Lal Carbon Center Newsletter

Spring | 2023

In this issue...

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"C-MASC" is now the "Lal Carbon Center"

Big news! We have retired the acronym "C-MASC" and moving forward with the shorthand "Lal Carbon Center." This abbrieviated name for our Center is meant to more clearly and concisely articulate our work and recognize the Center's 2022 official renaming after our director, Dr. Rattan Lal, approved by the Board of Trustees of The Ohio State University.

This is a tremendous time of growth for our Center. We are excited to introduce you to some new faces and provide updates on everything happening at the Lal Carbon Center!

LAL CARBON CENTER

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THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

Director's Viewpoint

Science Without Humanity

Human population of 2-20 million about 10 thousand years ago at the dawn of settled agriculture has increased to 8 billion in 2022 and is projected to reach 9.7 billion by 2050 and 11.2 billion by 2100. Scientific advances in medical and agricultural sciences, along with human nutrition and value addition of agricultural products have enhanced access to safe and nutritious food and improved human health and wellbeing . Yet, 2.37 billion people (one in three persons) do not have access to adequate food ,1.2 billion(2 in 7 persons) are undernourished and 2 billion (1 in 4 persons) are malnourished. Problems of under and malnourishments are aggravated by three Cs : COVID, Climate Change and Conflicts (i.e., Ukraine). Since September 2015, when the United Nations Sustainable Development Goals (SDGs) were launched to provide nutritious and adequate food for all (SDG Target 2.1) and eliminate all types of malnutrition (SDG Target 2.2) by 2030, these targets are not on track to be accomplished for many reasons especially due to the 3 Cs outlined above. On the contrary,660 million people will be prone to hunger by 2030.Over and above the adverse effects of 3 Cs,both quantity and quality of food produced are also affected by the extent and severity of soil degradation by wide range of degradation processes. Indeed, soil degradation is the major cause of human malnutrition. Depletion of soil organic carbon content in the surface layer of almost 500 million small land holders in the developing world ,who cultivate less than 2 acres and follow mostly extractive farming practices, to less than 0.25 % in the root zone is the principal driver of deficiency of micronutrients in food grown on highly depleted and severely degraded soils. The problem is aggravated because these resource-poor farmers cannot afford to invest in soil restoration and use of the site-specific best management practices.

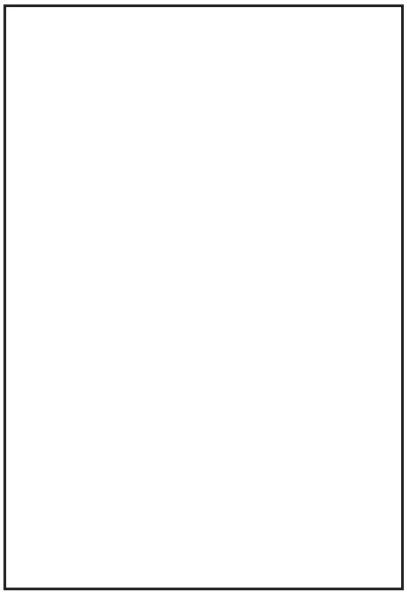
Yet, scientific information on sustainable management of these soils is available .The problem lies in translation of this science into action so that degraded and depleted soils can be restored and sustainably managed to produce healthy, nutritious and safe food. There is also lack of scientific information based on the on-farm assessment of the rate of soil carbon sequestration under real world situation .Thus, FFAR -funded C-FARM project implemented by the CFAES Rattan Lal Center for Carbon Management and Sequestration in cooperation with Co-PIs from 12 universities and USDA/USGS and other stake holders is implemented in USA and South America to monitor management induced changes in soil health through sequestration of soil organic carbon .

The C-FARM project is an example of scientific projects aimed at addressing the involvement of science to addressing problems of the humanity. Indeed, the C-FARM project will help advance both SDG #1 (End Poverty) and SDG#2 (Zero Hunger) and make science useful to humanity.

