and shear forces that disrupt cells, disperse particles and mix solutions.

(F) Electrophoresis Unit: An electrophoresis unit is a laboratory instrument used to separate DNA, RNA and protein molecules based on their size and electric charge, utilizing an electric field, buffer solution, and an agarose or polyacrylamide gel matrix. These units, often featuring platinum electrodes and acrylic safety lids, come in horizontal or vertical types, powered by a connected power supply. In electrophoresis, the negatively charged molecules (like DNA) move toward the anode (+), while positively charged particles move toward the cathode (-), with smaller molecules moving faster than the heavier ones.

(G) Magnetic Stirrer: A magnetic stirrer is a laboratory instrument that employs a motor-driven magnet or electromagnet to generate rotating magnetic field to spin a Teflon-coated stir bar, immersed in a liquid, inside the vessel to spin at a controlled speed and creating a vortex for uniform mixing. It often includes a hot plate for simultaneous heating and mixing, commonly used for chemical synthesis, dissolution and temperature-controlled experiments in both open and sealed vessels. A magnetic stirrer operates on the principle of magnetic coupling to create a rotating magnetic field that drives a stir bar, enabling uniform mixing of liquids.

(H) pH Meter: A pH meter is an electronic instrument that measures the acidity or alkalinity of a solution by gauging hydrogen ion activity, providing readings on a scale from 0 (acidic) to 14 (basic). Essential in laboratories, water treatment, and agriculture, these devices use a electrode to determine the pH and display it digitally. A pH meter operates on the principle of potentiometry, measuring the electrochemical potential difference (voltage) between a glass sensing electrode and a reference electrode. This voltage, which changes based on the hydrogen ion concentration in the sample, is converted into a pH reading using the Nernst equation.

(I) Inverted Microscope: An inverted microscope is designed with the light source and condenser above the stage pointing down, and objectives below pointing up. It is particularly used for observing live cell cultures in petri dishes or flasks. An inverted microscope works by reversing the optical path of a conventional microscope: the light source and condenser are placed on top, illuminating the specimen from above, while the objective lenses are situated below the stage, pointing upward. The aforesaid setup allows observation of large, thick vessels like Petri dishes or cell culture flasks from below.

(J) Spectrophotometer: A spectrophotometer is an instrument that measures the amount of light a chemical substance absorbs by passing a beam of light through a sample, identifying or quantifying substances based on the intensity of wavelength. It deduces concentration by analyzing the interaction of UV or visible light spectrum. A spectrophotometer works by measuring the monochromatic light intensity that passes through a sample compared to that of blank. The spectrophotometer works on the Beer-Lambert Law, which states that the absorbance (A) of a sample is directly proportional to its molar concentration (c) and the path length (l) of light (A= €cl).

(K) UV Cabinet: A UV cabinet is an instrument employed to analyze and detect UV-active substances, such as spots on Thin Layer Chromatography plates, by offering a dark environment and controlled UV light *viz*., typically 254nm and 365nm. The UV cabinet protects the user's eyes from UV radiation allowing safe and clear inspection of fluorescent materials. A UV visualization chamber uses ultraviolet light lamps to induce fluorescence or absorption in substances, making invisible compounds, such as those separated on a Thin Layer Chromatography plate, visible to the eye. The principle relies on illuminating samples with short-wave (254 nm) or long-wave (365 nm) UV light.

(L) Water Bath: A water bath is a heated container used to incubate samples at constant, controlled temperatures up to 100°C. An electric heating element warms the water, which uses convection to maintain an even temperature throughout the tank, ensuring precise and stable incubation. It is useful for uniform heating of reagents, melting substrates and incubating cell cultures, offering a safer alternative to open flames for flammable substances. Common types include circulating, non-circulating, and shaking water baths. A water bath works on the principle of indirect, uniform heat transfer using water as a medium to heat samples gently and consistently to a specific temperature.

