



THE OHIO STATE UNIVERSITY

Winter | 2021

CFAES DR. RATTAN LAL CARBON MANAGEMENT AND SEQUESTRATION CENTER

C-MASC NEWSLETTER



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Break for Winter: December 23-29

From President Johnson: “As the semester draws to a close and we look forward to the holiday break, I want to thank you for your dedication and excellence this semester and beyond. The past two years have brought historic challenges for our university and, as members of our incredible faculty and staff, you have time and again demonstrated remarkable commitment and resilience. So many of you have put aside personal time and made sacrifices to support our teaching, learning, research and service missions. We must now — more than ever — emphasize the health, safety and well-being of the people who are working every day to support our students — and each other.”

— December 10th, Notes from a Fellow Buckeye

Imaae courtesv OSU Sianature Gallerv



As COVID-19 pandemic restrictions relaxed this fall, as the 50th World Food Prize (WFP) Laurate in 2020 whose ceremony was virtual, Dr. Lal received a twice-in-a-lifetime opportunity to represent C-MASC as an honored

laurate at the World Food Prize. Along with the 51st WFP Laurate, Dr. Shakuntala Thilsted, Dr. Lal joined his other

esteemed colleagues U.S. Secretary of Agriculture Tom Vilsack; Mexico Secretary of Agriculture Victor Villalobos; Paul Schickler, Chairman of the World Food Prize Council of Advisors;



Barbara Stinson, President of the World Food Prize Foundation; Dr. Gebisa Ejeta, Chair of the World Food Prize Selection Committee; Ambassador Kenneth M. Quinn, President Emeritus of the World Food Prize Foundation;

Iowa Lt. Governor Adam Gregg, 2016 WFP Laureate Dr. Jan Low; and 2010 WFP Laurate Rev. David Beckman at the in-person 2021 World Food Prize Laureate Ceremony at the Iowa State Capitol.

He was particularly honored to be recognized by Secretary Vilsack at that event.

Dr. Lal enjoyed a chance to meet the Ruan family in person and receive his

physical prize at the 2021 Laurate Welcome Dinner. He is also grateful for the kindness of Iowa University President Wendy Wintersteen and her husband for inviting him into their home for a lovely meal, and

for the opportunity to meet with Dr. Melanie Foster-Joy in Iowa.

He was honored to be invited to several Borlaug Dialogue Side Events with IICA, USAID, ICRAF, and the Global Youth Institute, as well as discussing nutritional security with Dr. Thilsted herself in a Borlaug Dialog Roundtable.

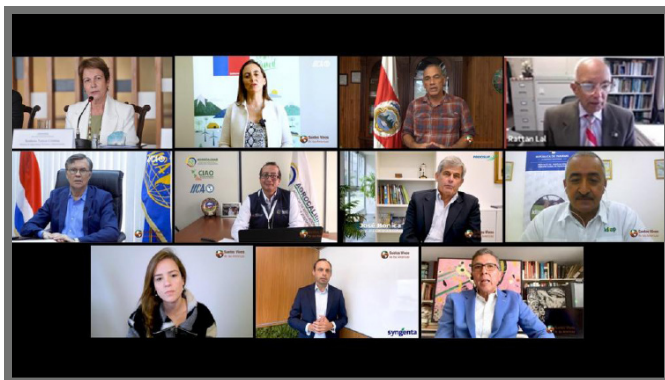


The conversations initiated at the 2021 World Food Prize will play an important role in shaping the way the world will address the coming challenges of food security and sustainable agriculture for years to come.

Many thanks for a successful and memorable WFP event and wishes that it will continue to occur in person in the future!



IICA Celebrates the Living Soils of the Americas Achievements



Article recreated from <https://tinyurl.com/dwxneydd>

SOIL HEALTH PRESERVATION IS ONE OF THE MOST PRESSING CHALLENGES FACING HUMANITY, SIGNALLED EXPERTS FROM THE AMERICAS AT EVENT ORGANIZED BY IICA

By Institutional Communication Division (IICA)

San Jose, 8 December 2021

To ensure the well-being of future generations, farmers from the Americas, representatives of academia, ministers of agriculture, officers of international agencies, and directors of important agri-food companies raised their voices together in signaling that preserving soil health is one of the most pressing tasks facing humanity.

