JULY 2024

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VOLUME NO - 01 ISSUE - 02

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Patent No. 523325 Toll Free No. 18002688989

+91 22 48888888
+91 80972 83444
www.ecrop.co.in
mail@ecrop.co.in

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e-CROP Magazine Editorial

Chief Editor : Amarben Patni
Eco-Conscious Editor : Swapnil Tiwari
Assistant Editor : Krishna Kanu
Sustainablity Editor : Prachi Athavale
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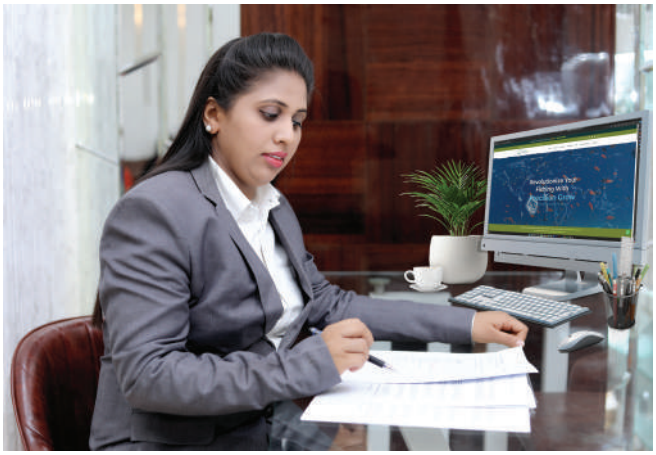
Publisher: Amarben Patni on behalf of Tech Visit IT Pvt Ltd
Published from: Plot No. 80/81, Shop No. 155, Vashi Plaza, Sector 17, Vashi, Mumbai, Mumbai City, Maharashtra, 400703
Phone No.: +91 8097626333
E-mail:
editor@ecrop.co.in
mail@precisiongrow.co.in

From The group Editor's Desk



Agriculture stands as one of humanity's most ancient and transformative practices, dating back approximately 12,000 years ago.Through the ages, our ancestors innovated countless methods to ensure food security for their communities, villages, and nations.The journey from rudimentary farming techniques to the sophisticated agricultural technologies of today reflects a profound evolution. The last century, in particular, has witnessed unprecedented growth in the agriculture sector, spurred by technological advancements that have transformed our approach to food production.

From satellites to nanotechnology, and from radio sensors to precise soil measurement devices, we have harnessed cutting-edge innovations to boost global food production, striving to meet the ever-growing demand. However, the increasingly erratic climate conditions serve as a stark reminder of the challenges that lie ahead. These challenges have prompted agriculturalists and scientists to develop new techniques that not only address food security but also mitigate the environmental impact of farming practices.

At Precision Grow, we are proud to introduce a groundbreaking solution to these pressing issues: the e-CROP device. Approved and patented by ICAR, this innovative technology employs radio sensors to monitor real-time crop growth, providing crucial data on soil nutrients such as nitrogen, phosphorus, and potassium. Additionally, e-CROP offers actionable advice to farmers on addressing problems like inadequate vegetation and cloud cover, ensuring optimal crop health and yield.

In this issue, we delve into the pressing challenges face by agriculture today, from severe heat waves and soil erosion to the critical importance of forests and the technological revolution exemplified by devices like e-CROP. We hope that readers will gain a deeper understanding of the global responsibilities we all share and the urgent actions needed to further the prosperity of human civilization.

Amarben
Editor in Chief

VOLUME – I ISSUE 2

JULY 2024

CONTENT

United Nation WARNS that Earth will Soon hit RECORD HIGH TEMPERATURES

By Amarben Patni

Children born today are entering a world struggling to maintain temperatures that support life. Since the start of the century, the climate has changed drastically due to technological advancements and increased human consumption. Controlling greenhouse gases has been a significant challenge, and global temperatures continue to reach new highs each year. Scientists are increasingly concerned and are urgently seeking effective measures to reverse this trend, though solutions remain elusive for now.

The Earth is experiencing its highest temperatures in over 100,000 years, and scientists from the United Nations are warning that more record-breaking hot years are almost guaranteed. The World Meteorological Organization (WMO) reports a nearly 90 percent chance that within the next five years, the planet will see its hottest year on record, surpassing even the scorching temperatures of 2023.

Alarming Projections for Global WARMING

According to the WMO, there's also a significant probability that within the next five years, the average global temperature will be 1.5 degrees Celsius (2.7 degrees Fahrenheit) higher than pre-industrial levels.This threshold is critical as it was set by countries in the 2015 Paris Agreement to avoid catastrophic climate impacts. displaying such ads, stating, "Fossil fuels are not only poisoning our planet; they're toxic for your brand."

UN Calls for Immediate Action

UN Secretary-General António Guterres emphasized the urgency of the situation in a recent speech at the American Museum of Natural History in New York City. He called for drastic measures including:

- **Reducing carbon dioxide emissions**
- **Adopting renewable energy sources**
- **Assisting poorer nations in their climate efforts**
- **Clamping down on the fossil fuel industry**

UN also urged governments to ban advertising by fossil-fuel companies, drawing parallels to the tobacco industry, which faces global advertising restrictions. He called on media and tech companies to stop displaying such ads, stating, "Fossil fuels are not only poisoning our planet; they're toxic for your brand."

Rising Temperatures and Extreme Weather

Since mid-last year, the Earth has been on an unprecedented streak of record-high temperatures. May 2023 was the hottest May ever recorded, marking the 12th consecutive month of record-breaking warmth. On average, temperatures during this period were 1.63 degrees Celsius above preindustrial levels.While the Paris Agreement's 1.5-degree target is a long-term goal, temporary breaches do not mean it is permanently unattainable. However, these breaches are becoming more common, indicating that immediate action is necessary to mitigate long-term effects.

Global Impacts of Extreme Heat

Extreme heat has already had severe consequences worldwide:

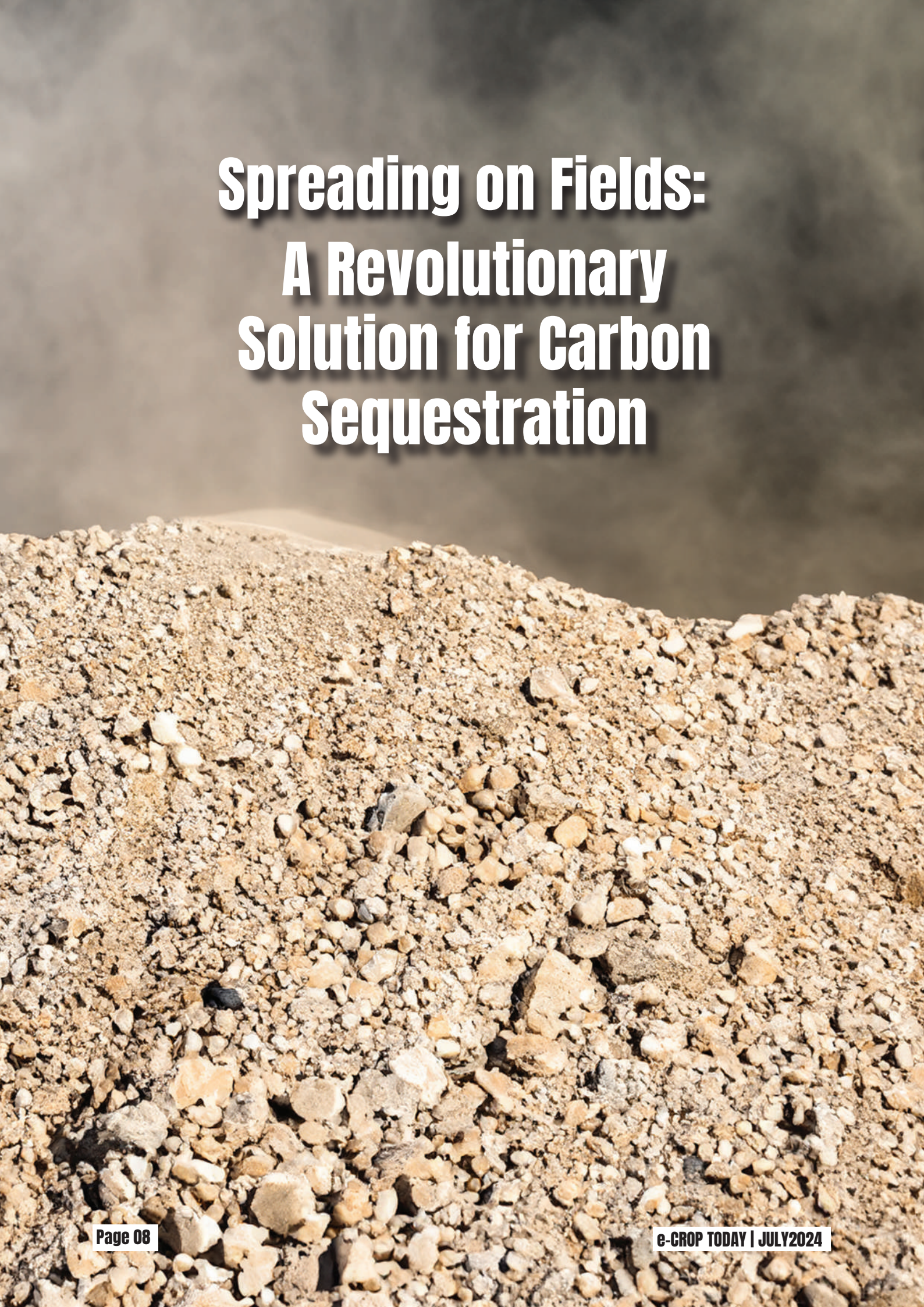
- **In South Asia, temperatures have soared past 110 degrees Fahrenheit, affecting millions.**
- **The U.S. Southwest is experiencing intense heat**
- **Brazil has faced devastating flooding, exacerbated by climate change.**

Additionally, coral reefs are suffering from widespread bleaching due to elevated ocean temperatures. The National Oceanic and Atmospheric Administration predicts an exceptionally stormy Atlantic hurricane season, driven by record ocean temperatures.

Future Outlook and Possible Relief

Despite the grim projections, some temporary relief might be on the horizon. The El Niño phenomenon, which redistributes heat in the Pacific Ocean and affects global weather patterns, is fading. However, other factors contributing to warming may persist. Recent regulations to reduce ship emissions have unintentionally increased warming by decreasing sulfur compounds that previously helped cool the planet. The primary drivers of global warming remain clear: rising levels of carbon dioxide, methane, and nitrous oxide. At the current rate of emissions, it may only be a few years before the atmospheric chemistry is so altered that limiting warming to 1.5 degrees Celsius becomes extremely challenging. To address this, scientists and policymakers emphasize the critical need to reduce greenhouse gas emissions and take immediate actions against climate change.

Spreading on Fields: A Revolutionary Solution for Carbon Sequestration



In the ongoing battle against climate change, scientists are continually exploring innovative methods to mitigate the impacts of rising carbon dioxide (CO2) levels in the atmosphere. One such groundbreaking technique gaining traction is the application of rock dust on farmland, known as Enhanced Rock Weathering (ERW). This method offers a promising avenue for carbon sequestration, potentially removing vast amounts of CO2 from the air annually.

The Science Behind Enhanced Rock Weathering

Enhanced Rock Weathering involves the spreading of finely ground rock dust, particularly basalt, on agricultural land. When applied to soils, the rock particles undergo chemical reactions that effectively trap CO2 by converting it into carbonates. This process occurs relatively quickly, with significant amounts of CO2 being locked away within months.

