

Lal Carbon Center Newsletter

Summer 2023

Prof. Rattan Lal had the great honor and privilege to meet the Honorable Prime Minister of India in New York on 20th June 2023. Prof. Lal presented several books to the Prime Minister and one of these was the Soil -Human Health -Nexus. India's Embassy in the U.S. organized a visit of the Academician from the U.S. to meet and greet the Prime Minister ,and Prof. Lal was one of the 10 members selected from around the U.S. Prime Minister was invited by the President of USA, and he addressed the U.S. Congress on 21st June.

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The Lal Carbon Center has had a very productive spring and summer. Dr. Lal has been traveling and meeting with folks all over the world to explain the importance of soil health and agriculture as part of the solution to climate change.

Please, consider making a gift to support the Lal Carbon Center
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Director's Viewpoint

From The Desk of Rattan Lal

Soil Health Act and The Farm Bill 2024

Implementation of environment policy act is a historical tradition in the U.S.A. Existing Acts and Resolution in favor of environmental improvement include: i) The Clean Water (CWA) of 1965 (P.L. 89-234) is designed to regulate discharge of pollutants into the waters of U.S.A. and establish quality standards for surface waters, ii) Clean Air Act (CAA, 42 U.S.C. 7401) was authorized by U.S. EPA in 1970 to establish National Air Quality standards to protect public health and environment, iii) The Agriculture Resilience Act is aimed at giving farmers the tools they need to become net-zero by 2040. However, clean water and air can only be achieved if soils of agro-ecosystems are healthy to scrub out pollutants. Furthermore, achieving net-zero emissions from agriculture is a good start but agriculture must become negative emission technology (NET). Transformation of agro-ecosystems is needed to become an effective solution to global warming and other environmental issues. Thus, agro-ecosystems must be a major sink for atmosphere CO₂ and drastically reduce emission of CH₄ and NO₂. For this innovative and a win-win-win solution, there is an urgency to implement Soil Health Act (SHA) which compliments the existing three Acts. The objective is to empower farmers and land managers to adopt site-specific best management practices through payments for ecosystem services at the flat rate of \$50/acre per year. The SHA will be in accord with the Senate Soil Protection Resolution 440 of 2008 and is needed to transform agriculture as a nature-positive industry.

Rattan Lal
Columbus, Ohio
30th June, 2023



Welcome Research Scientist, Dr. Nancy Loria.

Dr. Nancy Loria (loria.10@osu.edu)

Researcher

Hailing from the beautiful state of Himachal Pradesh, India, I completed my Ph.D. in Environmental Science and master's in forestry from Dr. Y S Parmar University of Horticulture and Forestry, Solan. I am honored to have been awarded gold medals for both my master's and Ph.D. degrees, recognizing my academic achievements. With a strong background in environmental research, I have gained valuable work experience as a research fellow for three years at ICAR-Indian Institute of Soil and Water Conservation, Research Center Chandigarh, India. During my tenure, I conducted extensive research on Himalayan soils, with a focus on agriculture as a solution for climate and environmental challenges. To further enhance my expertise, I have pursued certifications in Geographic Information System (GIS) from UC Davis, California, and Data Analyst Associate from Mission College, Santa Clara, California, demonstrating my commitment to environmental data analysis. My research interests encompass soil health, water quality, carbon sequestration, sustainable agriculture, and climate change. In my previous research, I focused on studying the impact of cropping systems on soil health and water quality, as well as assessing the bio-physical vulnerability of the farming community to environmental changes in the Indian Northwestern Himalayan region. Working closely with smallholder farmers, I dedicated efforts to building their capacity for a low carbon future through the implementation of climate-resilient agricultural practices. My research involved comprehensive site surveys, questionnaires, field experiments, and meticulous analysis of soil and water samples, following established scientific protocols. Through the preparation of reports and manuscripts, I actively contributed to the scientific community, having published 11 research papers and 2 book chapters. Currently, I am working on a Microsoft project that focuses on the development of a handheld device utilizing in-situ soil carbon sensor technology. This innovative device aims to provide real-time measurements of soil carbon content, empowering farmers to make informed decisions regarding carbon sequestration practices. Additionally, I am engaged in the C-FARM (Carbon Farming Alliance for Research and Management) project, which strives to enhance the carbon sequestration potential of croplands, rangelands, and grasslands, aligning with the United Nations' Sustainable Development Goals (SDGs). Looking ahead, I have plans to conduct research on the long-term effects of farmland mulching practices on soil physicochemical and microbial properties. Furthermore, I am eager to explore the quantification of greenhouse gas emissions reductions achieved through long-term carbon farming practices. I am deeply passionate about advancing sustainable agricultural practices and addressing the challenges of climate change. It is with great enthusiasm and honor that I embrace the incredible opportunity to work alongside Dr. Lal and his exceptional team. I am thrilled to collaborate with them and contribute to the innovative research that is at the forefront of our field.