Conclusion:

The present endeavor is a simplified compilation comprising of 12 instruments within a limited space with an ease of understanding. The proper understanding of handling and working procedure of each and every instrument is very crucial to generate accuracy in observation and results along with precession in experimental findings. Owing to this concern the present compilation intends to highlight new trends of instruments, with special emphasis on its introduction and principle. The current prospects present a coverage on various aspects of above-mentioned scientific instruments beneficial for researchers to quench their thirst of knowledge. In a nut shell the present compilation ultimately draws special attention towards the implication of recent and advanced techniques in basic research methodologies along with their future research prospects for generations ahead.

BOOK REVIEW

Biodiversity Security in *Crises or Sankate Jiboboichitro Suraksha* (সংকটে জীববৈচিত্র্য সুরক্ষা)
by Saikat Kumar Basu. Language: Bengali, Publisher: Gobordanga Gobeshona Porishod (April, 2026), ISBN: 978-93-94091-19-1. Hardcover, 160 pages, Rs. 300.

Dr. Suparna Sanyal Mukherjee
Associate Professor & Head
Department of Education, DIC to the Departments of Sociology & Anthropology, Seacom Skills University, Bolpur, Birbhum, West Bengal and Chief Functionary, Howrah Suparna, Ramrajatola, Howrah, West Bengal;
Email: drsuparnasanyalmukherjee@gmail.com

Biodiversity Security in Crises emerges as a timely and intellectually engaging contribution to contemporary environmental scholarship. Written by distinguished agriculturist and environmental scientist and academic Saikat Kumar Basu, the book addresses one of the defining challenges of the Anthropocene: how biodiversity can be protected, restored, and secured amid escalating global crises—climate change, pandemics, ecological degradation, food insecurity, and socio-economic instability. The text situates biodiversity not merely as a conservation concern but as a security imperative, expanding the conceptual boundaries of environmental discourse. In doing so, Basu aligns biodiversity conservation with human survival, ecological resilience, and sustainable development.

The book's central argument is clear and compelling. Biodiversity loss is simultaneously an ecological, economic, social, and security crisis. Rather than treating conservation as a static activity confined to protected areas, Basu conceptualizes biodiversity security as a dynamic system embedded within social-ecological networks. This perspective resonates with contemporary scholarship emphasizing that conservation strategies must adapt to rapidly changing crisis conditions rather than operate under "business-as-usual" assumptions.

Basu argues that crises—whether environmental disasters, agricultural collapse, or global health emergencies—expose the fragility of ecological systems and human dependence on biodiversity services such as food production, climate regulation, disease resilience, livelihood security, cultural continuity.

Although interdisciplinary in tone, the book can broadly be understood through several thematic pillars. The opening chapters contextualize biodiversity erosion as a consequence of over-exploitation, habitat destruction, pollution, and unsustainable development. Basu highlights how human actions destabilize soil systems, species interactions, and ecosystem balance—processes already identified as drivers of ecological decline worldwide. The author successfully connects local ecological degradation to global systemic risks, reinforcing the argument that biodiversity decline threatens economies, food systems, and public health security.

A major intellectual strength of the book lies in its treatment of crises as transformative ecological moments.

Natural disasters, pandemics, and climate disruptions are analyzed not only as destructive events but as revealing mechanisms that expose weaknesses in environmental governance. Basu demonstrates how crisis conditions accelerate biodiversity loss while simultaneously offering opportunities for policy reform, community participation, and ecological innovation.

The book strongly emphasizes agro-ecology and sustainable agriculture. Basu argues that biodiversity security underpins global food systems by maintaining soil organisms, pollinators, and genetic diversity—elements fundamental to resilience against climate variability and crop failure. This argument reflects broader scientific understanding that biodiversity sustains ecosystem services essential for food production and human well-being.