Advantages of Enhanced Rock Weathering

One of the key advantages of ERW is its compatibility with existing agricultural practices. Many farmers already incorporate limestone dust into their soils to mitigate acidification, and the addition of other rock dust types further enhances soil fertility and crop yields. Basalt, in particular, proves to be highly effective in capturing CO2, and its widespread availability makes it a practical choice for large-scale implementation.

Global Impact and Potential

Recent research indicates that ERW has the potential to capture billions of tonnes of CO2 annually, a figure equivalent to the combined emissions of major industrialized nations. By treating approximately half of the world's farmland, ERW could play a significant role in meeting the emission reduction targets outlined in the Paris Agreement. Moreover, countries with extensive cropland areas, such as China, the US, and India, stand to benefit the most from this approach. **Precision Grow** addresses this issue by providing a range of services aimed at promoting sustainable farming practices. These services play a crucial role in mitigating global agricultural emissions

Cost-Effectiveness and Feasibility

Cost considerations are crucial in evaluating the viability of carbon sequestration strategies. The estimated cost of implementing ERW varies depending on factors such as local labor rates but aligns with projected carbon prices in the future. Furthermore, the use of waste rock dust from mining, cement, and steel manufacturing processes presents a sustainable and cost-effective solution for ERW implementation.

Environmental and Agricultural

Beyond its carbon sequestration potential, ERW offers additional environmental and agricultural benefits. By replenishing essential nutrients and reducing soil acidity, this technique enhances soil health and promotes sustainable agriculture. Moreover, the widespread adoption of ERW could contribute to global food security by improving crop yields and resilience.

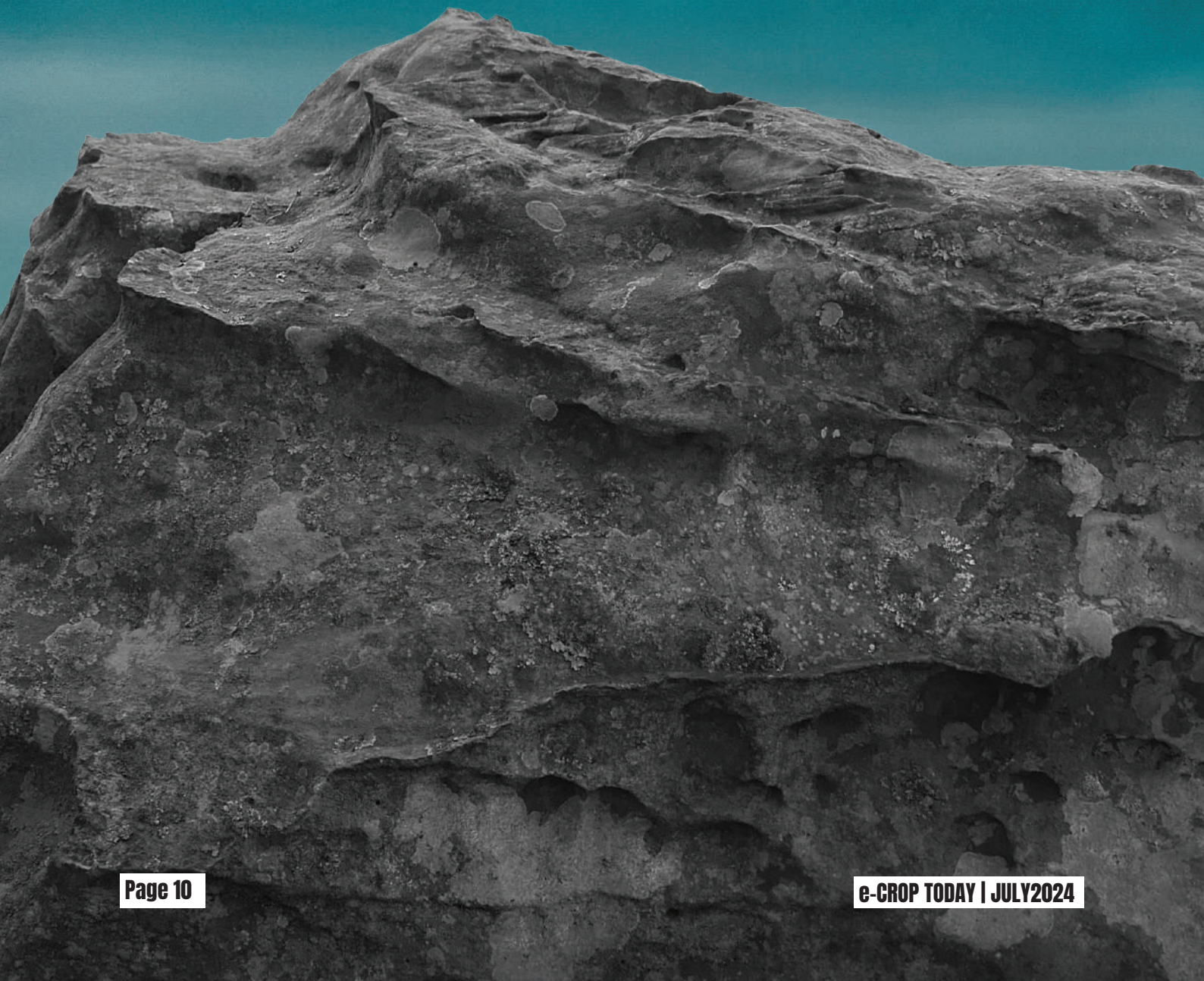
Challenges and Future Directions

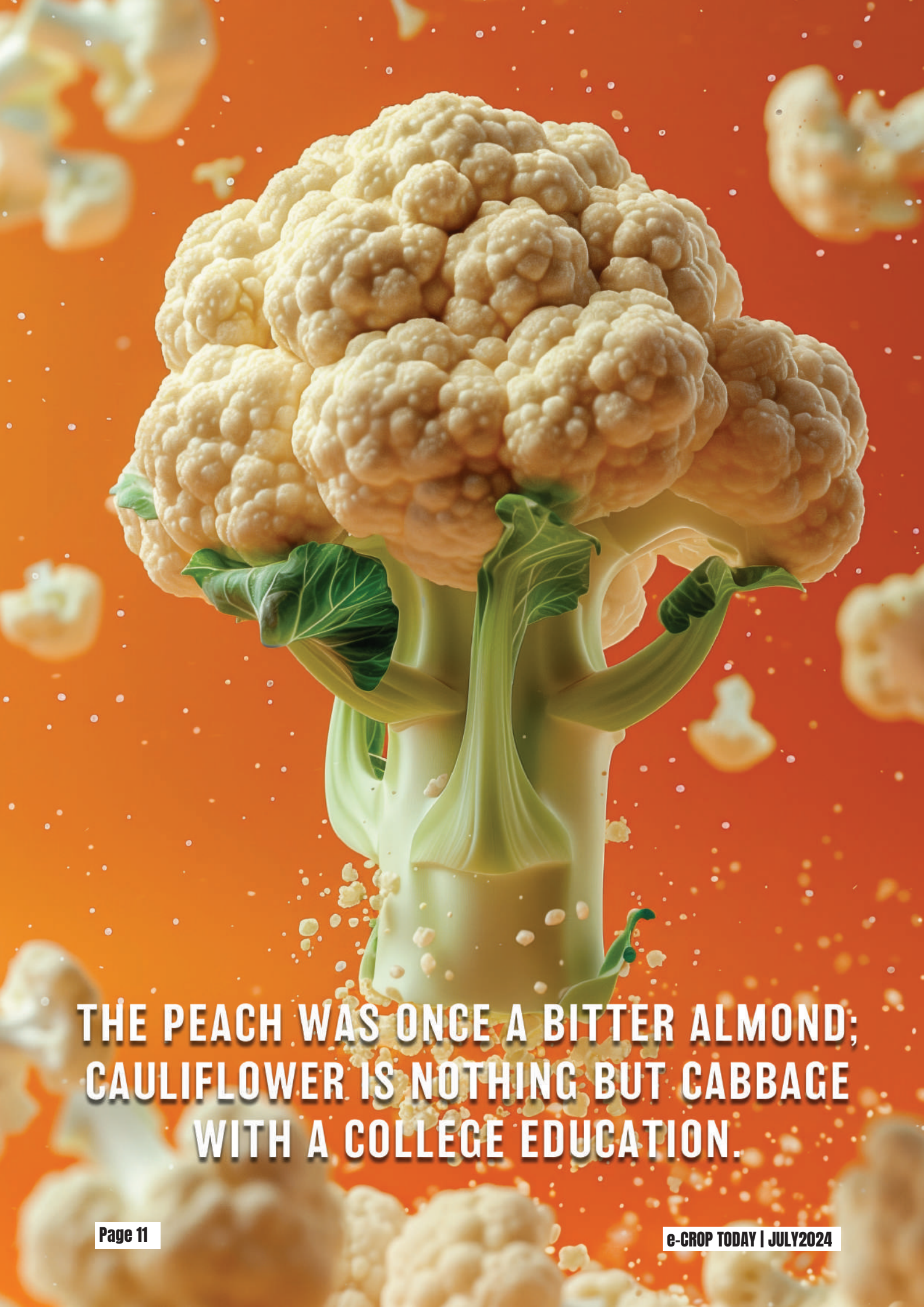
While ERW holds immense promise, challenges remain in scaling up implementation and addressing logistical considerations. Comprehensive inventories of available rock dust stockpiles are needed, along with efforts to engage farmers and incentivize participation. Continued research into soil

chemistry and real-world experimentation will further refine our understanding of ERW's efficacy and potential environmental impacts.