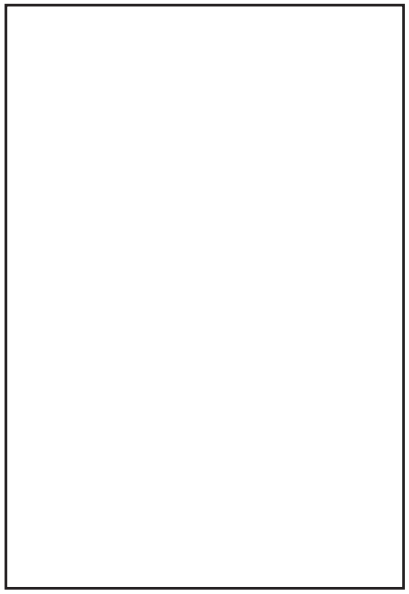
Rattan Lal
Director,
CFAES Rattan Lal Center for Carbon Management and Sequestration
The Ohio State University
Columbus,OH 43210

Lal Carbon Center External Advisory Board

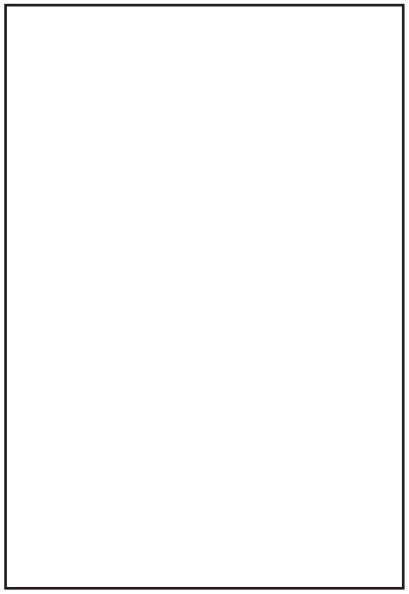
Oversight Committee



Agricultural Soils Working Group



Forestry Working Group



Welcome Research Scientist, Dr. Carla Gavilan.

Dr. Carla Gavilan is a Peruvian Soil Scientist with a background in Agronomy, Plant sciences, and Pedology. She has a breadth of experience studying soils in multiple landscapes and environmental settings, with a particular interest in using geospatial and remote sensing tools to enhance the understanding of pedogenic processes at different scales.

Before joining the Lal Carbon Center, Carla was a Postdoctoral fellow at New Mexico State University. She collaborated with the U.S. Forest Service to update the Mount Hood National Forest (Oregon) soil information by integrating geospatial and data-driven tools to provide accurate and detailed soil data to inform soil-based management.

Carla earned her Ph.D. at the University of Florida, and her research was focused on examining soil carbon dynamics across different scales in the Andean region of Peru. She used proximal and remote soil sensing, process-based and statistical modeling, and spatial and temporal information to understand the variation of soil organic carbon in response to climate and land use changes in the Andes. In addition to her research, she was a guest lecturer and teaching assistant for graduate and undergraduate-level soil courses and communicated her research at national and international conferences.

Carla often draws on experiences from her time at the International Potato Center (CIP), where she spent almost a decade as a researcher. Her work at CIP allowed her to be involved in projects related to soils and cropping systems worldwide, giving her a unique perspective on the challenges and limitations that farmers (and soils) face in diverse landscapes, ecosystems, and cultures. She is excited to bring her expertise to the "Living Soils of the Americas" initiative. This international initiative, spearheaded by the Inter-American Institute for Cooperation on Agriculture (IICA) and the Lal Carbon Center at Ohio State University, aims to articulate science, public policy, and development work to strengthen the soil health agenda and the transformation of agri-food systems in the Americas.

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Welcome Postdoc, Dr. Lauren Balderelli

Lauren is a broadly trained ecologist with experiences in academia, environmental consulting and the startup atmosphere. Her passions and expertise center on factors that drive species diversity of soil microbial communities.

Prior to joining OSU, Lauren was a fulltime researcher at the nature-positive startup, Single.Earth, based in Estonia. There she focused on incorporating soil microbes into ecological models to better describe soil carbon storage in forested lands. Her PhD projects involved better understanding how elevation, parent material, grazing and nutrient additions affected biocrust distributions and functionality throughout Arizona and New Mexico. As a MS student, she was part of a team that described new species of bacteria from the Atacama Desert in Chile, South America.

Although she's originally from western PA, Lauren considers the Cleveland area home for the past 15 years. Lauren moved to Cleveland to attend John Carroll University where she received her Bachelor's degree in Environmental Science and her Master's degree in Biology. She worked at an environmental consulting firm in the Cleveland area before going back to school for her PhD. She completed her PhD in Ecology and Evolutionary Biology from Kent State University in 2021.