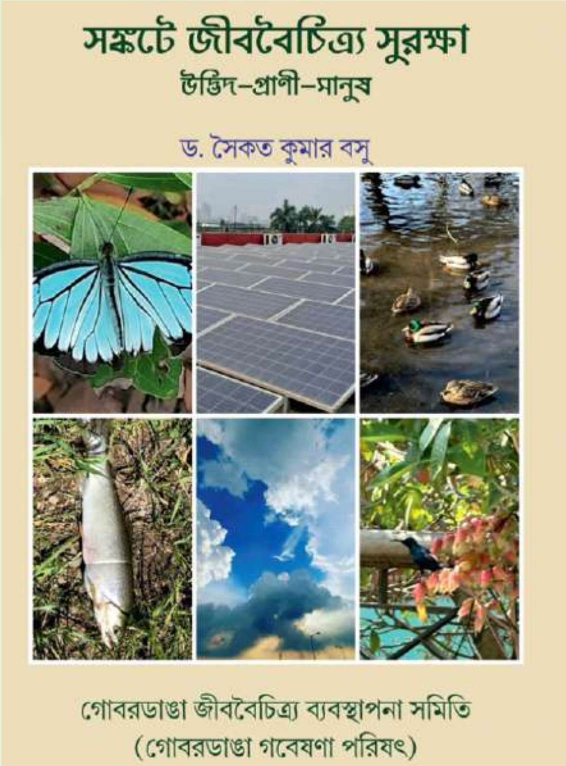
One of the most valuable contributions of the text is its advocacy for integrating traditional ecological knowledge, indigenous conservation practices, and grassroots stewardship models. Basu challenges top-down conservation approaches and promotes community-based environmental governance, particularly relevant for developing nations facing simultaneous ecological and socio-economic pressures.

Perhaps the book's most innovative dimension is its framing of biodiversity as a security issue. Basu expands the meaning of security beyond military or political frameworks to include ecological stability, resource sustainability, public health resilience, and climate adaptation. Recent global policy debates similarly recognize biodiversity loss as a threat to economic stability and geopolitical security, reinforcing the relevance of Basu's insightful narratives.

The book adopts an interdisciplinary methodology combining ecological science, environmental sociology, sustainability studies, development policy and case-based analysis. Rather than relying solely on theoretical discourse, Basu integrates real-world examples, regional experiences, and policy reflections. The narrative style makes complex ecological concepts accessible without sacrificing academic rigor.

The major strengths of this seninal work is that book bridges natural sciences, social sciences, and policy studies, making it valuable for researchers across disciplines. Unlike many Western-centric environmental texts, Basu foregrounds experiences from Asia and other developing regions, highlighting climate vulnerability, rural livelihoods, and environmental justice.

The work offers actionable insights relevant to sustainable development planning, disaster risk reduction, biodiversity governance, and climate adaptation frameworks. Beyond science, the author introduces ethical reflections on humanity's relationship with nature, urging a shift from exploitation toward ecological coexistence.



Despite its many strengths, certain aspects invite constructive critique. The ambitious scope occasionally limits detailed empirical analysis in specific chapters. Readers seeking quantitative datasets or methodological rigor may desire deeper case-study expansion. The book strongly advocates conservation ethics, which enriches its moral clarity; but, sometimes reduces engagement with opposing economic-development perspectives.

While visionary, some recommendations require clearer operational frameworks for implementation in politically complex contexts. Nevertheless, these limitations do not undermine the book's intellectual contribution; rather, they highlight opportunities for future research inspired by Basu's framework. Biodiversity Security in Crises contributes to emerging academic conversations in anthropocene studies, resilience theory, environmental security, and sustainability transitions.

The book advances an important shift—from conserving biodiversity as an environmental luxury to recognizing it as a civilizational necessity. The book is particularly suitable for university students in environmental science and ssustainability, policy makers and conservation planners, interfaith and community environmental initiatives, researchers in climate change and ecological security, and development professionals and NGOs.

Biodiversity Security in Crises stands as a thoughtful, urgent, and forward-looking work that reframes biodiversity conservation within the language of survival, resilience, and shared planetary responsibility. Through interdisciplinary synthesis and ethical engagement, Saikat Kumar Basu successfully argues that safeguarding biodiversity is inseparable from safeguarding humanity itself.