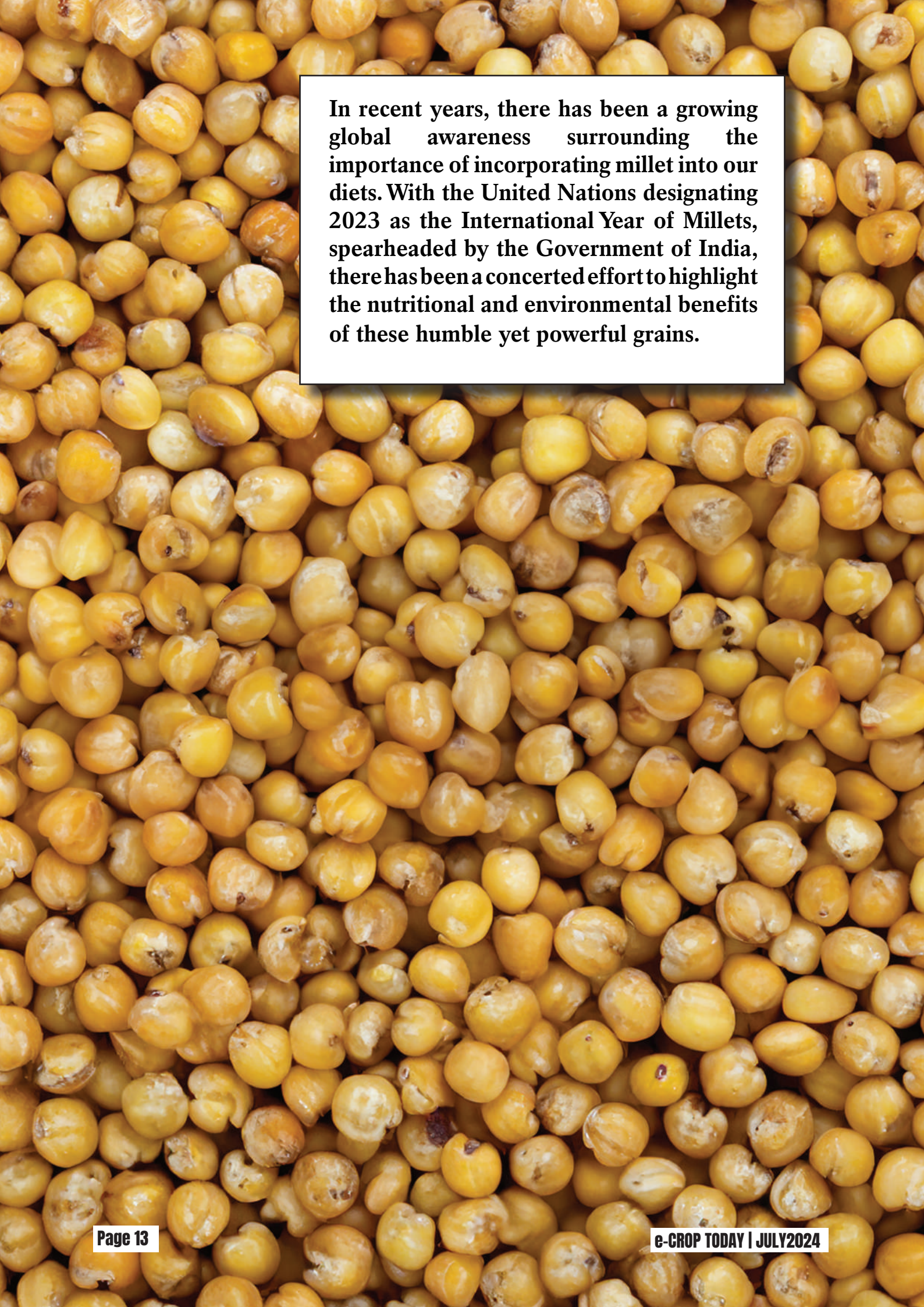
Enhanced Rock Weathering represents a compelling solution to the pressing challenge of carbon sequestration. By harnessing the natural processes of rock weathering, this innovative approach has the capacity to significantly reduce atmospheric CO2 levels while simultaneously improving soil health and agricultural productivity. As global efforts to combat climate change intensify, ERW emerges as a practical and scalable strategy with the potential to reshape our approach to environmental stewardship.

By Swpanil Tiwari




THE PEACH WAS ONCE A BITTER ALMOND;
CAULIFLOWER IS NOTHING BUT CABBAGE
WITH A COLLEGE EDUCATION.

Exploring the Significance of Millets in Global Nutrition



In recent years, there has been a growing global awareness surrounding the importance of incorporating millet into our diets. With the United Nations designating 2023 as the International Year of Millets, spearheaded by the Government of India, there has been a concerted effort to highlight the nutritional and environmental benefits of these humble yet powerful grains.

Understanding Millets: Nature's Nutrient Powerhouses

Millets encompass a diverse group of cereal crops and small-seeded grasses, predominantly cultivated in African and Asian countries. Among the most prominent varieties found in India are Ragi (Finger millet), Jowar (Sorghum), Sama (Little millet), Bajra (Pearl millet), and Variga (Proso millet). These grains have been staples in traditional diets for centuries, revered for their resilience and nutritional density.

Health Benefits of Millets: A Comprehensive Overview

Weight Management and Fiber Richness

One of the most notable advantages of incorporating millets into one's diet is their low-calorie content coupled with high fiber levels. This combination not only aids in weight management but also promotes digestive health and satiety, making millets an excellent choice for individuals striving for overall well-being.

Antioxidant Properties and Blood Sugar Regulation

Millets are rich sources of antioxidants, compounds that play a crucial role in neutralizing harmful free radicals in the body. Additionally, their low glycemic index ensures that millets do not cause sudden spikes in blood sugar levels, making them particularly beneficial for individuals with diabetes or those aiming to maintain stable energy levels throughout the day.

Climate Resilience and Environmental Sustainability Regulation

Beyond their nutritional prowess, millets stand out for their remarkable resilience to adverse climatic conditions. These hardy grains are drought-resistant and exhibit tolerance to various crop diseases and pests, making them a sustainable option for agricultural cultivation. By promoting the production and consumption of millets, we can mitigate environmental degradation while ensuring food security for future generations.Beyond their nutritional prowess, millets stand out for their remarkable resilience to adverse climatic conditions.

These hardy grains are drought-resistant and exhibit tolerance to various crop diseases and pests, making them a sustainable option for agricultural cultivation. By promoting the production and consumption of millets, we can mitigate environmental degradation while ensuring food security for future generations.

The Role of Millets in Global Food Security and Economic Development and Environmental Sustainability Regulation

Enhancing Agricultural Resilience and Livelihood Opportunities Sustainability Regulation

The cultivation of millets presents promising opportunities for small-scale farmers, particularly in regions prone to erratic weather patterns and soil degradation. By diversifying agricultural practices and reintroducing millets into local farming systems, communities can bolster their resilience to climate change while fostering economic growth and food sovereignty.

Fostering Trade Diversity and Market Stability

Despite their myriad benefits, millets currently account for a mere fraction of the global grains trade. However, their potential to serve as alternative staples during times of food scarcity or market volatility cannot be understated. By expanding the production and trade of millets, we can enhance the diversity and stability of the global food system, reducing dependency on monoculture crops and mitigating supply chain disruptions.

Innovations in Millet Utilization: Exploring Future Possibilities

Therapeutic and Pharmaceutical Applications

The genetic diversity inherent in millets opens doors to innovative applications in various sectors, including healthcare and pharmaceuticals. Researchers are increasingly exploring the potential of millets in developing functional foods, dietary supplements, and therapeutic formulations, capitalizing on their nutritional richness and bioactive compounds.

Culinary Creativity and Gastronomic Delights

In addition to their nutritional benefits, millets offer endless possibilities for culinary experimentation. From hearty grain bowls to crispy dosas and savory snacks, millets lend themselves to diverse preparations that cater to a wide range of tastes and preferences. By embracing millets in our kitchens, we not only nourish our bodies but also celebrate the rich culinary heritage of these ancient grains.

Embracing Millets for a Sustainable Future

In summary, the resurgence of millets represents a pivotal moment in the global quest for sustainable nutrition and environmental stewardship. By recognizing the inherent value of these resilient grains and supporting initiatives aimed at their promotion and cultivation, we can pave the way for a healthier, more equitable future for generations to come.

By Rajni Dhankanthi

Climate Change is Depleting Life in Soil

Soil-dwelling creatures are crucial for Earth's carbon cycle. Thousands of species, like mites and springtails, live in soil worldwide and play a vital role in enriching it. They consume organic matter such as fallen leaves and wood, transferring carbon into the ground and releasing nutrients that help new plants grow.

Life Above and Below the Soil

A recent analysis of 38 studies shows that droughts, often worsened by climate change, are killing these organisms at an alarming rate. Ina Schaefer, a researcher at the University of Göttingen in Germany, emphasizes the importance of protecting these critters because we know so little about them.

Some of these organisms live deep in the soil, while others move around on the surface. Scientists are still learning how they break down decaying matter, with recent molecular research showing springtails have special genes for this job. Springtails can even fling themselves into the air to escape predators.

Impact of Moisture and Heat

Mites and springtails are not widely studied, but we know they are sensitive to moisture. During dry spells, their populations can shrink by 39%, and severe conditions can reduce their numbers even more, SaysPhilip Martin from the Basque Center for Climate Change. temperatures, dropping nearly 10% for each degree Celsius increase. Philip Martin from the Basque Center for Climate Change. Springtail populations also decline with rising temperatures, dropping nearly 10% for each degree Celsius increase.

While droughts also affect soil fungi, which springtails feed on, some soil dwellers have adaptive advantages. Mites generally handle heat better than springtails, and some springtail species are more resilient to heat and dryness. These creatures may move deeper into the soil or seek moist spots, and some will adjust their diets.

The effects of climate change vary globally. Different regions will experience changes differently, affecting soil communities uniquely, explains Zoë Lindo, a soil biodiversity expert at the University of Western Ontario. Some areas may see more droughts, while others will get more rainfall.

Biodiversity Under Threat

There are over 12,000 species of oribatid mites and around 9,000 species of springtails, but these numbers might only represent 20% of their global diversity. More than half of Earth's biodiversity is below our feet, including bacteria, fungi, and worms. However, we lack data for many regions, making it hard to predict the impact of losing these species.

Soil has long been a "black box," but researchers are starting to uncover its mysteries. Understanding the role of each species is crucial for protecting our ecosystems in the face of climate change.

By Prachi Athavale


A LIGHT WIND SWEPT OVER THE CORN, AND
ALL NATURE LAUGHED IN THE SUNSHINE.

Carbon Footprint: How Our Actions Today Impact the Planet Tomorrow

What is Carbon Footprint?

Footprint simply means the reminiscence of our actions or in the context of environmental issues, our collective human movement. Carbon Footprint is the overall trace of Carbon released into the environment in the form of greenhouse gas emissions. This environmental measure tracks both direct and indirect emissions of gases such as methane, nitrogen oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and especially carbon dioxide, which has been the most significant contributor to global warming since 1990.

The World Meteorological Organization stated that the rate of greenhouse gas emissions peaked in 2019 at its all-time high and today's levels of atmospheric CO2 are at comparable levels as it was three million years ago when the temperature of the earth was warmer than 3°C and sea levels were 10 to 20 meters higher than current levels. So far, Carbon footprint has not stopped and it has kept on increasing since 1961 and now accounts for 60%

Footprint by an Individual

The amount of carbon emissions released by an individual's moving acting eating and utilizing resources is measured as a personal Carbon Footprint. Environmental NGO The Nature Conservancy estimates that each inhabitant on the planet produces an average of almost four tons of CO2 every year, and in the United States, each emits four times more than the average of the rest of the world.

The experts suggest that if we don't want the global temperature to touch the threshold of 2 °C we all have to reduce our Carbon footprint to less than 2 tons by 2050.

The Carbon Footprint of Companies

Large Corporations also produce greenhouse gases during their manufacturing, transport, and energy consumption. The amount of Carbon emitted is on a much larger scale in comparison to the Individual. Companies usually have the option to reduce their carbon footprints by implementing better policies and actions such as improving their energy efficiency, consuming renewable energy, running awareness campaigns and following ESG(Environment Social & Governance) compliances as well as paying green taxes and buying tons of Carbon Credits on the international emissions market.

The Carbon Footprint of a Product

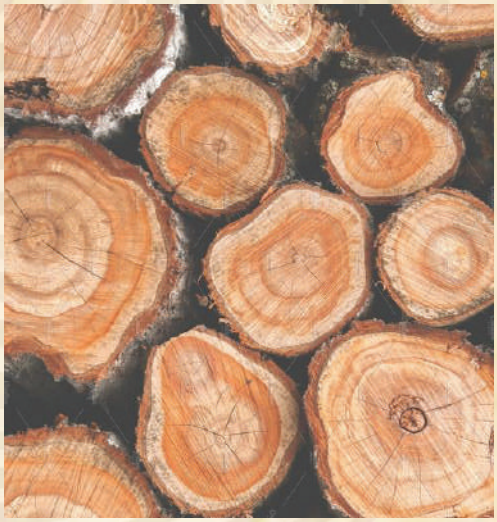
Consumer products and services contribute to greenhouse gas emissions at every stage, from getting raw materials, through manufacturing and distribution, to their use and disposal. This pollution starts with extracting and processing raw materials, making the products, and getting them to consumers, continuing as they are used and eventually become waste, which might be reused, recycled, or sent to a landfill. Events like concerts, shows, and sports games also have a significant carbon footprint because of factors like transportation, energy use, and the waste they produce.