Dr. Ram Swaroop Meena



Dr. Ram Swaroop Meena is working as an Assistant Professor (S-3) in the Department of Agronomy, Institute of Agricultural Sciences, BHU, Varanasi (UP). Dr. Meena has secured first division in all the classes with triple NET, Junior Research Fellowship, and Senior Research Fellowship from the ICAR. Dr Meena also received RGNF Award of the University Grants Commission and Raman Research Fellowship of the Ministry of Human Resource Development, Government of India. He has recently with awarded Fellow of the National Academy of Agricultural Sciences (NAAS) and Indian National Science Academy (INSA) Fellowship to work at RRI South Asia Regional Centre (IRRI SARC) as a visiting scientist. He has been listed in the World's Top 2% Scientists by the Stanford University, USA, and

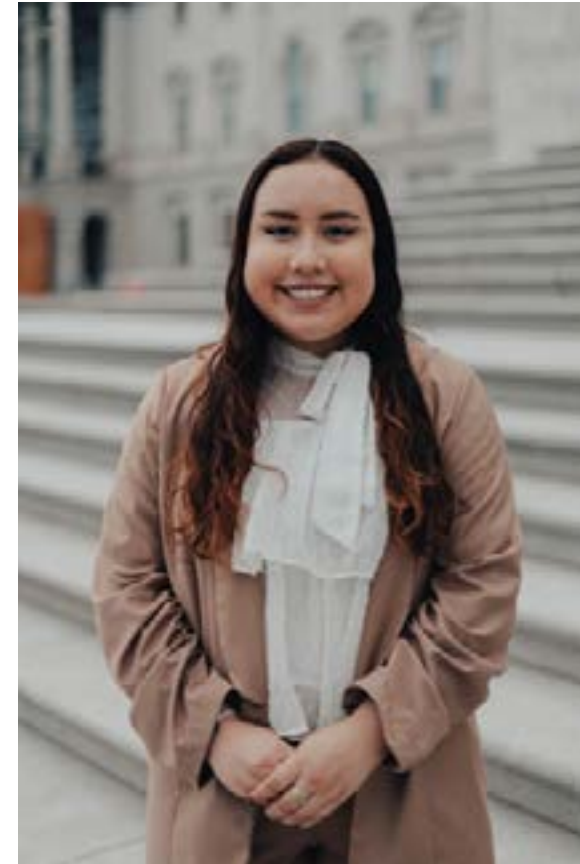
Elsevier report. He is also listed in 9th position out of 100 scientists from India in the field of forestry and agriculture sciences by the AD scientific index at the global level ranking. Dr Meena did his Postdoctoral fellowship on soil carbon sequestration from CFAES Rattan Lal Center for Carbon Management and Sequestration, The Ohio State University, Columbus, OH, United States. Dr Meena has more than 13 years of research and teaching experience at the undergraduate/postgraduate/Ph.D. levels and contributed significantly in the field of soil sustainability, crop productivity, resource use efficiency and climate resilient agriculture.. He has in his credit more than 135 National and international research and reviews papers with a H-index of 55, an I-10 index of 161, and citations 9,300. He has published 28 book including four at the national level and 24 books (Springer, Elsevier, etc.) 85 book chapters. Dr. Meena is credited with development of a novel, affordable biochar separation technique for integrated nutrient management. He has created models of the agricultural ecosystem for CO₂ sequestration, carbon credit and enhancing soil physico-chemical properties, and regenerating degraded land. Dr. Meena contributed significantly to the agricultural extension activities in adopted villages by the Honourable Prime Minister of India, as an associate coordinator through skill development, interaction meetings, workshops, and farmers' fair. His future target is to reduce soil organic carbon oxidation and enhance the stability in agroecosystems, for possible benefits to the farmers through carbon credits.