In an era marked by ecological uncertainty, the book functions not only as an academic text but also as a call to ecological consciousness and action—reminding readers that the future of civilization depends on restoring balance between human progress and the living world.

WORLD ENVIRONMENT DAY

S. K. Basu
PFS, Lethbridge, Alberta, Canada
Email: *saikat.basu@alumni.uleth.ca*

World Environment Day (WED), observed annually on 5 June under the leadership of the United Nations Environment Programme (UNEP), serves as the world's largest platform for environmental awareness, advocacy, and action. The observance of World Environment Day 2026 assumes particular significance in the context of escalating global environmental challenges, including climate change, biodiversity loss, pollution, deforestation, water scarcity, and unsustainable patterns of consumption and production. As nations strive to achieve the Sustainable Development Goals (SDGs) and fulfill commitments under international environmental agreements, World Environment Day 2026 provides a critical opportunity to strengthen public participation, policy interventions, and collective responsibility toward environmental conservation.

From an Indian perspective, the significance of World Environment Day 2026 is multifaceted. India, home to nearly one-sixth of the global population and one of the world's richest biodiversity regions, faces complex environmental pressures arising from rapid urbanization, industrial growth, population expansion, and climate variability. Environmental issues such as air pollution, declining groundwater levels, waste management challenges, land degradation, and extreme weather events have increasingly affected ecological stability and human well-being. Consequently, World Environment Day acts as a catalyst for promoting environmental stewardship, sustainable development, and climate resilience across the country.

The observance highlights India's ongoing efforts toward renewable energy expansion, sustainable agriculture, afforestation, river conservation, biodiversity protection, and the transition to a circular economy. National initiatives such as the National Action Plan on Climate Change (NAPCC), Mission LiFE (Lifestyle for Environment), the Swachh Bharat Mission, Green India Mission, and various clean energy programs reflect India's commitment to balancing economic development with environmental sustainability. World Environment Day further strengthens these initiatives by encouraging citizen participation, educational outreach, community engagement, and corporate environmental responsibility.

Moreover, the event reinforces the importance of integrating traditional Indian ecological values with contemporary environmental management practices. Ancient Indian philosophies emphasizing harmony between humans and nature continue to offer valuable insights for sustainable living and resource conservation. By fostering environmental literacy among youth, promoting green innovation, and encouraging collaborative action among governments, industries, civil society organizations, and local communities, World Environment Day 2026 contributes significantly to building a more sustainable and climate-resilient future.

In conclusion, World Environment Day 2026 represents more than a symbolic environmental observance; it serves as a strategic platform for mobilizing global and national efforts toward ecological preservation and sustainable development. For India, it provides an opportunity to address pressing environmental concerns, strengthen climate action, promote sustainable lifestyles, and reaffirm the nation's commitment to environmental protection for present and future generations.

Photo credit: **Saikat Kumar Basu**






DEFLECTION OF CANTILEVER BEAM – AN EASY APPROACH

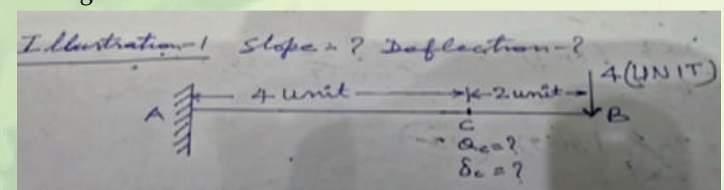
Manoj Kumar Varshaney
Civil Engineering, D. N. Polytechnic,
Meerut (U.P.) - 250103
E-mail: *manojvarshaney17@rediffmail.com*

Abstract:
Since the evolvement of various methods of determining the deflection of beams, it has been always in practice to get know the deflection of beam at any point beside of the load. The paper is explaining the shortest view to get know the facts of deflection in a very short of time. The study revealed that by choosing this view into practice, would make the better way to find deflection.