How to Reduce Your Carbon Footprint

The next few years are crucial in our fight against climate change, and our success will depend on how well we can reduce our carbon footprint. Here are some simple tips to help you do that:

- **Shop Smart and Local: Buy local products and support sustainable production. Consider starting your garden, even if it's a small one in your**
- **Travel Green: Use public transportation, ride a bike, walk, or choose eco-friendly vehicles.**
- **Use Renewable Energy: Opt for 100% renewable energy sources, buy energy-efficient appliances, and be mindful of your heating and cooling to**
- **Spread Awareness: Educate yourself and others about the importance of reducing our carbon footprint.**
- **Reduce Waste: Reuse and recycle packaging, and if you can't, make sure to dispose of it properly.**

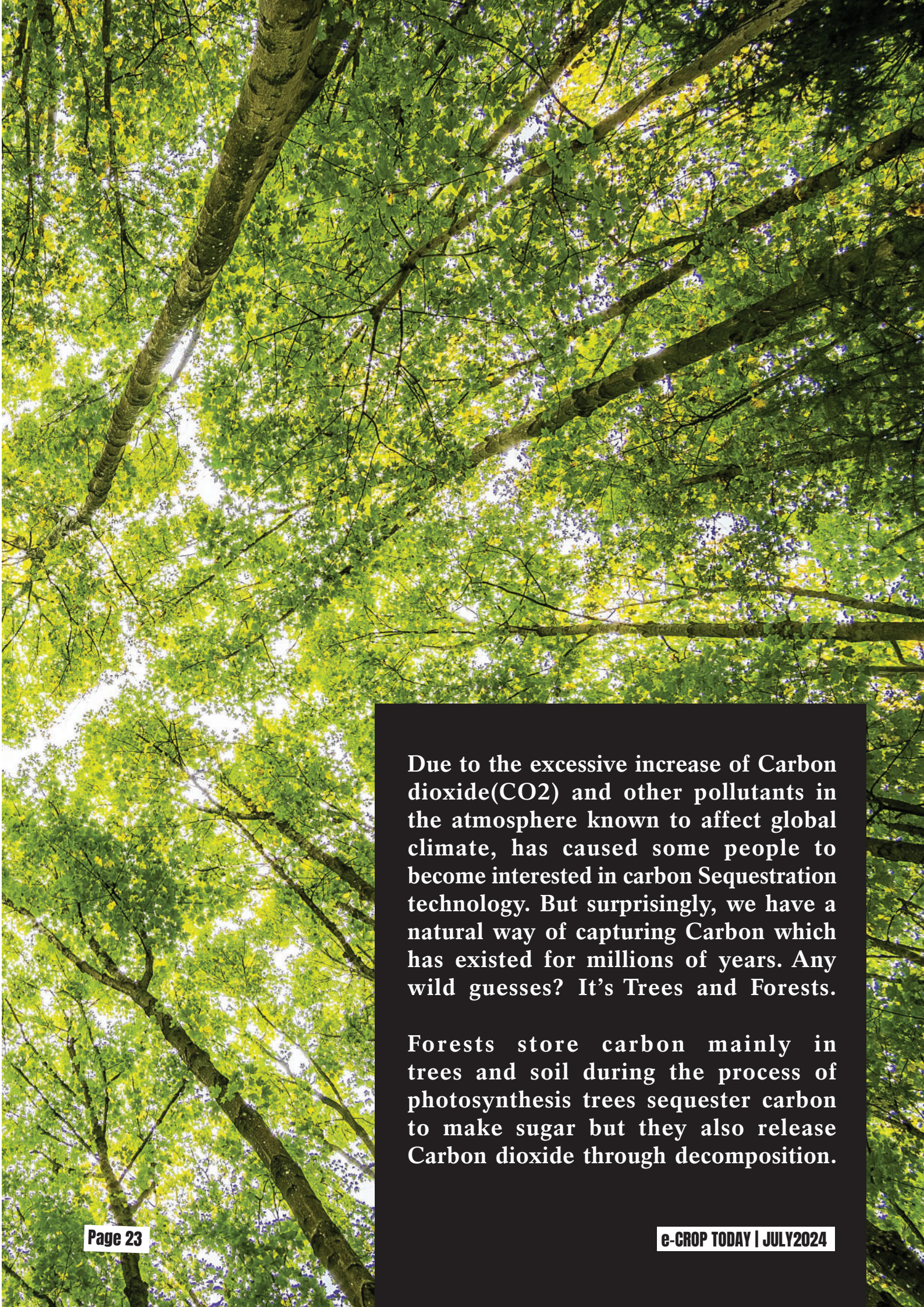
Reducing our carbon footprint is something we all need to work on together. Every small action we take, like choosing local products, using green transportation, and saving energy, can add up to make a big difference. If we all do our part, we can have a positive impact on the environment now and for future generations. Our collective efforts today will help create a healthier, more sustainable planet for everyone.



By Kirti Rawal

How Forests Store Carbon

By Krishna Kanu



Due to the excessive increase of Carbon dioxide(CO_2) and other pollutants in the atmosphere known to affect global climate, has caused some people to become interested in carbon Sequestration technology. But surprisingly, we have a natural way of capturing Carbon which has existed for millions of years. Any wild guesses? It's Trees and Forests.

Forests store carbon mainly in trees and soil during the process of photosynthesis trees sequester carbon to make sugar but they also release Carbon dioxide through decomposition.

Importance of Trees in Carbon Sequestration

Trees pull out Carbon dioxide out of the air while binding up sugar, it releases oxygen into the atmosphere when they perform photosynthesis. It uses sugar for building wood, roots, and branches. Trees are the best carbon-storing technology in the world and that too it's naturally available. Wood is an excellent carbon sink as it is formed with 50 percent of carbon.

For years Carbon is stored in a standing tree and it breaks down after the tree dies. When their leaves decompose or their roots burn sugar to capture nutrients and water they release some carbon back into the atmosphere. Depending on the average age of trees, forests capture and store different amounts of carbon at different speeds. Young trees can pull carbon rapidly because they grow quickly. Due to competition for light and resources not every sapling grows up to become a full-fledged tree.

The trees that are middle-aged, medium to large, healthy, and have a big root system are considered Mature forests. The rate of growth in middle-aged trees is slower than the young trees but the amount of carbon sequestered is relatively greater. Whereas in older trees the rate of storing Carbon is relatively slower.

Carbon Sink in Soils

The amount of carbon stored in forest soils is variable and is dependent on many local factors such as geology, soil type, and vegetation. In some forests, the soil holds more carbon than the trees, but in other forests, like the rainforest, the soil holds relatively little carbon and the trees store more carbon. This is because some soil types like clay soils, can bind up a large amount of carbon whereas sandy soils are not able to bind much carbon.

Management Strategies In the Forests

Natural forests do more than just capture carbon as they offer numerous other benefits, like providing habitats for wildlife. When forests are converted to other land uses, they release carbon and lose their ability to store carbon and provide other ecosystem services.

Proper forest management can enhance the ability of trees to absorb carbon by adjusting the age and density of trees in a given area. Carbon offset projects often use sustainable forestry practices designed to boost carbon storage over time. In forests with trees of various ages, young trees continuously grow while older trees retain carbon for long periods.

Improving tree growth and regeneration can involve selectively removing some trees. However, this can disturb the soil, which also stores carbon. Frequent disturbances can turn the soil from a carbon sink into a carbon source. To minimize soil disturbance, it's beneficial to extend the period between thinning operations. For example, instead of thinning a hardwood forest every 10-15 years, extending this to every 20-25 years gives the soil time to recover.

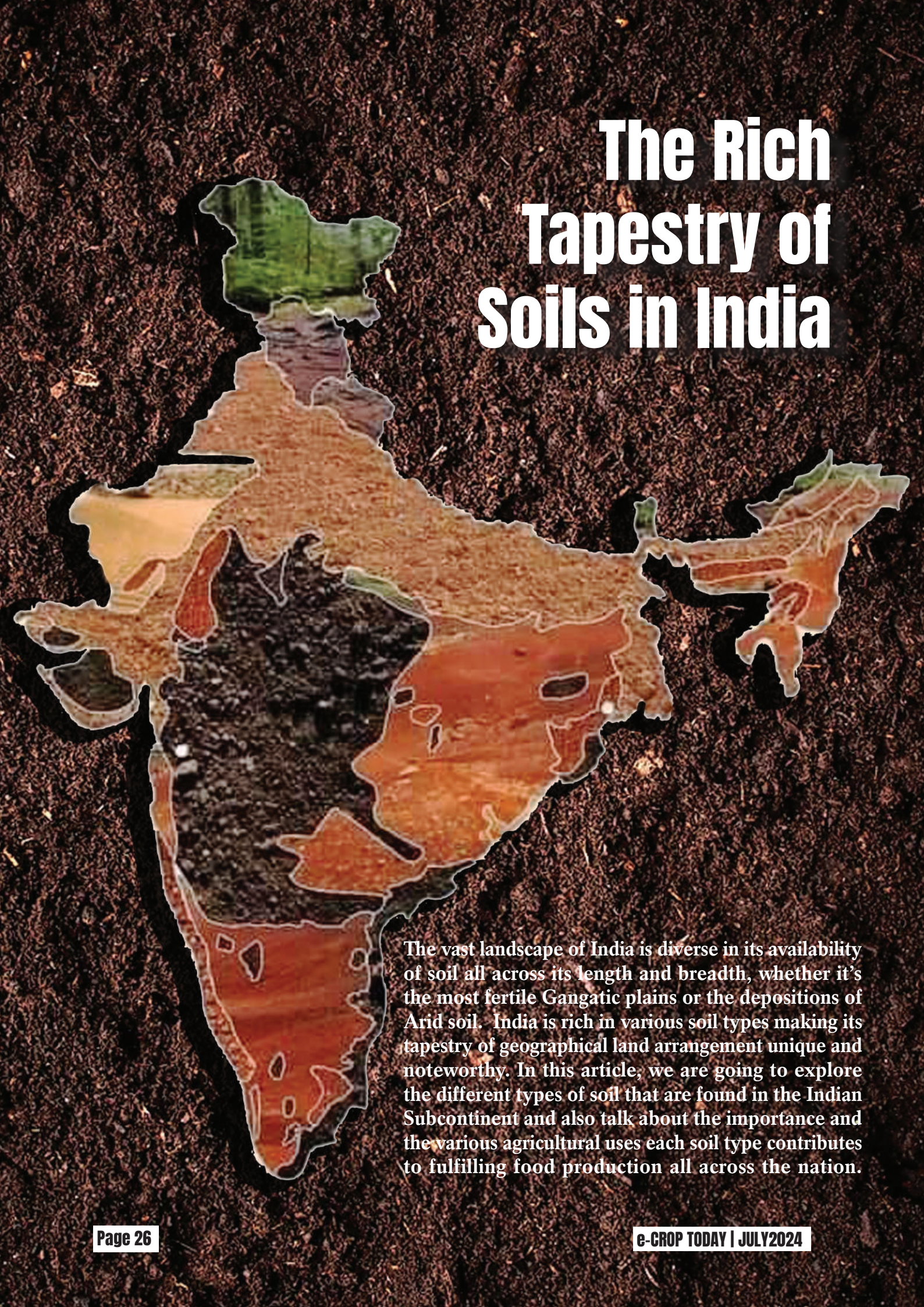
Increasing forest cover is another effective way to enhance carbon capture without cutting down existing forests. This can be achieved by planting native trees on old fields or restoring old mine sites. While clear-cutting resets the forest's age, it can sometimes speed up carbon capture by encouraging the growth of younger, faster-growing trees. Additionally, using timber products can have climate benefits by replacing products made from fossil fuels, like plastics.