Convened by the Inter-American Institute for Cooperation on Agriculture (IICA), stakeholders from the public and private sectors commemorated World Soil Day, held on 5 December each year, with the aim to emphasize the critical importance of sustaining all life forms on the planet.

The event provided a space to summarize the achievements to date of the “Living Soils of the Americas” program, launched in December of 2020 by IICA and Ohio

State University’s Center for Carbon Management and Sequestration, and directed by prize-winning scientist Rattan Lal.

The initiative has made concrete progress in fighting soil degradation—which threatens

the countries’ capacities to sustainably satisfy the demand for food—at the hands of different governments in the hemisphere and with the participation of private companies that have incorporated policies aimed at restoring soils in their productive activities.

Participants at the event included Professor Lal, 2007 Nobel Peace Prize co-laureate, IICA Goodwill Ambassador, and the world’s top soil scientist; Tereza Cristina, Minister of Agriculture, Livestock and Food Supply of Brazil; María Emilia Undurraga, Minister of Agriculture of Chile; Renato Alvarado, Minister of Agriculture and Livestock of Costa Rica; Arnulfo Gutiérrez, Chair of the Board of Directors of FONTAGRO; José Bonica, Chair of the Steering Committee of the Cooperative Program for Agrifood and Agroindustrial Technological Development in the Southern Cone-PROCISUR; Rommel Betancourt, President of the Inter-American Commission for Organic Agriculture (ICOA); Arturo Durán, Agro Sr. Director for Latin America at Pepsico; Natasha Santos, Vice President and Head of Global Stakeholders Strategy and Affairs at Bayer; Juan Pablo Llobet,

Regional Director of Syngenta in Latin America; and Manuel Otero, Director General of IICA.

The event afforded the opportunity to share the success achieved in O’Higgins Region, Chile, within the framework of the Living Soils of the Americas program, where due to erosion, farmers had long abandoned agriculture and only practiced small-scale livestock production.

Information was also shared on the case of improved yields in coffee and vegetable plantations in Costa Rica as a result of practices that improve soil health in the context of AGRO-INNOVA, a program implemented by IICA and the European Union.

Professor Lal explained that restoring soil health is essential to eradicating poverty, making progress in the strive for social equity, strengthening biodiversity, improving water quality, and reducing greenhouse gas emissions, which are responsible for climate change.

The scientist applauded the recent creation of the Coalition of Action 4 Soil Health (CA4SH), on occasion of the United Nations Food Systems Summit.

The Coalition connects multiple stakeholders from the public and private sectors to work for improving soil health through implementing and monitoring policies and obstacles to public and private investment that hinder farmers in adopting beneficial soil practices.

Please continue reading about IICA’s many achievements with LiSAM here: <https://tinyurl.com/dwxneydd> and also here: <https://tinyurl.com/yckja332>



C-MASC Graduate Student Viewpoint

FROM THE DESK OF ANNA KOLGANOVA

The issue of climate change has become one of the greatest problems of humanity. The agricultural sector is one of the main economic branches primarily responsible for actively changing climatic conditions, due to the fact it accounts about 25.5% of total global anthropogenic emissions. About 18% of these emissions are accounted only by livestock. Animal husbandry produces multiple kinds of greenhouse gases, including methane. The methanogenesis process in ruminants serves as a prevailing mechanism of methane production and its emission from livestock. Methane is produced as a byproduct of digestion during the process of enteric fermentation in ruminants' organisms. Therefore, enteric fermentation is considered a primary source of methane production in cattle. This is why it is important to study ways of enteric meth-

ane emissions reduction from ruminants, and this is exactly what I am going to do during my work in the scope of C-MASC. Under Dr. Lal's mentorship and with the help of Dr. Lakritz, who represents the Veterinary Medical Center at the Ohio State University, I am planning on studying the usage of heavy metals as a tool for enteric methane emissions reduction from ruminants. This paper will identify the role of heavy metals in the methanogenesis process. The hypothesis of this work is based on the assumption that heavy metals serve as inhibitors of the methanogenesis process in ruminants. If the hypothesis will be proven, then, we can provide a model of methane emission reduction by using heavy metals as inhibitors and this will be the main result of the paper. We can offer to use optimal doses of heavy metals as ruminants forage supplements. This would also be an exciting discover since usually, science talks only about heavy metals' negative impact on living organisms.