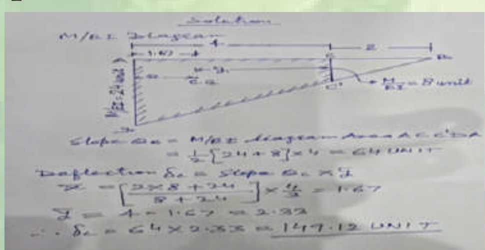
Introduction:
There are various methods like Double Integration / Macaulay's / Conjugate beam and Moment area method of determining the deflection at any point of various type of beams like fixed/continuous/simply supported/cantilever and over hanged etc. Various methods have their deflection procedures with limitations however indirectly they are intermingled together with. An easy approach usually occurs with moment area method where-in the deflection determination below the load or on any point, seems easy than other methods. Though some illustrations of deflection are read by readers through various media, but these are quasi concern with author's illustration. Author's title has easy approach through illustration with diagrams to make learn aspirants for the deflection not below the load.

Method:
The present method is usually moment area method and firstly to draw M/EI (bending moment) diagram and then by finding the area of M/EI diagram from fixed end to deflection point is the deflection angle or slope. After this the centre of gravity of M/EI diagram up to the deflection point distance to be multiplied with the M/EI diagram area up to deflection point, gives the deflection at the point where the deflection is to be determined. The value is the real deflection angle/slope as well as deflection.

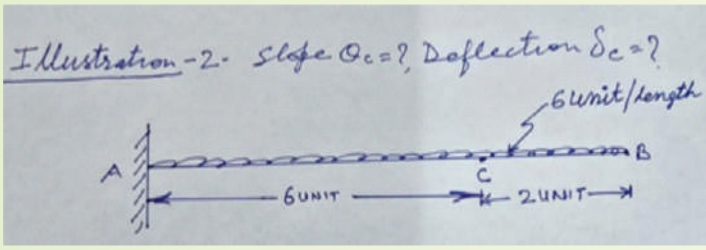
1- Illustrtion-1-To find the deflection for point load as per the figure-1



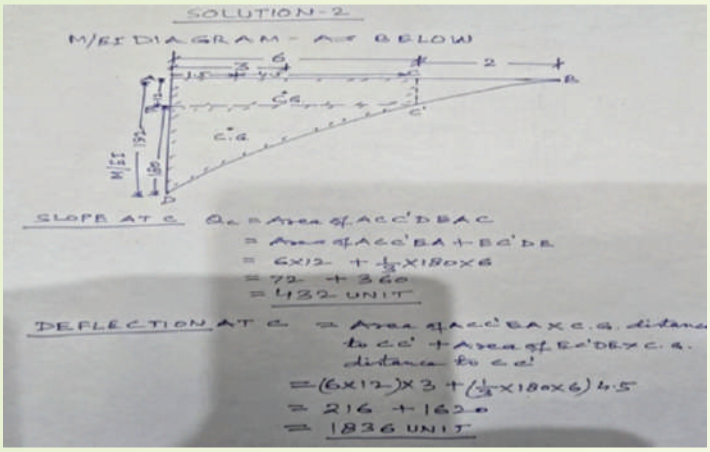
Solution-1



4- Illustrtion-2-To find the deflection for UDL as per the figure-2



Solution-2



Conclusion:
The method and illustration as taken with author's title reveals that easiest method of determining the deflection and slope at point of cantilever beam, is moment area method. Also there are fewer illustrations available in media for determination of slope and deflection before side of load of cantilever beam. Available illustrations of deflection/ slope in books are for away/on to the load. At this situation aspirants feel problem to solve such type of questions. They feel doubt to the area and centre of gravity of the M/EI diagram to be taken in consideration up-to which extent. The author has illustrated correct, useful and significant examples cum versions.

Reference

1. **Strength of Materials** (Hindi)- Asian Publishers Muzaffarnagar-2025-26, ISBN-978-93-5502-972-0.
2. **Strength Of Materials** (English)- Asian Publishers Muzaffarnagar-2025-26, ISBN-978-93-5502-440-4.
3. **Mechanics of Material** (English)-Asian Publishers-MZN-2025-26-ISBN-978-93-5502-882-2.
4. **Mechanics of Material** (Hindi)-Asian Publishers-MZN-2025-26-ISBN-978-93-5502-441-1.