Award recived: Fellow of the National Academy of Agricultural Sciences (NAAS)

Undergraduate Member Regina Loayza

Excerpt from Regina Loayza:



Regina Loayza is a rising senior majoring in Environmental Policy and Decision Making with a minor in Andean and Amazonian Studies, who worked in CMASC this past spring. During her time with us, Regina received a variety of accolades.

1. Inducted into the SPHINX Senior Class Honorary, the oldest honorary at the Ohio State University, recognizing only 24 exceptional seniors.
2. Recognized by OSU CFAES with the Internship Award for Excellence, nominated by Lucia Hadella, SENR Career Advisor & Career Development Coordinator. Regina completed an internship at the U.S. Senate on Agricultural, Nutrition, and Forestry.
3. Selected for the Ohio State 2023 Homecoming Court based on leadership, achievements, and integrity through her contributions and involvement.
4. Honored as the 2023 Udall Scholar Awardee, which recognizes outstanding students involved in leadership, service, and careers related to the environment.

Join us in congratulating Regina on all of her successes!

Announcements:

-Jason's Departure

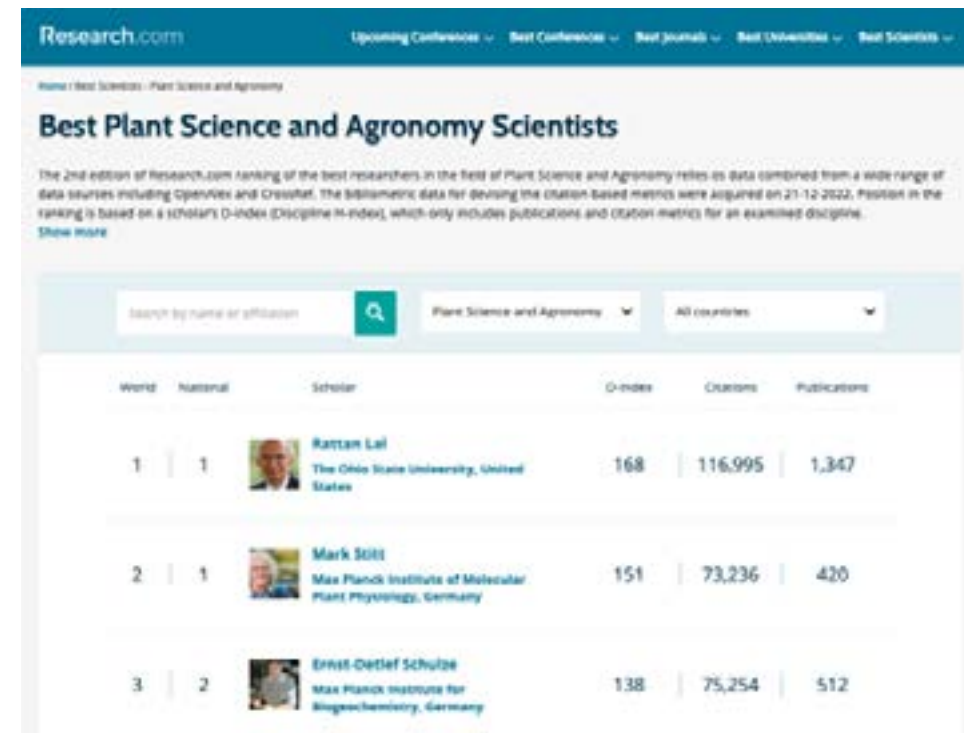
We would like to congratulate Jason Phillips for his promotion to Director of Development




-Brittany Multer

We would like to Congradulate Brittany Multer on her graduation and completion of her Master's Thesis!