One of the main goals of C-MASC is to provide comprehensive research on carbon management and sequestration in the field of the agricultural industry. It requires a detailed study of the system "soil – plant – animal" components in order to find out the mechanism of carbon generation, transformation, and transmission on each of these stages. On the basis of such studies, it will become easier to find the main levers of carbon management and ways to prevent greenhouse gases emissions from this system.

As a representative of the Ohio State University and C-MASC, I am planning on taking part in different scientific conferences about soils in the upcoming semester. Dr. Lal and I are currently working on the article for the XXV Dokuchaev Conference «Soil is life», which is going to be in St. Petersburg, Russia at the beginning of March. I am also developing a paper for the international scientific ecological conference "Environmental protection is the basis of the country's security", which will be organized in Krasnodar, Russia in April 2022.

I am grateful to C-MASC and Dr. Lal for providing a plethora of opportunities for my self – development and for supporting me throughout my scientific path.

Sincerely,

Anna Kolganova
Graduate Student
School of Environment and Natural Resources
CFAES Rattan Lal Center for Carbon Management and Sequestration

C-MASC Updates

C-MASC & World Coffee Research: Rethinking Coffee Carbon Accounting



Experience: Developing a white paper and presenting worldwide audiences in collaboration with World Coffee Research

By Umesh Acharya

It was my first job in the USA and an honor to be working under guidance of the great soil scientist Dr. Rattan Lal at CFAES Rattan Lal Center for Carbon Management and Sequestration, The Ohio State University. I was nervous and at the same time excited when I first met Dr. Lal in-person around noon of 2nd August 2021. He made me feel comfortable and asked me about my arrival and settlement



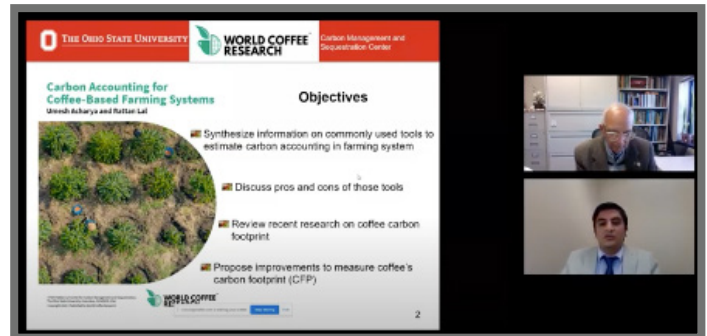
here in Columbus, Ohio. We discussed my first assignment of writing a white paper on the carbon

footprint of coffee in collaboration with world coffee research (WCR). I had worked in carbon during my master's but linking carbon with climate change and coffee was new to me. After a few meetings with Dr. Vern Long and Dr. George P. Kotch from WCR and Dr. Lal, I developed an outline for the white paper. Finally, with the input from several

Dr. Lal and review from several researchers from WCR, I prepared white paper titled "Carbon Accounting for Coffee-Based Farming Systems." The objective of this paper is to collate and synthesize

information on commonly used tools in estimating the carbon footprint (CFP) of coffee-based farming systems, discuss pros and cons of those tools, review recent research on coffee's CFP, and propose improvements to measure CFP more accurately at the farm level. I have reviewed over 50 articles related to coffee, carbon footprint and its calculation, variables considered for carbon accounting during the preparation of this white paper. WCR organized the webinar to disseminate white paper with