BAYBERRY: THE HIDDEN TREASURE FRUIT

Mageshwari. D, Nimisha Sharma, R M Sharma, Damini Singh and Abeer Ali
Division of Fruits and Horticultural Technology
Indian Agricultural Research Institute, New Delhi
Email: magesh.iari@gmail.com

Bayberry is a small with central stone, juicy and attractive fruit known for its sweet , sour taste and the fruit is usually red, dark red or purple in color and usually grows on evergreen trees. Bayberry is popular in several Asian countries and it is tropical or subtropical fruit because of its refreshing flavor and health benefits. Though it is not as common as mango, banana or apple, the fruit has gained importance because of its nutritional and medicinal value. The scientific name of bayberry is *Myrica rubra*. It belongs to the family Myricaceae. The fruit is soft, juicy and highly delicate. It is mostly consumed fresh, but it is also processed into juice, jam, jelly, wine, syrup and candies due to its low shelf life usually less than five days. In recent years, people have become more interested in natural and healthy a food, which has increased the popularity of bayberry.

Origin and History of Bayberry
Bayberry originated in China many thousands of years ago, it is also known as Chinese Bayberry. The fruit has been cultivated and consumed in China for more than 2000 years based on the historical records. Ancient Chinese people considered bayberry to be a valuable fruit because of its pleasant taste and medicinal properties. Later, the fruit spread to nearby countries such as Japan and other Asian regions. In ancient times, bayberry fruits were often used during the summer season because they were believed to cool the body, reduce thirst, improving digestion and relieving stomach discomfort. In hilly and subtropical areas with favorable environmental conditions, bayberry trees were frequently grown. The fruit was characterized as a unique fruit consumed by royalty and affluent families in various historical accounts. China continues to be the world's top producer of bayberries.

Botanical Description of Bayberry
Bayberry is an evergreen tree that grows to medium height and the tree has dark green leaves and produces small flowers before fruit formation. The fruits are round and have a rough outer surface covered with tiny soft projections and it gives the fruit a unique appearance. The fruits are green in the early stages. They turn red, dark red, or purple as they get older. Fruits that are fully ripe are juicy, tender, and fragrant. In the middle of the fruit is a firm seed.

Climate and Soil Requirement
Bayberry trees grow best in warm subtropical climates with moderate rainfall. Very cold weather or dry conditions can reduce fruit yield and quality. They prefer fertile and slightly acidic soil with good drainage conditions. The trees can survive well in hilly areas and remain green throughout the year. Waterlogging is harmful because it damages the root system. Good sunlight is necessary for proper flowering and fruit development. Farmers usually cultivate bayberry in hilly regions where drainage conditions are naturally better.

Why Bayberry is Not Widely Cultivated
Although bayberry is healthy and economically useful, it is not as commonly cultivated as other commercial fruit crops. One main cause is the short shelf life. Because of their high moisture content, the fruits deteriorate soon after harvest. This causes complications with storage and shipping. Another reason is the fragile nature of the fruits. They are easily destroyed during harvesting, packing, and transportation. Farmers must use careful handling procedures to ensure fruit quality. Bayberry trees also require specific climatic conditions, such as warm temperatures, moderate rainfall, and good soil. As a result, cultivation is limited to specific regions. Another key reason is a lack of customer knowledge. Many people are unfamiliar with bayberry when compared to other fruits such as apples and oranges. Limited market demand discourages farmers from large-scale cultivation.

The trees also take several years before they begin fruit production. Farmers often prefer crops that provide quicker returns. In addition, research and marketing systems for bayberry are still developing in many countries.