Dr. Lal's # 1 ranking

<https://research.com/scientists-rankings/plant-science-and-agronomy>



World	National	Scholar	Q-index	Citations	Publications
1	1	 Rattan Lal The Ohio State University, United States	168	116,995	1,347
2	1	 Mark Stitt Max Planck Institute of Molecular Plant Physiology, Germany	151	73,236	420
3	2	 Ernst-Detlef Schulze Max Planck Institute for Biogeochemistry, Germany	138	75,254	512

Dr. Rattan Lal was ranked #1 both nationally and globally for Best Plant Science and Agronomy Scientists on Research.com.

Pictures:



Postdoc, Dr. Baldarelli recently traveled to Pullman, Washington where she was able to witness the stunning canola blooms throughout the Palouse area. These vibrant fields that span miles between eastern WA and western ID are typically in bloom for 4-6 weeks during the spring/summer months. This major agricultural region is well-known for its beautiful rolling hills, formed from wind-blown dust, that can make farming the land a bit challenging for farmers. Locals in the area are accustomed to the view of tractors along some steep slopes!

The Palouse area is especially known for producing legumes such as lentils and chickpeas and of course wheat. If you haven't had a chance to visit, you might want to add it to the list. It's quite a sight to see, as it's named one of the seven wonders of Washington State!

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Visit to New York City



From left to right are Dr.Hicham (President of UM6P), Dr Terrab (CEO of OCP), Dr Joanne Whalen (Professor at UMSP) ,Rattan Lal, and Dr Simeon Ehui (Director General of IITA).



Dr. Lal met Princess of Thailand, Her Royal Highness Maha Chakri Sirindhorn, during the 7th International Conference on Vetiver (29 May-1 June 2023 in Chiang Mai, Thailand).

At this gathering, Dr. Lal gave the Keynote Speech and a tribute to the Princess' late father, King Bhumibol Adulyadej the Great.

Thailand owes much of its agricultural success to the lifelong dedication of His Majesty King Bhumibol Adulyadej the Great, in fostering resiliency through advancing food security for the Thai people. King Bhumibol Adulyadej established some 3,000 education programs geared towards agriculture, health, and the environment.

The name of His Majesty means the Unique Power of Soil. Similarly, "Swaran Bhumi" (Bangkok Airport) pertinently and appropriately means "Golden Soil."



A delegation of farmers and agrotechnologists and product services visited the Center on 20th June and discussed the impact of modern innovations on agriculture production in Brazil and the so called "Cerrado Miracle". The visitors were also interested in the options to reduce the carbon footprint of agriculture and make modern farming a part of the solution to mitigate climate change and improve the environment



Former Vice President Al Gore talking about the incredible work done by Dr. Rattan Lal here at the center during the AIM Summit for Climate.



One Agro – Syngenta – Brazil – June 2023



Dr. Lal presented to the EPN field tour attendees on Monday, June 5 and sharing the exciting work occurring at Waterman Lab.



2023 Publications and Presentations

Books Written

- Jayaraman, S., R.C. Dalal and Rattan Lal (eds) 2023. Sustainable Soil Management: Beyond Food Production. Cambridge Scholars Publishing, ISBN 13: 978-1-5275-0204-8, pp 350.