the coffee growers, roasting companies and scientists working on carbon footprint scheduled on 16th November 2021 from 11 AM to 12 PM EST. More than 650 people registered for the webinar with 330 live attendees and 62 questions were asked during the webinar. I presented 7 slides after the opening and closing remarks on the topic from Dr. Lal. The discussion was facilitated by Dr. Long on the topics related to carbon footprint and coffee with regards to climate change was interesting and motivating



for me. In summary, I learned a lot during the process of writing this white paper and presenting to a worldwide audience. This will certainly be a great boost to my career and understanding the carbon footprint with a global perspective more in depth. The white paper "Carbon Accounting for Coffee-Based Farming systems" can be found in the link https://worldcoffeeresearch.org/media/documents/Rethinking_Coffee_Carbon_Accounting.pdf. The recorded webinar "Rethinking Coffee Carbon Accounting" can be found in the link <https://www.youtube.com/watch?v=bEoHwOCub5U>.

Graduate Student Anna Kolganova Places 1st at Conference

By Anna Kolganova

On November 18 there was an international student scientific conference in Russia, Omsk, called "Safety of the Urban Environment." It was organized online due to the current situation with the pandemic. Four countries were represented there, including, India, Russia, Kazakhstan, and the USA. It was a big honor for me to be the only representative of the US and to perform on behalf of the Ohio State University.

The conference lasted 3 days. All participants were divided into 7 sections, according to the theme of their reports. The conference was ecologically polarized, so, many presentations covered serious environmental issues of the modern world. My section, called "Risk factors for humans' life and health and ensuring its safety," included

20 participants. Some of them were talking about demographic issues and their environmental consequences, some were discussing the ecological safety of the urban environment for kids. Due to the huge time difference of 11 hours, I had to present my paper at midnight, and, honestly, it was a big challenge. I talked about the assessment of molybdenum-containing compounds' influence on biochemical indicators of mice blood serum in the conditions of high copper content. This article is based on a part of my final Bachelor's work where I studied a phenomenon of chemical antagonism between copper and molybdenum. As a copper chemical antagonist, molybdenum is able to inhibit the process of this heavy metal accumulation in living organisms and decrease its level

of toxicity. I set up an experiment on 20 mice in order to prove the efficacy of molybdenum in solving the copper intoxication issue. The results of the experiment have shown a positive trend in the scope of copper intoxication reduction, which was proven by blood serum indicators stabilization.

My work was evaluated by the section jury and awarded first place. I am happy to give OSU such a great result. I am grateful to my advisor, professor Lal, for his support and permission to take part in the conference. It is an honor for me to be an OSU ambassador at the international scientific platform. I am looking forward to participating in other scientific conferences and meetings on behalf of OSU, SENR, and C-MASC.

Update from Dr. Muhammad Shaukat

Dr. Muhammad Shaukat is serving as Lecturer in Department of Agricultural Sciences at Allama Iqbal Open University (AIOU), Islamabad-Pakistan. Dr. Shaukat has served as a Lead Scientist in various national & international projects on climate change, its mitigation and adaptations. He also worked as a Project Coordinator of a research project funded by FAO to develop "agricultural resilience building initiatives (ARBIs)" all over Pakistan.

Previously, Dr. Muhammad visited the Carbon Management and Sequestration Center (C-MASC), Ohio State University (OSU), USA as a Research Trainee under the very kind supervision of Professor Lal. This visit was sponsored by the Higher Education Commission (HEC) of Pakistan. During his stay at OSU, he conducted an experiment on assessing the GHGs mitigation potential of biochar in N-fertilized paddy soils.

AT AIOU, Dr. Muhammad is performing the following duties; delivering lectures on use of innovative technologies in agriculture, supervising M. Phil students, attending and delivering talks in various national and

international conferences/workshops/symposium as well as virtual events/webinars and conducting research experiments on the use of bioproducts in ag. sector.

Key interest areas of Dr. Shaukat are; Carbon Sequestration, Climate Change Impact Assessment, Cropping Systems Modeling, GHGs emission and Climate Smart Agriculture.