Now, as part of the OSU Rattan Lal Center for Carbon Management and Sequestration, she will collaborate with locals to assess how farming practices impact soil health. She's passionate about applying her soil microbial background to soil sustainability initiatives as an effort to support climate mitigation. She's very excited to connect with OSU, particularly the Lal lab, and work with farmers in Northeast Ohio.

In her free time, Lauren enjoys riding her bikes, experimenting in the kitchen, traveling to new places and spending time with her family.

Visiting Scholar Feature

Dr. Muhammad Adnan works as a lecturer of soil and environmental sciences at the University of Swabi Pakistan since, 2014. He has completed his PhD (Soil Fertility and Microbiology) as a split program from the Department of Soil and Environmental Sciences (SES) the University of Agriculture Peshawar, Pakistan and Department of Plant, Soil and Microbial Sciences, Michigan State University, USA.

He is the recipient of three Gold Medals, President of Pakistan award, Indigenous PhD scholarship, IRSIP grant for Michigan State University USA and Fulbright Postdoc grant for the Ohio State University in his educational carrier. He has published 147 research articles, 21 book chapters (with cumulative IF of 251.4 and 4000 citations) and edited 09 books. He is the member Canadian Society of Soil Science, American Society of Microbiology and Soil Sciences Society of Pakistan.

Adnan's research focuses on improving fertilizer use efficiency, reducing N losses, management of organic wastes and legume N2 fixation for increasing cereal production, and soil carbon sequerstation for sustainable agricultural production and mitigation of green house gases (CO_2, & N_2O) emission. Pesently, he is working on " Developing Climate Smart Agricultural and Weeds Management Practices for Improving Soil Health and Mitigating N_2O Emissions from Arable Soil" in his postdoc at CFAES Rattan Lal Center for Carbon Sequerstation and Management The Ohio State University. The aim is to transform weeds (green wastes) into nutrient enriched biochar(s) and explore their role in C sequestration, improving soil health and crop yield, and mitigating N_2O emission from cultivable land using nuclear (N15) and other related techniques.

1st Annual C-FARM Conference

You are invited to join us vitually for the 1st Annual C-FARM Conference, April 5th, 2023. The event will be an opportunity to learn more about this ambitous project and hear research updates from OSU faculty and our collaborating institutions across the U.S. and the western hemisphere.

Click here to register

If you are interested in attending in-person, limited space is available. Please contract Jason Phillips at Phillips.814@osu.edu.

Aim for Climate Summit

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2023 ASA, CSSA, SSSA INTERNATIONAL ANNUAL MEETING

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THANK YOU

Sponsors & Collaborators

The Foundation for Food and Agriculture Research, the Inter-American Institute for Cooperation on Agriculture, FONTAGRO, Bayer U.S. – Crop Science, Microsoft, Cotton Incorporated, Corteva, Ohio Corn and Wheat Growers Association, Ohio Soybean Association, Kansas Corn, United Sorghum Checkoff Program, National Sorghum Producers, Utah Department of Agriculture & Food, Kansas State University, Michigan State University and Utah State University. The project will also be supported through scientific collaborations with the USDA Agricultural Research Service, Sandia National Laboratories, the U.S. Geological Survey and the National Agricultural Research Institute of Uruguay. Further project support is provided by Ohio State's Office of Research, Graduate School, and the CFAES Office for Research and Graduate Education.

All about AgMission

AgMission
Cultivating climate-smart solutions

Agricultural production contributes roughly 13 percent of global greenhouse gas (GHG) emissions, but the sector also has the potential to be a powerful climate solution. At the same time, agriculture is increasingly under threat from extreme weather events and changing climate patterns, posing risks to global food security and farmer livelihoods. To combat these emerging threats, the Foundation for Food & Agriculture Research (FFAR) and the World Farmers' Organisation (WFO) launched AgMission™, a global collaboration between scientists and farmers to advance research and increase adoption of climate-smart solutions that can achieve net-zero GHG emissions. This initiative is directly connecting farmers and scientists to ensure that research is actionable and new technologies can be rapidly adopted. By including farmers as collaborators throughout the research process, AgMission aims to design novel solutions that improve climate resiliency on farms while reducing emissions.

Author
Allison Thomson,
FFAR AgMission
Program Director

Ultimately, AgMission is developing and deploying climate-smart technologies that can help ensure net-zero, resilient agriculture globally.