Books Edited

- Jayaraman, Somasundaram, Ram C. Dalal, Ashok K Patra, and Rattan Lal 2023. Soil Sustainable Management: Challenges, Prospects and Benefits Chapter 1 in J.Somasundran et al.(Eds) "Sustainable Soil Management : Beyond Food Production", Cambridge Scholars Publishing, New Castle Upon Tyne, U.K. pp 1-22



- Jayaraman, Somasundaram, Ram C. Dalal, and Rattan Lal 2023. Conclusions : Perspective on Sustainable Soil Management. Chapter 12 in J.Somasundran et al.(Eds) "Sustainable Soil Management : Beyond Food Production", Cambridge Scholars Publishing, New Castle Upon Tyne, U.K. pp 322-335.

Referred Journal Articles

- Briedis, C., J. Sa, R. Lal, A. Ferreira, J. Franchini, et al. 2023. Preservation of labile organic compounds is the pathway for carbon storage in a 23-year continuous no-till system on a Ferralsol in southern Brazil. GEODERMA REGIONAL 33. doi: 10.1016/j.geodrs.2023.e00643.
- Das, S., A. Das, R. Idapuganti, J. Layek, D. Thakuria, et al. 2023. Liming and micronutrient application improves soil properties and productivity of the groundnut-rapeseed cropping system in an acidic Inceptisol of India's eastern Himalayas. LAND DEGRADATION & DEVELOPMENT. doi: 10.1002/ldr.4713.

3. Huang, Y., B. Tao, R. Lal, K. Lorenz, P. Jacinthe, et al. 2023. A global synthesis of biochar's sustainability in climate-smart agriculture- Evidence from field and laboratory experiments. RENEWABLE & SUSTAINABLE ENERGY REVIEWS 172. doi: 10.1016/j.rser.2022.113042.
4. Layek, Jayanta. A Das, V.K. Mishra, R. Lal, R. Krishnappa, et al. 2023. Improved agronomic practices and high yielding rice varieties maintain soil health and enhance yield and energy use efficiency under shifting cultivation landscapes of eastern Himalayas. LAND DEGRADATION & DEVELOPMENT. Doi: 10.1002/ldr.4807.
5. Kolganova, A. , Lal, R. and Firkins, J. (2023) Biochar's Electrochemical Properties Impact on Methanogenesis: Ruminal vs. Soil Processes. Journal of Agricultural Chemistry and Environment, 12, 28-43. doi: 10.4236/jacen.2023.121003.
6. Lal, R. 2023. Agriculture in the North Western Sahara Aquifer System: A miracle in the making? JOURNAL OF SOIL AND WATER CONSERVATION 78(3): 57A-62A. doi: 10.2489/jSWC.2023.0106A.
7. Lal, R. 2023. Farming systems to return land for nature: It's all about soil health and re-carbonization of the terrestrial biosphere. Farming System 1(1): 100002. doi: 10.1016/j.farsys.2023.100002.
8. Lin, B., R. Li, K. Liu, O. Oladele, Z. Xu, et al. 2023. Management-induced changes in soil organic carbon and related crop yield dynamics in China's cropland. GLOBAL CHANGE BIOLOGY 29(13): 3575–3590. doi: 10.1111/gcb.16703.
9. Maas, E., and R. Lal. 2023. A case study of the RothC soil carbon model with potential evapotranspiration and remote sensing model inputs. REMOTE SENSING APPLICATIONS-SOCIETY AND ENVIRONMENT 29. doi: 10.1016/j.rsase.2022.100876.
10. Nandal, A., S. Yadav, A. Rao, R. Meena, and R. Lal. 2023. Advance methodological approaches for carbon stock estimation in forest ecosystems. ENVIRONMENTAL MONITORING AND ASSESSMENT 195(2). doi: 10.1007/s10661-022-10898-9.
11. Naorem, A., S. Jayaraman, N. Sinha, M. Mohanty, R. Chaudhary, et al. 2023. Eight-year impacts of conservation agriculture on soil quality, carbon storage, and carbon emission footprint. SOIL & TILLAGE RESEARCH 232. doi: 10.1016/j.still.2023.105748.
12. Serafim, M., I. Mendes, J. Wu, F. Ono, L. Zancanaro, et al. 2023. Soil physicochemical and biological properties in soybean areas under no-till Systems in the Brazilian Cerrado. SCIENCE OF THE TOTAL ENVIRONMENT 862. doi: 10.1016/j.scitotenv.2022.160674.
13. Shrestha, R., P. Jacinthe, R. Lal, K. Lorenz, M. Singh, et al. 2023. Biochar as a negative emission technology: A synthesis of field research on greenhouse gas emissions. JOURNAL OF ENVIRONMENTAL QUALITY. doi: 10.1002/jeq2.20475.
14. Wang F., Harindintwali J.-D., Wei K., et al., (2023). Climate change: Strategies for mitigation and adaptation. THE INNOVATION GEOSCIENCE 1(1), 100015. doi: 10.59717/j.xinn-geo.2023.100015
15. Xia, L., L. Cao, Y. Yang, C. Ti, Y. Liu, et al. 2023. Integrated biochar solutions can achieve carbon-neutral staple crop production. NATURE FOOD 4(3): 236–246. doi: 10.1038/s43016-023-00694-0.