Dr. Muhammad Shaukat is looking forward to work with researchers/scientists/faculty of OSU on different aspects of climate change related research. He is wishing very best of luck to C-MASC's family for their more success in future. Dr. Muhammad will be happy to welcome to any member of C-MASC's family who has intension to visit Pakistan especially Islamabad.



Quarterly Viewpoint

FROM THE DESK OF RATTAN LAL

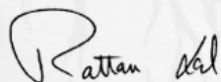
16 December 2021

Enhancing Awareness About the Importance of Soil to Addressing Global Issues

The year 2022 had two international events of global significance. United Nations Food System Summit (UNFSS) conducted numerous meetings over 18 months and involved thousands of scientists, farmer organizations and industry partners from around the world. It was concluded with the report presented by the Secretary General on 23rd September. UNFCCC -COP 26 was held after two years (COP-2020 meeting was not held because of the COVID pandemic) from 31st October to 12 November 2021. Both meeting discussed agriculture and soil during the side events and several meetings. There was a lot of focus on agroecology, regenerative agriculture, nature -positive agriculture etc. Numerous game- changing solutions were discussed in each of the five action tracks of the UNFSS. Discussions under Action Track 3 led to the creation and launch of the Coalition for Action on Soil Health (CA4SH). The initiative has received strong support from UN member nations and the private sector, and its activities are still ongoing.

Despite the discussions within the Action Tracks of UNFSS and several side events of COP26, the word “soil “did not appear in the official announcements of either of the two events. This omission is a challenge to soil scientists and agronomists on continuation and strengthening communication with all stake holders (i.e., the policy makers) regarding the awareness of the importance of soil to advancing the Sustainable Development Goals. There is a strong precedence of the launch of 4 per 1000(4pT) initiative at COP21 in Paris in 2015 and of the Adapting African Agriculture (AAA) in 2016 in Marrakesh and subsequent COPs. However, future COPs and UNFSSs must also emphasize the importance of soil and launch on the ground programs to translate science of soils into action. While a tremendous progress has been made, even bigger challenges lie ahead in convincing policy makers about the importance of soils. Indeed. Sustainable Development Goals can only be met if soils are part of the agenda and agriculture is part of the solution to addressing environmental issues.

Sincerely,



Rattan Lal
Distinguished University Professor of Soil Science, SENR
Director, CFAES Dr. Rattan Lal Carbon Management and Sequestration Center (C-MASC)
IICA Chair in Soil Science & Goodwill Ambassador for Sustainable Development Issues
Adjunct Professor at the University of Iceland and the Indian Agricultural Research Institute (IARI)



Sia Chitnis

By *Sia Chitnis*

My name is Sia Chitnis and I am excited to announce that I will be continuing my research with soil genetics at Cornell University! I will be studying biological engineering.

This past summer I interned at the Dr. Rattan Lal Center for Carbon Management and Sequestration with lab manager, Kyle Sklenka. My journey began because of the welcoming



Microbiology), Dr. Sunghun Park (Kansas State).

Biological engineering will help

community that has embraced me— Dr. Rattan Lal, Dr. Rien van Genuchten (HYDRUS-1D), Dr. Mary Beth Kirkham (Kansas State), Dr. Catherine R e a r d o n and Dr. Kristin Trippe (USDA Soil

me create one of the most needed disruptive technologies that I can foresee, and that is a soil-genetics interdisciplinary approach to prevent the coming drought, building the future. My goal is to create a device that takes soil genetics, genetically modified acetobacter bacteria's acetobacter xylum gene to increase cellular production, and turns it into disruptive technology. With soil genetics and inserting this device into soil, a change in our direction, we can reduce the catastrophes that await us.

Martha E. Jiménez-Castañeda

By *Martha E. Jiménez-Castañeda*

On January 3, 2022, Dr. Martha E. Jimenez-Castaneda will join C-MASC at The Ohio State University as a Research Scientist. She is a biogeochemist interested in the origin and stabilization of soil nutrients, primarily organic carbon. Martha comes to C-MASC from Purdue University, where she worked as a Postdoctoral Research Associate in the School of Earth, Atmospheric and Planetary Sciences and as a Senior Scientist in the Arequipa Nexus Institute, a partnership with Universidad Nacional de San Agustín, Peru. As a postdoc researcher, Martha investigated microbial necromass stabilization in agricultural soils and collaborated with the team developing portable soil health laboratories (known as Pacha Kit) to evaluate soil health parameters, including carbon transformation, nutrient cycling, and soil structure.