Guest Article:

Impact of climate change on Himalayas

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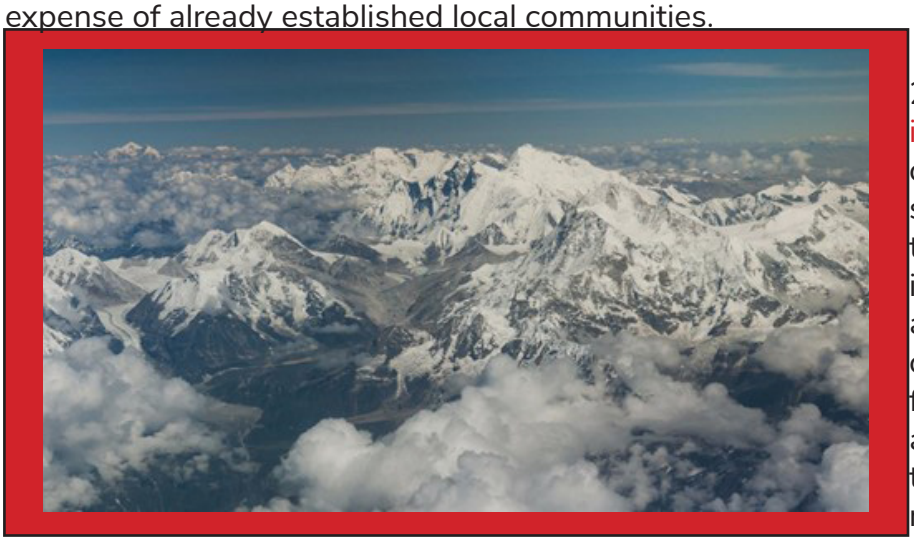
A significant problem our planet is facing today is climate change (CC). This is a universal threat that will create serious environmental, political, social, and economic issues that will continue for many years. As it relates to the planet's common atmosphere, climate change has become an important world-wide environmental issue. Since it has the least chance of being predicted scientifically, its effects are most likely to have a negative impact on the poor and vulnerable, who have made the least contributions to the main causes of CC. The word "climate change" refers to a shift in long-term weather patterns. Significant changes in precipitation, temperature, snowfall, and wind patterns over an extended period of time define it. Basically, CC refers to a change in the climate that is caused by human activity that modifies the makeup of the earth's atmosphere. Mountains are early indicators of a climate change (Singh et al., 2010). River flows are anticipated to vary as glaciers retreat and snowlines rise. This shift in water flow regime has the potential to impair hydropower production, threaten biodiversity, threaten livelihoods based on forestry and agriculture, and negatively impact the general well-being of the population. On the northern edge of the Indian subcontinent, the Great Himalayas, which are made up of several parallel ranges and measure around 2500 kilometres in length from west to east, act like a massive wall. It has three longitudinal ranges:

1. The Great Himalayas are also known as Inner Himalaya, Central Himalaya, or Himadri. This mountain range comprises the tallest peaks of the world, most of which remain under perpetual snow.
2. Middle or Lesser Himalayas has an Elevation from 3,500 to 4,500 m above sea level.
3. Outer Himalayas also known as Shiwaliks extends from 600 to 1500 meters.

Throughout ancient times, the Himalayas have served as a defensive barrier to keep foreign invaders out of India. The climate of south-east Asian countries is significantly influenced by the Himalayas specially the Indian monsoon. After Antarctica and the Arctic, the Himalayan Mountains have the third-largest ice and snow deposits in the world. The Himalayan glaciers may also be affected by the global climate change, which will probably cause them to retreat quickly as a result of global warming. The average amount of ice lost by Himalayan glaciers every year from 1975 to 2000 was four billion billion tonnes (Vohra, 1981). From 2000 to 2016, however, glaciers melted twice as quickly, translating to an average annual loss of nearly eight billion tonnes of ice. Between 1934 and 2003, the 30-km-long Gangotri glacier lost 5% of its length and retreated on average at a rate of 22 metres per year (Kumar et al., 2008). According to the report, the rapid ice loss is being caused by rising temperatures, which puts the water supplies of hundreds of millions of people downstream across much of Asia at risk (Ramanathan et al., 2005). Climate change effects Himalayas directly which further indirectly impact the lives of millions of people in Asian countries. The adverse effects of climate change on Himalayas are as follows:

1. Impact on Himalayan ecosystem: Himalayas appear to be warming faster than the global average rate. Temperature increases are also more pronounced in the winter and autumn than they are in the summer, and they are also greater at higher elevations. According to data from the Indian Institute of Tropical Meteorology in Pune, precipitation has decreased over 68% of India's land area over the past 100 years (Kumar et al. 2006). Nonetheless, several areas of the Indian peninsula, and Jammu and Kashmir, had a noticeable increase in rainfall. Over the past two decades, the Kashmir Valley's average temperature has increased by 1.45°C (Sinha 2007). The effects of a changing climate can be seen on the plants. Due to resource overuse and land degradation, biodiversity is being lost or threatened in some high-altitude areas. Himalaya, the youngest and most dynamic mountain system on Earth, are a home to millions of species of flora and fauna. The Himalaya has been designated as one of the most significant global biodiversity hotspots due to the high species endemism and rising anthropogenic threats. Wildlife and habitats are being influenced by rising temperatures. Several species are on the verge of extinction as a result of melting glaciers and vanishing ice. The probability of extinction of species with a limited geographic and climatic range is increased. The most susceptible species are those that are endangered or endemic, while invasive species from warmer climates will congregate at the expense of already established local communities.



2. Socio-economic and health impacts: Many factors, including climate change, can affect the socioeconomic environment in the Himalayas. It can have an impact on both people's health and the economy (such as agriculture, cattle, forestry, tourism, fisheries, etc.). The impoverished and marginalised populations that rely almost entirely on natural resources are expected to suffer the severe effects of biodiversity loss due to CC. The Himalayas are more susceptible to CC because of poverty, inadequate infrastructure (roads, electricity, water supply, education and health care services, communication, and irrigation), reliance on subsistence farming and forest products for a living, poor health indicators (high infant mortality rate and low life expectancy), and other indicators of development. Climate change has a significant negative impact on human health, both directly (e.g., impacts of thermal stress, death/injury in floods and storms), as well as indirectly Through changes in the ranges of disease vectors, water-borne pathogens, water quality, air quality, food availability and quality, cardiovascular mortality and respiratory illnesses, transmission of infectious diseases, and malnutrition from crop failures (Patz et al. 2005). Several vector-borne diseases' epidemiologies are predicted to be directly impacted by climatic changes. The rate of pathogen replication is expected to increase, which will lead to an increase in the spread of infectious diseases such bartonellosis, malaria, tick-borne illnesses, and other disorders. It includes the livelihoods of 51 million people who still practice hill agriculture. The Himalayan ecosystem is essential to the ecological security of the Asian specially Indian landmass because it provides forest cover, feeds perennial rivers that provide drinking water, irrigation, and hydropower, conserves biodiversity, offers a rich foundation for high-value agriculture, and has breath-taking landscapes for sustainable tourism.

3. Impact on agro-ecosystem: Weather is a major factor affecting agriculture, and variations in the weather cycle have a significant impact on crop productivity and food security. Mountain agriculture is primarily rain-fed (about 85%), powered by the biomass energy of the nearby forests, and limited to terraces cut into the sides of hills. The irregular rainfall has had a significant impact on irrigation systems. It has been seen that apple cultivation has moved to higher elevations and that apple yield, particularly in lower elevations, has decreased due to insufficient cooling as the temperature at lower elevations is rising as a result of CC. The number of chilling hours required for apple trees is decreased as a result of the change in snowfall, which affects bud break. Agrobiodiversity has been abundantly preserved by traditional agriculture in the Himalayan mountains, which has also proven to be resistant to crop diseases. These crops are adapted to the regional environmental circumstances and have the innate ability to tolerate environmental dangers and other natural disasters. The farmers' food security and dietary stability have been preserved for generations due to this adaptability. To the contrary, several traditional crops are on the verge of extinction and the area planted with them has severely decreased (by more than 60%), especially over the past three decades. Recent research at the Indian Agricultural Research Institute (IARI), New Delhi, suggests that every 1°C increase in temperature during the growth phases could result in a loss of 4 to 5 million tonnes of wheat production in the future. Although losses to other crops are still unknown, they are anticipated to be far less, particularly for kharif (summer) crops (Uprety & Reddy 2008). Pollinator populations especially honeybee will be impacted by changes in floral diversity brought on by changes in land use and land cover as well as the extinction of native cultivars. Changes in pest occurrence, movement, and viability are also caused by climate change. An expansion of a pest or disease's regular range into a new habitat due to CC can result in increased losses and have an impact on natural plant communities.