Nutritional Benefits of Bayberry
Bayberry is highly nutritious fruit due to rich in vitamins, minerals and antioxidants. The fruit is rich in vitamin C that helps to improve immunity and protect the body from infections and also supports healthy skin and wound healing.The dietary fiber present in bayberry improves digestion and helps prevent constipation. Regular consumption of fiber-rich fruits supports healthy bowel

movement and digestive health. Bayberry contains antioxidants such as anthocyanins and flavonoids and protect body cells from damage caused by harmful free radicals. Antioxidants may help reduce the risk of heart disease and certain chronic illnesses. The fruit also helps maintain hydration because of its high water content. During summer, bayberry juice is commonly consumed as a refreshing drink to reduce tiredness and thirst. Minerals such as potassium and calcium present in bayberry support proper body functions. Potassium helps regulate blood pressure and supports heart health. Since the fruit contains very little fat, it is considered a healthy snack option.

Medicinal Importance of Bayberry

Bayberry has been used as a traditional medicine for many years. Ancient healers believed that the fruit could aid digestion, prevent dehydration, and chill the body in hot conditions. The fruit was also used to alleviate stomach pain and fatigue. In some traditional methods, the bark and leaves of the bayberry tree were utilized to make herbal remedies. Modern scientific investigations indicate that bayberry may have antioxidant, antimicrobial, and anti-inflammatory properties. Researchers are investigating the fruit's potential function in preventing cell damage and increasing general health. Although further research is needed, bayberry is regarded as a valuable therapeutic fruit in traditional systems.

Economic Importance of Bayberry

Farmers can make an excellent living growing bayberries. Due to their distinct flavor and nutritional content, the fruits are highly valued in local markets. Both processed goods and fresh fruits can be sold by farmers. Juice, jam, jelly, candies, syrup, and wine are all frequently made from bayberries. The fruit's commercial significance is increased by these items. Processing and marketing bayberry goods also helps small food businesses. Rural residents can find work through cultivation and processing. The demand for bayberry products may grow in the future as consumers become more interested in eating healthier.

Environmental Importance of Bayberry

Bayberry trees provide several environmental benefits. Since they are evergreen trees, they help maintain greenery throughout the year. The trees improve the beauty of landscapes and contribute to environmental stability.

The root system of bayberry helps prevent soil erosion, especially in hilly areas. The trees also provide habitat and food for birds and insects, supporting biodiversity and ecological balance.

Harvesting and Post-Harvest Problems

During the ripening period, bayberry fruits are carefully plucked. The fruits are readily harmed by hard handling because they are delicate and tender. To preserve quality, farmers must employ appropriate harvesting and packing techniques. Post-harvest spoiling is one of the main issues. Due to their high moisture content, the fruits quickly lose their freshness. For a brief time, shelf life is extended by cold storage and better packing techniques. The fruits are readily bruised after long-distance travel, which makes transportation challenging. To lower post-harvest losses, scientists are developing improved preservation solutions.

Future Scope of Bayberry

Today, people are becoming more health conscious and interested in fruits rich in antioxidants and vitamins. Because of its nutritional and medicinal value, bayberry has good future potential.Researchers are developing improved cultivation methods, disease management practices and better storage technologies. Scientists are also studying new processing methods to increase the commercial value of the fruit. With proper awareness, marketing and research support, bayberry cultivation may increase in the future. The fruit has the potential to become an important crop in health food industries and processing sectors.

Conclusion

A valuable and rare fruit with a long history and numerous health advantages is the bayberry. The fruit, which is native to China, has been grown for generations due to its delicious flavor and therapeutic value. Antioxidants, vitamins, and minerals found in bayberries are beneficial to human health. The fruit has significant nutritional, medicinal, economic, and environmental value, but it is not commonly grown because of storage issues and certain climate requirements. This unusual fruit is now attracting more attention from farmers, researchers, and the food industry. Bayberries have the potential to grow in popularity in the future with improved storage techniques, better production techniques, and increased consumer awareness. It is a vital fruit for both humans and agriculture because of its many applications, nutritious value, and pleasant flavor.

Sources:

ICAR publications and Scientific literature related to bayberry.