These kits can be distributed to diverse Peruvian stakeholders including land managers, NGOs, government agencies, and teaching faculty.

Dr. Jimenez-Castaneda's work includes the use of biomarker analysis to study the pathways and bioavailability of organic matter in extreme environments, and mapping pollutant plumes. Before joining Purdue University, Martha worked as an Assistant Professor of Sustainable Development in the National Polytechnic Institute (Mexico) and collaborated in



projects for the sustainable use of agricultural wastes in Mexico City. She earned her MSc in Natural Resources Management, with focus in Environmental Geophysics in Mexico (National Polytechnic Institute) and her Ph.D. in Environmental Biogeochemistry in the United Kingdom (The University of Manchester) integrating geochemical, microbiological, and mineralogical analyses to determine the role of organic matter in acid rock/mine drainage attenuation. As part of C-MASC, Martha will investigate the effect of soil organic matter on the productivity of soils of Latin America and the Caribbean.

Waseem Hassan



By Waseem Hassan

I am Waseem Hassan from Pakistan, serving the Government of the Punjab, Agriculture Department as a Scientific Officer (Soil Science) and Ph.D. scholar at the Institute of Soil & Environmental Sciences, University of Agricultural Faisalabad (UAF) on a departmental nomination basis. I am highly thankful to the Higher Education Commission (HEC), Pakistan for funding my visit and the Secretary, Government of the Punjab, Agriculture Department (parent department) for nominating me and granting NOC. I have been at CFAES, C-MASC as Exchange Visiting Ph.D. Scholar from August 3rd, 2021 to January 14th, 2022

under the supervision of Rattan Lal, Distinguished University Professor of Soil Science in the School of Environment and Natural Resources (SENR) and Director of the CFAES Dr. Rattan Lal Carbon Management and Sequestration Center (C-MASC). I am really pleased and honored to join the CMASC family - an unforgettable tenure for me. My work at C-MASC was of great relevance to soil health and climate change and to map and assess the spatial distribution of soil organic carbon (SOC) under different cropping patterns, agroecological zones of the Punjab-Pakistan. I not only

change. I have no words to appreciate Dr. Lal for his sincere help and guidelines. Very simply, I will say that every word from Dr. Lal is a world of knowledge. During this unusual period of COVID-19, I was confined to my apartment after attending University and could not go anywhere. However, I appreciate my Pakistani friends Pervez Azad, Imran Akram, Adnan Zafar and Dr. Maqsood (Columbus) who supported me a lot during my stay at Columbus. I also appreciate my cousins, Tariq Shafi (Cincinnati) and Dr. Faisal who continuously arranged my visits at their home for fun and food. I not only missed my

cute children Abdullah, Ayesha and Zainab, but also my beloved wife Nadia Manzoor (also Scientific Officer, (Soil Science)) for her delicious food dishes. I



participated and enjoyed many seminars, presentations, farm science reviews, and field visits, but I also received training from Dr. Lal on analytical techniques and scientific writing that improved my skills and level of understanding regarding soil carbon and climate

often chat with them to keep them from worrying. It was really an eye-opening visit that will not only boost my services to my parent department but also to my future professional career. I love the Rattan Lal-CMASC family; I love OSU.

“We are part of the earth and it is part of us. What befalls the earth befalls all the sons of the earth.”