4. Impact on forest ecosystems: Global distribution, forest structure, and ecology, as well as vegetation patterns, are largely influenced by the climate. The Third Assessment Report of IPCC (2001) concluded that Future CC may have a significant adverse impact on forest ecosystems. A significant threat to the extinction of wild flora and fauna western Himalayan mountains may result from habitat degradation and corridor fragmentation due to climate change, changing vegetation, increasing deforestation, and shortage to clean drinking water. Early flowering of various Rosaceae species, including Pyrus, Prunus spp., and Rhododendrons, has been affected by global warming in the western Himalayan mountains. The spread of invasive alien species like Lantana, Eupatorium, and Parthenium spp. in natural forests has also been connected to CC and will affect existing species through competition.

5. Impact on water system of Asian countries: One of the most dynamic and diverse mountain systems in the world, the Himalayan region is also one of the most sensitive to climate change. The Indo-Gangetic plains receive significant amounts of water from the Himalayan Mountains through its enduring glacier-fed rivers. The decrease in ice cover over the past century, particularly in mountain glaciers, is viewed as proof of CC. High elevations in the Himalaya could experience a faster glacial retreat as well as an increase in the number and size of glacial lakes, many of which have formed in recent years. Those areas that largely rely on glacier and snowmelt irrigation will have erratic water availability and increased food insecurity. The high mountains of Asia would lose between 29 and 43% of their ice mass if the world warmed by 1.5°C, which would have an effect on the populations that depend on glacier and snowmelt waters for their livelihoods. River watershed support up to 60% of irrigation outside of the monsoon season and an additional 11% of crop production overall. Himalayan river system provides approximately 8.6 million cubic meters of water per annum to Asian countries (Ming et al., 2008). So, the detrimental impact of CC on water system will further change the livelihood of millions of people in the Indus and Ganges–Brahmaputra basins (Lal, 2011). The water availability for various agricultural, hydro-electric and industrial purposes will get reduced. Several species are on the verge of extinction as a result of melting glaciers and disappearing ice. Because of glacier melting, sea levels are rising by 0.13 inches annually. Low-lying islands and coastal cities have been affected by the recent rapid rise.

Conclusion: The world is alarmed by CC because it affects agriculture and the products produced by it. Considering the catastrophic nature of global warming's repercussions and the fact that human activity is mostly to blame for them, saving "Mother Nature" requires collective responsibility. Failure to this can result in a variety of disastrous events that will severely jeopardise the health of both current and future generations. Himalayas act as a boon for the economy and climate of Asia. So, it is our duty and moral responsibility to protect them.

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2023 Publications and Presentations

Books Written

1. Lorenz, K. and Lal, R., 2023. Organic Agriculture and Climate Change. Springer Nature SBN:978-3-031-17214-4, 232pp. https://doi.org/10.1007/978-3-031-17215-1

Books Edited

2. Lal, R. (Ed) 2023. Soil and Drought: Basic Processes. ISBN: 9781032286747
3. Lal, R. (Ed) 2023. Soil and Drought: Practical Applications. ISBN:

Referred Journal Articles

4. Nandal, A., Yadav, S. S., Rao, A.S., Meena, R.S., and Lal, R. 2023. Advance methodological approaches for carbon stock estimation in forest ecosystems. Environ. Monit. Assess. 195: 315. https://doi.org/10.1007/s10661-022-10898-9
5. Kolganova, A., Lal, R., and Ferkins, J. 2023. Biochar's electrochemical properties impact on methanosenesis. J. Agric. Chemistry and Env. 12(1), Feb 2, 2023. DOI: 104236/jacen.2023.121003
6. Mandal D, Patra S, Sharma NK, Alam NM, Jana C, Lal R. Impacts of Soil Erosion on Soil Quality and Agricultural Sustainability in the North-Western Himalayan Region of India. Sustainability. 2023; 15(6):5430. https://doi.org/10.3390/su15065430