Controlling invasive plant species is crucial for enhancing carbon capture. Although invasive plants can grow quickly, they are poor at storing carbon. They also disrupt native ecosystems, alter soil microbes, and prevent tree regeneration, all of which hinder a forest's ability to sequester carbon. Native plants are better adapted to local conditions and are more effective at capturing carbon, besides providing other benefits such as habitats for wildlife.

Forests are very important carbon sink as both trees and soils can store a large amount of carbon for longer periods. Carbon Management is not just deciding which trees should be cut down rather it's shifting our attention to larger aspects such as growing more young and established forests as they capture and sequester more carbon. The key is to use planning and management strategies to minimize losses of stored carbon while maintaining the value and health of the forests.


"WHEN LIFE GIVES YOU LEMONS, USE THEM TO MAKE LEMONADE"

The Rich Tapestry of Soils in India



The vast landscape of India is diverse in its availability of soil all across its length and breadth, whether it's the most fertile Gangatic plains or the depositions of Arid soil. India is rich in various soil types making its tapestry of geographical land arrangement unique and noteworthy. In this article, we are going to explore the different types of soil that are found in the Indian Subcontinent and also talk about the importance and the various agricultural uses each soil type contributes to fulfilling food production all across the nation.

Alluvial Soil

The highest percentage of soil available in the country with a weightage of 43% covering almost 143 Sq Km of land mass. While it is widespread in the northern plains and river valleys, they are primarily found in deltas and estuaries in the peninsular region. Alluvial soil as a whole is very fertile. Mostly these soils contain an adequate proportion of potash, phosphoric acid, and lime which are ideal for the growth of sugarcane, paddy, wheat, and other cereal and pulse crops.

Because of its rich content of humus, lime, and organic matter, alluvial soil is ideal for agriculture. It is deposited by rivers and streams, with sand content decreasing from west to east.

Red Soil

Also known as the Omnibus group, These types of soil are commonly found in low-rainfall areas. Red Soil develops on crystalline igneous rocks in the eastern and southern parts of the Deccan plateau. Yellow and red soils are also found in parts of Odisha, Chhattisgarh, West Bengal, Maharashtra, southern Karnataka, Tamil Nadu, and Madhya Pradesh. Red and yellow soils develop a reddish color due to the diffusion of iron in crystalline and metamorphic rocks. It looks yellow when it occurs in a hydrated form. Crops like Wheat, Cotton, pulses, tobacco, oilseeds, potatoes, etc. are cultivated in Red Soil.

Black Soil

This is the best soil for cotton production, Most of the Deccan areas are occupied by the Black Soil, It has a high capacity to retain water as it swells and becomes sticky upon being wet. It is made up of Lava flows, because of their high clay content, black soils develop wide cracks during the dry season, but their iron-rich granular structure makes them resistant to wind and water erosion. They are rich in soil nutrients such as calcium carbonate, magnesium, potash, and lime. These souls are generally poor in phosphoric contents.

Laterite soil

The name of this soil is derived from the Latin word "Later' which means brick. When dried it becomes soft and hard when it is wet. It is commonly found in areas of high temperature and high rainfall. This is the result of intense leaching due to heavy rain. The Humus content of the soil is low because most of the microorganisms, particularly the decomposers, like bacteria, get destroyed due to high temperatures and lack of organic matter which is food, shelter, and protection for the microorganisms from the high temperatures. Laterite soils are suitable for the cultivation of Rice, Ragi, Sugarcane, and Cashew nuts. Laterite soils are mainly found in Karnataka, Kerala, Tamil Nadu, Madhya Pradesh, Andhra Pradesh, and the hilly areas of Odisha and Assam.

Arid / Desert Soil

Arid soils, which range in color from red to brown, are typically sandy and salty. In some places, the salt content is so high that common salt can be harvested by evaporating the water. Because these soils are found in dry climates with high temperatures, water evaporates quickly, leaving them with little organic matter and moisture, which are needed to form humus. The lower layers of these soils often have a buildup of calcium, forming a hard layer called Kankar that prevents water from soaking in. However, with proper irrigation, these soils can be made suitable for farming, as seen in western Rajasthan.

Forest Soil

Forest soil is found mainly in areas with plenty of trees and vegetation, such as hilly and mountainous regions. This soil is rich in organic matter because it gets a lot of fallen leaves and decomposed plant material, making it very fertile. It can be found in different colors, from brown to dark brown, and its texture varies from loamy to silty and sometimes even clayey. Forest soil retains moisture well, which helps support the growth of trees and plants. It's also rich in nutrients like nitrogen and humus, making it great for growing a variety of crops and supporting lush forests. However, the exact composition of forest soil can vary depending on the type of forest and the climate of the region.

The Importance of Soil

Climate change has severely affected the quality as well as the availability of soil in the environment. The destruction of river bodies by pollution and the surprising increase in the global temperature have disturbed the natural way of soil sedimentation which has seriously impacted the agricultural outputs and the overall soil health. We as a society have to remain aware of the importance of soil in the formation of our civilization and the future of humanity as well as all life on this planet. Soil is life and we have to cherish this gift with care and attention.

Protecting soil is crucial for several reasons:

Agricultural Productivity:

Soil is the foundation of agriculture. Healthy soil provides the nutrients and structure necessary for crops to grow. Protecting soil ensures sustainable food production.

Ecosystem Health:

Soil supports plant growth, which in turn supports diverse ecosystems. It is home to a vast array of organisms, including bacteria, fungi, insects, and larger animals, all of which contribute to a balanced ecosystem.

Water Filtration:

Soil acts as a natural filter for water, trapping pollutants and contaminants. This helps maintain clean groundwater and surface water, which are essential for drinking, agriculture, and natural habitats.

Carbon Sequestration:

Healthy soil plays a significant role in carbon sequestration, helping to mitigate climate change. Soil organic matter stores carbon that would otherwise be released into the atmosphere as carbon dioxide.

Preventing Erosion:

Protecting soil prevents erosion, which can lead to loss of fertile land, sedimentation in waterways, and increased flooding. Erosion also contributes to the loss of topsoil, which is the most nutrient-rich layer.

Supporting Biodiversity:

Soil is a habitat for numerous organisms, contributing to biodiversity. Diverse soil life is essential for nutrient cycling and soil fertility.

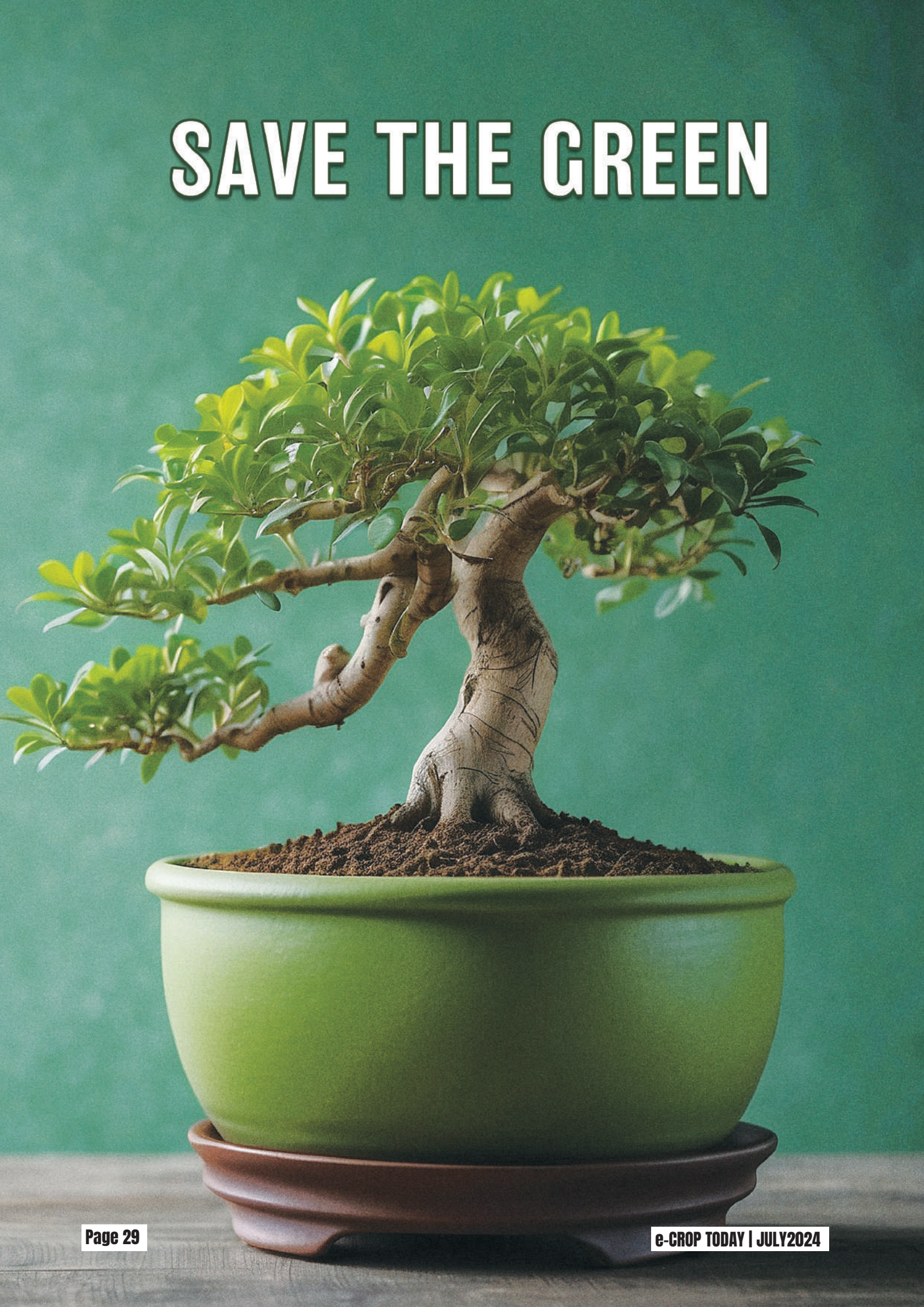
Economic Benefits:

Healthy soil contributes to the economic well-being of communities by supporting agriculture, forestry, and other land-based industries. It also reduces costs associated with erosion control, water treatment, and environmental degradation.

Protecting soil involves practices like crop rotation, cover cropping, reduced tillage, organic farming, and proper land management to maintain its health and productivity for future generations.