Invited Keynote Presentations

15. Lal, R. 2023. Climate change and soil science. Webinar by Methodist Theological School, Delaware, Ohio, 19th April, 2023.
16. Lal, R. 2023. Managing soil as nature-based solution to achieving climate and food security: Role of CA4SH. Friends of Soil Health Dialogue, 19th April, 2023, CA4SH session.
17. Lal, R. 2023. Integrated management of degraded soils to ensure food and climate security. International Conference at the National University of Uzbekistan, 19-22 April, 2023.
18. Lal, R. 2023. Protecting and restoring soil health by sequestering carbon for returning land to nature. Professor World Peace Academy Event, 21st April, 2023
19. Lal, R. 2023. The Living Soils of America (LiSAM) program: Potential and opportunities, LiSAM Board Meeting, 27th April, 2023, San Jose, Costa Rica.
20. Lal, R. 2023. Bringing Soil Health Revolution Forward and Operationalizing. CA4SH Side Event at AimForClimate, 10th May, 2023, Washington D.C.
21. Lal, R. 2023. Climate Change and its impact on African agriculture. AAA Science Day, 3rd May, 2023, Meknes, Morocco
22. Lal, R. 2023. Managing soil health for food and climate security. Extinction or Regeneration Conference, 11-12 May, 2023, London, U.K.
23. Lal, R. 2023. Concluding remarks for AgCarbon Conference, 24-25 May, 2023, UMGP, Ben Guerir, Morocco
24. Lal, R. 2023. Carbon farming for advancing Sustainable Development Goals. Plenary Lecture, AgCarbon Conference, 24-25 May, 2023, Ben Guerir, Morocco
25. Lal, R. 2023. Managing soil health with Vetiver (Vetiveria Zizinioides) for food and climate security. 7th Int. Vetiver Conference, Chiang Mai, Thailand, 29-31st May, 2023
26. Lal, R. 2023. Processes of soil carbon sequestration. 7th Int. Vetiver Conference, Chiang Mai, Thailand, 29-31st May, 2023
27. Lal, R. 2023. Tribute to Her Royal Highness Maha Chakri Sirindhorn: The Determined Developer, 7th Int. Vetiver Conference, Chiang Mai, Thailand, 29-31st May, 2023
28. Lal, R. 2023. Agriculture Revolution in Brazil: Accomplishments and Challenges. Syngenta OneAgro 2023, 13-14 June, 2023, Campinas, Brazil.
29. Lal, R. 2023. Managing agriculture for climate and food security. OneAgro 2023 Conferences, Syngenta, Campinas, Brazil, 13-14 June, 2024.
30. Lal, R. 2023. Principals of carbon farming. OneAgro 2023, Campinas, Brazil, 13-14 June, 2023.

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