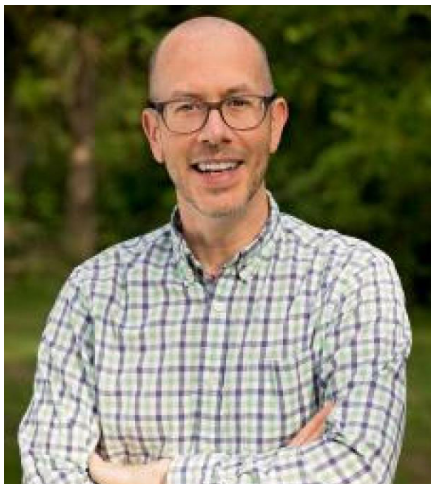
Invited Keynote Presentations

7. Lal, R. 2023. Managing soil health for environmental and climate security in the Latin American and Caribbean Region. Congresso Futuro, Public Relations Team, Morande 441, Santiago, Chile, 4th January, 2023
8. Lal, R. 2023. Managing soil health for food and climate security. Global Forum for Food and Agriculture (GFFA), World Food Program (WFP), Berlin, 20th January, 2023.
9. Lal, R. 2023. Soil, Climate, Water Issues: Addressing the global and Indian scenarios. Walmi, Dharwad Conference, Department of Water Resources, Kunatka, India, 23 January, 2023.
10. Lal, R. 2023. Regenerative agriculture on global scale for people and the planet. Future Harvest Conference Keynote, The Chesapeake Alliance for Sustainable Agriculture, 12-14 January, College Park, Maryland, USA.
11. Lal, R. 2023. Saving our Vanishing Soils: Global perspective. The City Gardens Club, Annual Environmental Forum, 19th January, 2023.
12. Lal, R. 2023. Managing ecological footprint of food systems. Carbon Footprints, Journal Editorial office, Beijing, China, 2nd February, 2023.
13. Lal, R. 2023. Ecological footprint of food and agriculture systems. Educational office of Carbon Footprint journal, 2nd February, 2023.
14. Lal, R. 2023. Pulses for sustainable agriculture in era of climate change. Plenary Lecture, ICU Pulses 2023 Conference. ICAR, New Delhi, 11th February, 2023.
15. Lal, R. 2023. Soil and ecological degradation in Indo-Gangetic Plains. 1st Int. Conf. About Cop-27 Climate Change and Food Security. Pir Mehr Ali Shah Arid Agricultural University, Rawalpindi, Pakistan, 14-15 February, 2023.
16. Lal, R. 2023. Translating science of soil carbon into action through cooperation with private sector. SSSA/SSSC Symposium, 22nd February, 2023.
17. Lal, R. 2023. Climate farming for climate and food security. National Center for Appropriate Technology. Butte, Montana, 28th February, 2023.

18. Lal, R. 2023. Soil health and how to work with the soil to unlock its true potential. Agri-Insider Business Group, Ireland, 28th February, 2023.
19. Lal, R. 2023. Managing soil health for adaptation to and mitigation of climate change. California climate change webinar, 2nd March, 2023.
20. Lal,R.2023. Isotopes in soil sciences research. Stable Isotope Biogeochemistry Class (EARTHSC 5622), Mendenhall Lab, 7th March 2023.
21. Lal, R. 2023. Importance of sustainable soils for the future of humanity. Moldova Academy of Sciences, NATIOONS, 13 March, 2023.
22. Lal, R. 2023. Processes, factors and causes of soil and ecological degradation in Pakistan, International conference on soil pollution and remediation, Forman Christian College University, Lahore, Pakistan, 15-16 March, 2023.
23. Lal, R. 2023. Living soils of America. Intl. Soil and Plant Analysis Conference, Concepcion, Chile, 22nd March, 2023.
24. Lal, R. 2023. Carbon Farming and Payments for Ecosystem Services. Intl. Soil and Plant Analysis Conference, Concepcion Chile, 23rd March , 2023.

Lal Carbon Center Staff (UPDATED TEAM PHOTO)

Leadership Announcement



Associate Professor Steve Lyon to join the School of Environment and Natural Resources (SENR) leadership team as the Associate Director for the School of Environment and Natural Resources (SENR) on the Wooster campus.

In this role, Dr. Lyon will lead SENR's Wooster operations (overseeing Wooster-based staff, coordinating with campus administrators and other Wooster-based associate chairs) as well as provide leadership on research policies and practices in SENR, and chair SENR's Research Committee and facilitate research reporting. Dr. Lyon is looking forward to helping support the vibrant and collaborative community on the College of Food, Agricultural and Environmental Science (CFAES) Wooster campus. His vision is to make SENR both in Columbus and on the CFAES Wooster campus a destination to promote environmental sustainability through teaching, research and outreach.

Contact Info:

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