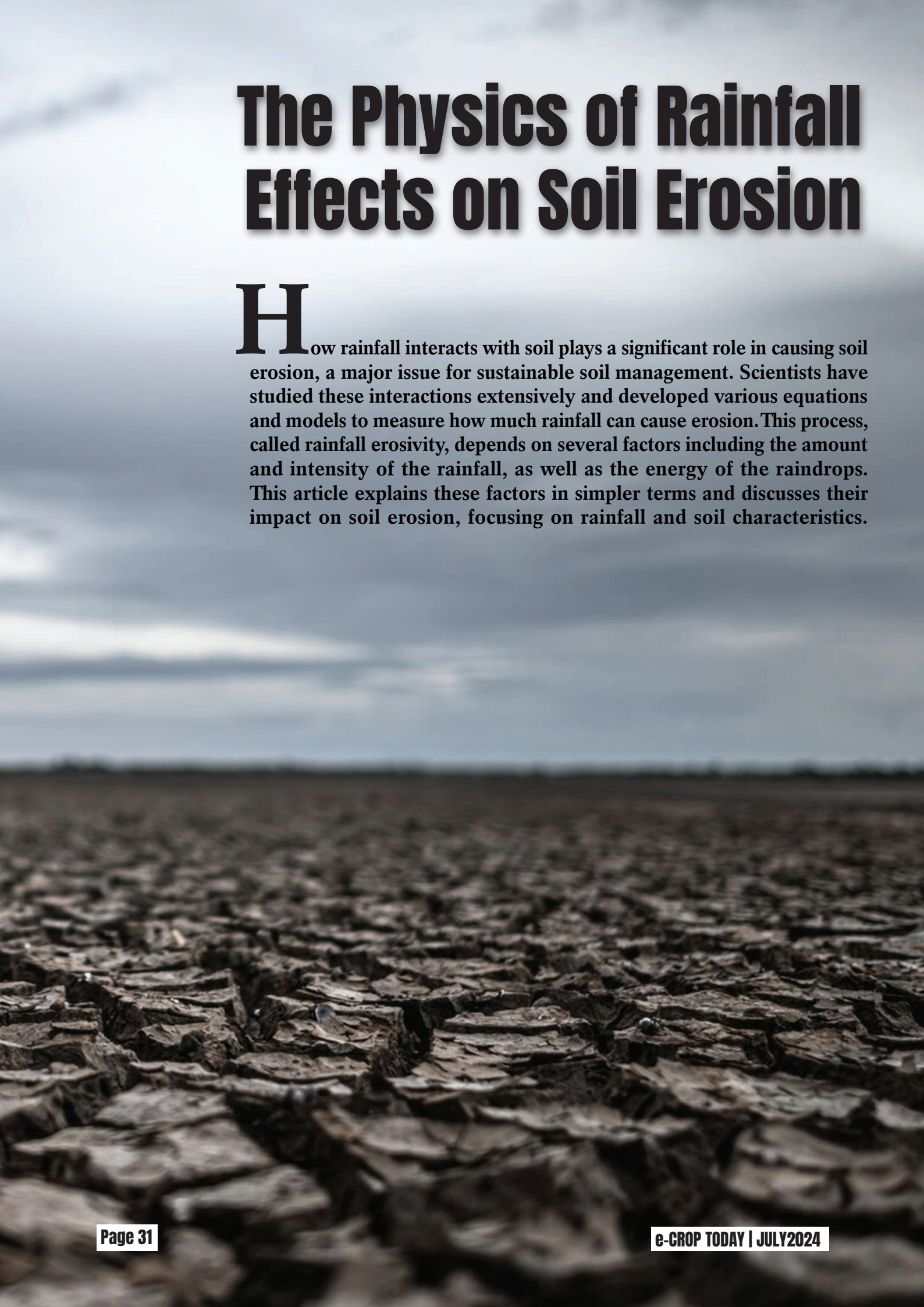
By Dipti Chavan

SAVE THE GREEN



The Physics of Rainfall Effects on Soil Erosion

How rainfall interacts with soil plays a significant role in causing soil erosion, a major issue for sustainable soil management. Scientists have studied these interactions extensively and developed various equations and models to measure how much rainfall can cause erosion. This process, called rainfall erosivity, depends on several factors including the amount and intensity of the rainfall, as well as the energy of the raindrops. This article explains these factors in simpler terms and discusses their impact on soil erosion, focusing on rainfall and soil characteristics.



Key Attributes of Rainfall

Two important factors in understanding how rainfall causes erosion are the amount of rain and the intensity of the rainfall. Rainfall intensity is the amount of rain that falls in a specific period, measured in millimeters per hour (mm/hr). The kinetic energy of raindrops is another crucial factor—it's determined by the mass of the drops and how fast they hit the ground. This energy impacts the soil, causing particles to be dislodged and potentially washed away.

Measuring Rainfall Erosivity

A common way to measure rainfall erosivity, developed by Wischmeier in 1959, combines the total kinetic energy of a storm with the highest 30-minute rainfall intensity. This measure is used in different regions, like in Europe by Panagos et al. in 2015, to understand and manage soil erosion on a large scale.

Other Sources of Water-Induced Erosion

Besides rainfall, other sources like snowmelt and irrigation also contribute to soil erosion, especially in northern regions such as Canada and Russia. These sources aren't usually included in basic rainfall erosivity calculations but are still important for a complete understanding of erosion.

Soil Properties and Erodibility

Infiltration and Runoff

Soil characteristics influence how much water runs off the surface and how resistant the soil is to erosion. Water can either soak into the soil (infiltration) or flow along the surface (runoff). The amount of water that infiltrates depends on the intensity and characteristics of the rainfall, the slope of the land, and the soil's ability to absorb water.

Factors Affecting Infiltration

Water infiltration into soil is driven by gravity and the attraction between soil particles and water. The infiltration rate is affected by the size and continuity of soil pores and how wet the soil already is. Soil texture, which includes the proportions of sand, silt, and clay, is the main factor influencing infiltration. Organic matter, past cultivation, and vegetation also play roles.

Soil Texture and Erodibility

The size of soil particles and aggregates (clumps of soil) is crucial in determining how easily soil can be eroded. Clay soils stick together and resist erosion, while sandy soils are less likely to be transported due to their large particle size. Silt and loamy soils, with a mix of sand, silt, and clay, are the most prone to erosion.

Aggregation and Stability

Microaggregates (small clumps) are tightly bound and resist erosion, while macroaggregates (larger clumps) are more loosely bound and less resistant. The stability of these aggregates depends on binding agents like organic matter and microbial substances.

Surface Roughness

Surface roughness, created by large soil clumps or rocks, increases friction and reduces the erosive power of water. However, rocks can sometimes concentrate water flow and increase local erosion.

Topography and Vegetation

Influence of Topography

The shape and slope of the land directly impact erosion. Steeper slopes increase the speed and erosive power of water runoff, leading to more erosion. On uniform slopes, erosion is usually higher at the bottom. Complex slopes with curves concentrate water flow in concave areas, where gullies (small channels) often form.

Vegetation's Protective Role

Vegetation helps reduce soil erosion in several ways:

Interception: Plants intercept rainfall, reducing the amount that hits the soil directly.

Protection: Vegetation shields the soil from raindrop impact, preventing particle detachment.

Infiltration: Plant roots improve soil structure, increasing water infiltration and reducing run off.

Resistance: Roots also make soil more resistant to erosion by water flow.

Friction: Vegetation increases surface roughness, slowing down water flow and reducing its erosive energy.

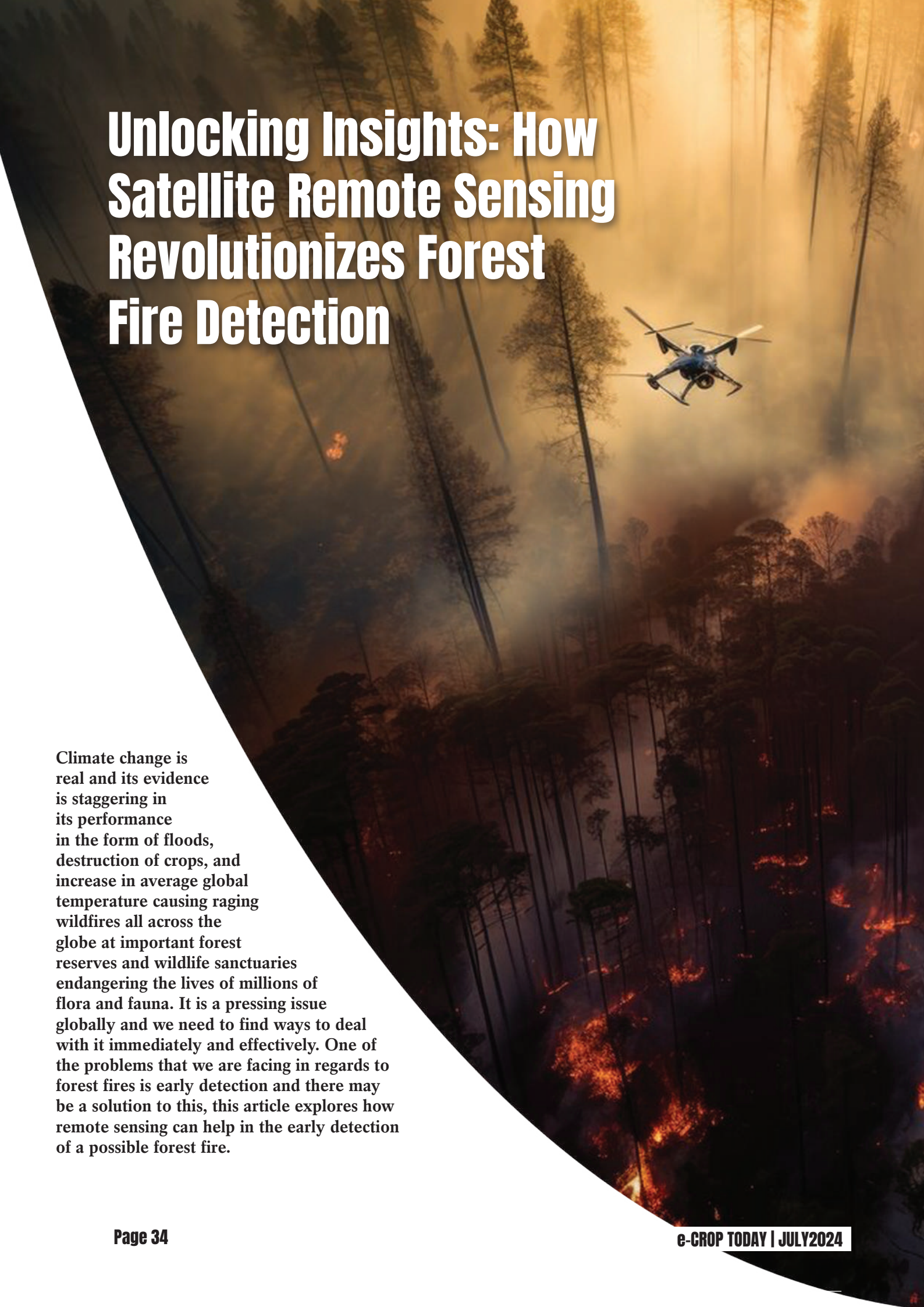
More vegetation leads to greater protection against erosion. For example, moving from cropland to grassland to forest, the soil becomes more resistant to erosion, and run off decreases.

Understanding the physics of how rainfall affects soil is essential for managing and reducing soil erosion. By examining rainfall erosivity, soil properties, topography, and vegetation, we can develop effective strategies to mitigate erosion and promote sustainable soil management.

By Vandana Prajapati


LIFE IS BETTER WITH A KIWI IN HAND.
THE TASTE OF SUMMER IN A KIWI.

Unlocking Insights: How Satellite Remote Sensing Revolutionizes Forest Fire Detection



Climate change is real and its evidence is staggering in its performance in the form of floods, destruction of crops, and increase in average global temperature causing raging wildfires all across the globe at important forest reserves and wildlife sanctuaries endangering the lives of millions of flora and fauna. It is a pressing issue globally and we need to find ways to deal with it immediately and effectively. One of the problems that we are facing in regards to forest fires is early detection and there may be a solution to this, this article explores how remote sensing can help in the early detection of a possible forest fire.

Types of Forest Fires

Surface Fire- A Forest fire may burn primarily as a surface fire, spreading along the ground as the surface litter (senescent leaves and twigs and dry grasses, etc.) on the forest floor is engulfed by the spreading flames.

Underground Fire - The fires of low intensity, consuming the organic matter beneath and the surface litter of the forest floor are sub-grouped as underground fires. In most of the dense forests, a thick mantle of organic matter is found on top of the mineral soil. This fire spreads by consuming such materials.

Ground Fire - These fires are fires in the sub-surface organic fuels, such as duff layers under forest stands, Arctic tundra or taiga, and organic soils of swamps or bogs. There is no clear distinction between underground and ground fires.

Crown Fire - A crown fire is one in which the crown of trees and shrubs burn, often sustained by a surface fire. A crown fire is particularly very dangerous in a coniferous forest because resinous material given off burning logs burns furiously.

Firestorms - Among the forest fires, the fire spreading most rapidly is the firestorm, which is an intense fire over a large area. As the fire burns, heat rises and air rushes in, causing the fire to grow. More air makes the fire spin violently like a storm.

The Cause of Forest Fires

Climate change is one of the major causes of forest fires, as global temperatures are rising day by day the heat waves are instigating the Forest fires. High atmospheric temperatures and dryness (low humidity) offer favorable circumstances for a fire to start.

There are man-made causes, as well as fires, which could be elevated through the smoke or the usage of flammable substances such as oil, or even the use of cigarettes can also start a fire.

What is Remote Sensing and How it Can Help

As the fires are detected manually through word of mouth, most of the damage is already done, and as the wildfires grow in intensity it becomes extremely difficult to control it and requires much more labor power and resources to deal with it.

Remote sensing is a technology that helps in fetching information without coming directly in contact with it physically. Satellite Monitoring could be the solution we are looking for as it can provide real-time data by detecting the concentration of smoke in the area thereby alerting us to take immediate actions. In satellite remote sensing, information about the Earth's surface and atmosphere is acquired using sensors mounted onboard satellites orbiting the Earth.

Types of Data garnered by Satellite Monitoring Include:

Heat Emissions:

During a fire event, the heat emitted by active fires can be detected by infrared sensors onboard a satellite. This procedure is commonly known as 'hot spot detection'. Fire hot spots can be detected and monitored during a fire event to provide information on the general locations, spatial distributions, and temporal evolution of fire.

Light Detection:

The Satellite can scan a wide area on the ground. It captures light in two main ranges: visible to near-infrared and thermal infrared. The data comes in two resolutions: "fine" and "smoothed."

Smoke Detection:

In images taken from above, smoke plumes are clear signs of active fires. They appear as fuzzy, bright streaks, usually pointing towards the ground. If multiple plumes are visible, they tend to line up with the wind direction.

Burned Area:

Burned areas stand out in remote sensing images because they look different from unburned areas. Maps made from these images show us where fires have spread and how big the affected area is.

Monitoring Fires in RealTime:

A continuous effort to monitor fires in a region is been made possible. We use data from satellites to track fires and smoke plumes. When hot spots are detected, satellites zoom in for a closer look. Daily reports with annotated images are then sent to the Ministry of Environment, helping them respond to fires effectively.

Early fire detection is going to save a lot of lives both plants and animals and even human beings, but it's important to address these issues globally and be aware of the changing climate as life on this planet can only progress when we all work together to a sustainable future. The causes that elevate the global temperature must be dealt with and technology should be incorporated to solve these pressing issues.

By Pooja Bhise

How 5G Will Transform Farming and Agriculture?

Using farm IoT sensors in agriculture is nothing new, but they are just nerves, not the brain. Once you control irrigation, measure soil parameters, monitor crops, or track livestock, it's all IoT farming. But if you want to solve crop or livestock problems rather than just detect them, you need to add AI algorithms and robotics so the system operates in real-time. Here's where 5G comes into play.

Why 5G Farming? Isn't LTE Enough?

Let's say a farmer owns 30,000 acres of land and wants to know which crops require immediate irrigation or pest control. This information can be easily obtained from special sensors attached around the land. 3G/4G connectivity would usually allow sensor data from the entire farm to be uploaded by the end of the day. In contrast, 5G can support a larger number of connected farms IoT devices in real-time. So, the farmer will instantaneously receive the important information they need about each crop area.

What is 5G technology?

5G is the next generation of wireless technology that will provide faster network speeds and connectivity. 5G networks will offer speeds ten times faster than the fastest available 4G networks today. With 5G, you can expect mobile data speeds from 1 to several gigabits per second depending on the network. This means 5G will enable many new applications that require high speed and low latency like virtual reality, self-driving cars, telemedicine, and more.

The Role of 5G in Revolutionizing Farming

5G technology promises to transform farming in significant ways. Perhaps the biggest impact will come from Internet of Things applications using sensors, robots, and drones. With high-speed connectivity, fleets of devices can collect real-time data across fields. Autonomous machines using 5G can precisely monitor soil moisture, and analyze crops up close. Drones survey large areas quickly to find pests or issues. This constant data flow gives farmers insight into optimizing their operations. Using analytics, they can tell exactly which areas need more water or fertilizer. Precise irrigation and precise application of chemicals save costs and reduce waste.

Real-time monitoring also catches problems early for faster responses. With machine vision, drones can automatically detect and count crops as they grow.

Benefits of Transitioning to 5G Farming

Crop Monitoring

Crop waste is one of the factors that contribute to the accumulation of 1 billion tons of annual agricultural waste. With 5G, you can help farmers better manage their resources and reduce waste. IoT farming sensors on plants, in the soil, or on autonomous drones gather valuable data. They help define the exact number of seeds, fertilizer, water, and pesticides needed. The data gathered can also determine when the farmer should intervene. Autonomous, real-time monitoring like this is becoming a basic feature of IoT farming.

Pest Control

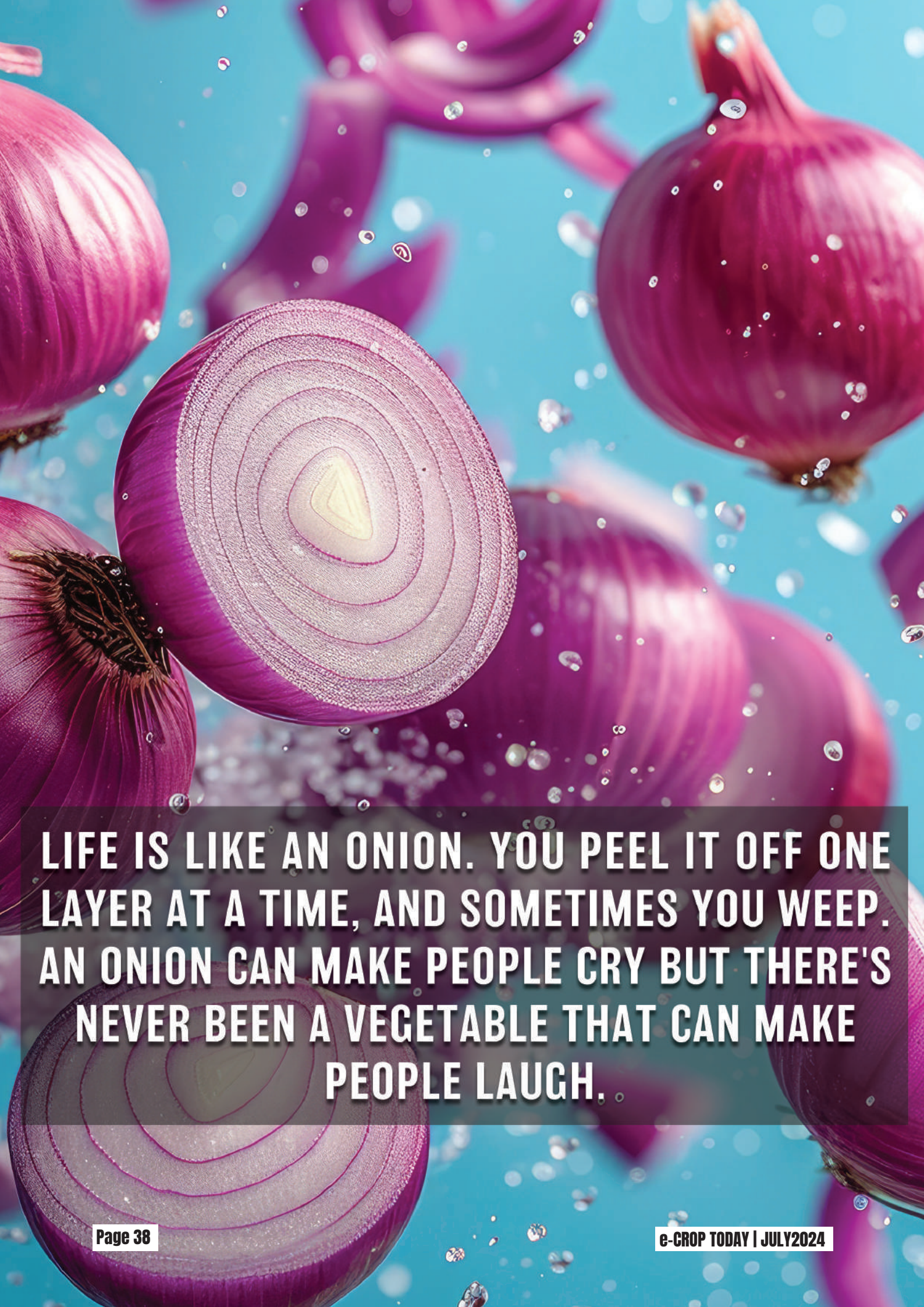
Weeds and crops are natural companions. Weeds are plants that grow on their own rather than being intentionally planted by a farmer. There are two ways to get rid of these volunteers: spraying pesticides or human labor. Pesticides can be harmful to both human health and soil, while human labor is expensive and time-consuming.

Bringing 5G to a farm helps automate weed removal. With a 5G connection, you can put computer vision in place to identify weeds automatically and robots to deal with the leftover plant material.

Produce More Using Less

Agriculture is highly influenced by environmental factors. With climate change and population growth, the pressure of food demand will constantly increase. "Grow more using less" is the only reliable strategy we have. Using smart farming technologies based on fast and stable 5G connectivity gives us hope.

By Neeraj Dakua


LIFE IS LIKE AN ONION. YOU PEEL IT OFF ONE LAYER AT A TIME, AND SOMETIMES YOU WEEP. AN ONION CAN MAKE PEOPLE CRY BUT THERE'S NEVER BEEN A VEGETABLE THAT CAN MAKE PEOPLE LAUGH.

PRECISION GROW CONGRATULATES ICAR - CENTRAL TUBER CROPS RESEARCH INSTITUTE ON THEIR 61ST FOUNDATION DAY

PRECISION GROW CONGRATULATES INDIAN COUNCIL OF AGRICULTURAL RESEARCH (ICAR) ON THEIR 97TH FOUNDATION DAY

The Indian Council of Agricultural Research (ICAR): A Pillar of India's Agricultural Progress

The Indian Council of Agricultural Research (ICAR) is a premier organization in the field of agricultural research and education in India. Established in 1929, ICAR has played a pivotal role in transforming India's agricultural landscape. As an autonomous body under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, ICAR has been instrumental in developing new technologies, improving crop varieties, and promoting sustainable agricultural practices.

Historical Background

ICAR was originally established as the Imperial Council of Agricultural Research on July 16, 1929, following the recommendations of the Royal Commission on Agriculture. The aim was to promote and advance agricultural research and education in the country. Post-independence, the organization was rechristened as the Indian Council of Agricultural Research. Over the decades, ICAR has expanded its research infrastructure and outreach, becoming a cornerstone of India's Green Revolution and subsequent agricultural advancements.

Organizational Structure

ICAR is a vast network comprising 113 institutes, 75 agricultural universities, and numerous regional stations and Krishi vigyan Kendra (KVKs). These institutions are strategically spread across the country, addressing region-specific agricultural challenges and opportunities. The organization is headed by the Director-General, supported by various deputy directors, assistant directors, and scientific personnel. The Governing Body of ICAR is responsible for policy formulation and overall guidance.

Research and Innovations

ICAR has been at the forefront of agricultural research, leading to significant innovations and break throughs. Some of the not able contributions include:

High-Yielding Varieties:

The development of high-yielding varieties of wheat and rice during the Green Revolution era dramatically increased food grain production, making India

Hybrid Crops:

ICAR has developed numerous hybrid varieties of crops like maize, bajra, and sorghum, which have higher yields and better resistance to pests and diseases. self-sufficient in staple foods.

Biotechnology and Genomics:

The council has made significant strides in agricultural biotechnology, including genetic engineering, molecular breeding, and genomics. These advancements have led to the development of transgenic crops with traits like pest resistance and improved nutritional content. self-sufficient in staple foods.

Sustainable Practices:

Promoting sustainable agricultural practices is a key focus area for ICAR. Research on organic farming, integrated pest management, and conservation agriculture has been pivotal in ensuring long-term soil health and environmental sustainability.

Climate-Resilient Agriculture:

With climate change posing a significant threat to agriculture, ICAR has been working on developing climate-resilient crop varieties and farming practices. This includes drought-resistant crops, water-efficient irrigation techniques, and weather-based advisory services for farmers.

Extension Services and Education

ICAR's role extends beyond research to include education and extension services. The council oversees a vast network of agricultural universities and colleges, offering undergraduate, postgraduate, and doctoral programs. These institutions are crucial in nurturing the next generation of agricultural scientists and professionals.

The Krishi Vigyan Kendras (KVKs) play a critical role in translating research findings into actionable practices at the grassroots level. KVKs conduct on-farm trials, training programs, and demonstrations to educate farmers about new technologies and improved agricultural practices. This direct engagement with the farming community ensures that scientific advancements reach the end-users effectively.

Collaborative Efforts and International Cooperation

ICAR has established strong collaborations with international organizations, agricultural research institutions, and universities worldwide. These partnerships facilitate the exchange of knowledge, expertise, and resources, fostering innovation and addressing global agricultural challenges. Notable collaborations include those with the International Rice Research Institute (IRRI), International Maize and Wheat Improvement Center (CIMMYT), and Food and Agriculture Organization (FAO).

Challenges and Future Directions

Despite its numerous achievements, ICAR faces several challenges in the rapidly evolving agricultural landscape. Some of the key challenges include:

Climate Change:

Developing resilient agricultural systems to cope with the adverse effects of climate change remains a significant challenge. Research on climate-smart agriculture needs to be accelerated.

Resource Constraints:

Ensuring efficient use of limited resources such as water, soil, and nutrients is critical. Innovations in resource-conserving technologies and practices are essential.

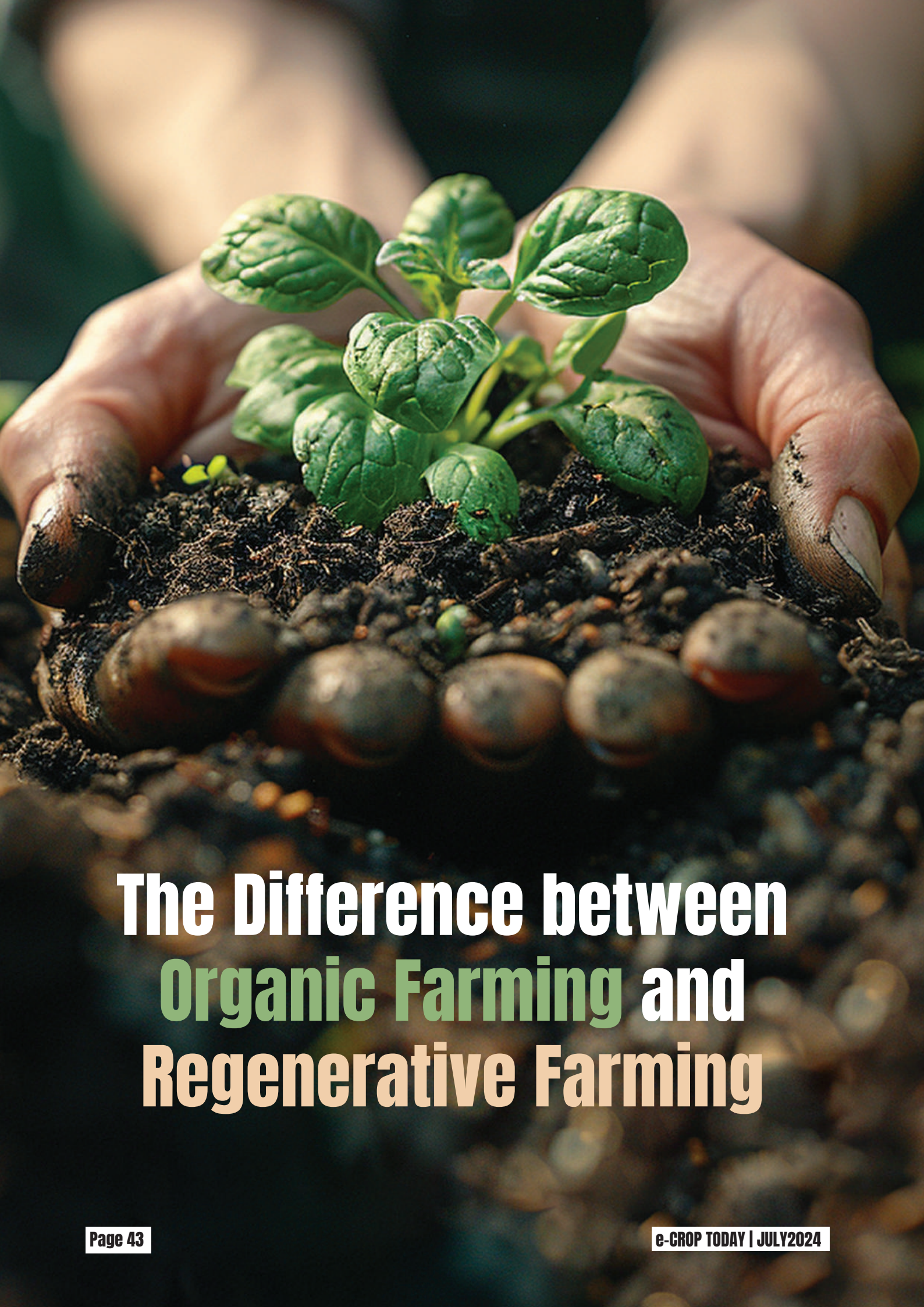
Technological Adoption:

Bridging the gap between research and practical adoption of technologies by farmers is crucial. Strengthening extension services and farmer education programs can facilitate this.

Sustainable Intensification:

With increasing population pressure, there is a need to produce more with less. Sustainable intensification practices that increase productivity without compromising environmental health are imperative.

The Indian Council of Agricultural Research (ICAR) has been a beacon of agricultural progress in India. Its contributions to research, education, and extension have transformed the agricultural sector, ensuring food security and improving livelihoods. As India navigates the complexities of modern agriculture, ICAR's role will be even more critical in fostering innovation, promoting sustainability, and addressing emerging challenges. With its rich legacy and continued commitment to excellence, ICAR is well-positioned to lead India's agricultural future.



The Difference between Organic Farming and Regenerative Farming

When we talk about Sustainable Agriculture, both Organic Farming and Regenerative Farming stand as a beacon as they both approach agriculture with somewhat similar philosophies but the difference occurs in the methodology. The lines between these two methods often blur but there are some clear ways to differentiate them, in this article, we will explore the important distinctions between Regenerative Farming and Organic Farming.

The Harsh Truth about Conventional Farming

The history of human development wouldn't be the same if not for our early ancestors learning to work the land to produce food. Farming started to intensify when modern breakthroughs in science and engineering introduced novel solutions to improve yield as demand for food and materials grew. The widespread use of chemical inputs, coupled with new plant breeds that require high levels of nutrients kept many farmers tied to more chemical inputs for their farm to stay productive.

What is Organic Farming?

It is commonly accepted that organic produce and other ingredients are grown without the use of pesticides, synthetic fertilizers, sewage sludge, genetically modified organisms, or ionizing radiation. Animals that produce meat, poultry, eggs, and dairy products are not given antibiotics or growth hormones. In a sense, organic farming is about a return to farming's roots. Up until the 20th century, all food was produced "organically." With the industrialization of the agriculture sector, synthetic fertilizers, chemical pest-control practices, and GMOs were introduced to increase productivity.When a farmer meets the organic standards, they effectively remove harmful chemicals from the environment, improving their soil health and there by sequestering carbon in the ground to help fight against climate change. When a farmer proves that they have met these standards, they gain access to premium prices, allowing organic farmers to operate at a higher cost of production. their farm to stay productive.

Regenerative Agriculture in Practice

It is the process of restoring degraded soils using practices based on ecological principles." It requires managing a farm or a ranch by considering the interactions among the soil, water, plants, animals, and humans — interconnected pieces of one whole system.

The benefits of regenerative ranching include:

- **Increased soil organic matter and biodiversity.**
- **Healthier and more productive soil that is drought- and flood-resilient.**
- **Decreased use of chemical inputs and subsequent pollution.**
- **Cleaner air and water.**
- **Enhanced wildlife habitat.**
- **Carbon is captured in the soil to combat climate variability.**

The Basic Difference

Approach to Soil Health: While both approaches prioritize soil health, regenerative agriculture places greater emphasis on rebuilding

Carbon Sequestration: Regenerative agriculture actively sequesters carbon dioxide from the atmosphere into the soil, helping mitigate climate

Biodiversity Conservation: Both approaches promote biodiversity, but regenerative agriculture often integrates agroforestry, multi-species cover cropping, and habitat restoration to enhance ecological resilience and ecosystem services.

Cost and Benefits Considerations in Europe, applicable to both North America and Europe:

The initial investment for regenerative agriculture typically falls between €900 and €2200 per acre, while for organic farming, it ranges from €750 to €1900 per acre. However, the long-term benefits per acre are notably higher for regenerative agriculture, ranging from €1900 to €5200 annually, compared to €1000 to €2800 annually for organic farming.

Holistic Approach

Regenerative farming embraces a holistic approach that considers the entire ecosystem, including soil, water, plants, animals, and even human well-being. It's a systems-thinking approach that aims for harmony among all elements. Organic farming primarily addresses the avoidance of synthetic inputs and follows a set of defined standards. It may not always encompass the comprehensive ecosystem-oriented approach of regenerative farming.

Conclusion

While both regenerative and organic farms contribute to sustainable agriculture, regenerative farming goes a step further by actively restoring and enhancing ecosystem functions. Organic farming serves as an important step toward reducing chemical inputs, but regenerative practices offer a broader and more proactive approach to fostering ecological balance and resilience. The choice between the two ultimately depends on the extent to which farmers aim to heal and enrich the land they cultivate.

By Snehal Nagwekar

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