- Chief Seattle, 1952

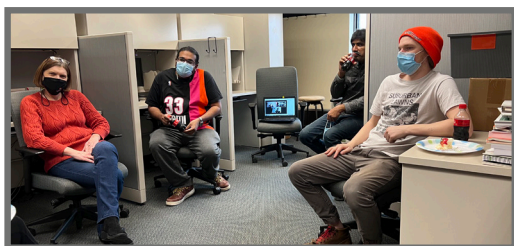
Maggie Willis

I am so pleased to have had the opportunity to work with all the talented people at the CFAES Rattan Lal Center for Carbon Management and



Sequestration for the last two years. The people at C-MASC truly form the heart of the Center: Dr. Lal himself, Klaus Lorenz, Kyle Sklenka; our PostDocs, Katy Bridges,

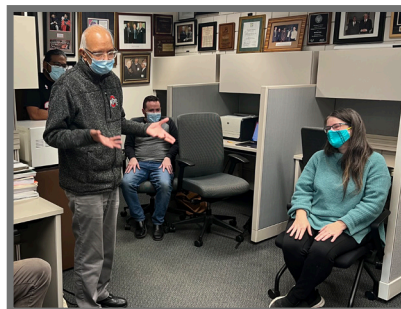
Srabani Das, Umesh Acharya; incoming Research Scientist ; the wonderful students that I have gotten to know, Nall Moonilall, Brittany Multer, Anna Kolganova, Patricia Cordero Irizarry, Henry Peller, Ellen Maas, Frank Clarke, Sunam Rustongi and Sia Chitnis, and, of course, Janelle Watts, Sergio Zarate Montes de Oca, and Joseph Helterbrand. I am blessed with many happy memories of chats and projects together. I will always cherish the bright perspectives and



can-do confidence of the Visiting Scholars that came to C-MASC in these last couple of years: Biswajit Das, Xiaodan Gao, Yingde Xu, Fengkui Qian, Nour el Houda Abed, Karabi Pathak, Hao Su, Mah-Noor Azad, Manjeet Kaur, Vladimir Ivezic, Gurmeet Singh Dheri, and Waseem Hassan. I'll treasure all the important lessons that I learned about our planet seeing the C-MASC Soil Seminars and learning about all of your research. Indeed, all of these colleagues have shown me much about incredible resilience in the face of difficult times: the COVID-19 Pandemic may have slightly slowed the mission of C-MASC, but it did not stop it, thanks

to the engine ignited by each person's passion to improve soil health and the health of our planet.

I was lucky to be a part of C-MASC during a time when the accomplishments of the Center were recognized on a global scale as Dr. Lal received the World Food Prize, the Arrell Global Food Innovation Award, and the Padma Shri of India, as well as support globally, from institutions like IICA, Fontagro, Syngenta, and Microsoft to further the mission of C-MASC. Along with the support of the Office of Research, Office of International Affairs, Extension, and Development, with colleagues like Dr. Gary Pierzynski, Dr. Jeff Sharp, Dr. Gil Latz, Dr. Barry Lyons, Dr. Jaqueline Wilkins, and Jason Phillips at home



to national support from Dr. Ranveer Chandra and team, Barbara Stinson and team, and Dr. Vern Long and team, and international support from Dr. Manuel Otero and Mr. Werthein and the IICA team, C-MASC has a solid foundation for success. I am so grateful to have been given a window into the important work of the C-MASC Working Groups, headed by Dr. Roger Williams, Dr. Scott Demyan, Dr. Sayeed Mehmood, and Dr. Steven Lyon.

And certainly, we are nothing without our "family" at home. I was so lucky to be a part of the larger SENR, CFAES, and University family here, with colleagues like (please forgive the alphabetical-by-first-name list) Alayna DiMartini, Amy Glaze, Becca Holt and all of IT, Dennis Wilt, Eric Hamilton, Fabrice Ligny, Gary Schickler, Hannah Bechtold, India Fuller, Jane Douglas,

Jera Oliver, Jill Toft, Kamal Uddin, Kim Keethler, Laurie Ward, Lori Kaser, Lynette Arner, Molly Bean, Molly Giammarco, Na'Tyra Green, Olivia Ameredes, Patrick Hollberry, Susan Dimit, Tara Weld, Taylor White, and last but not definitely, definitely not least, Trisha Taylor – and many more here at OSU and around the world! – who would often step in and give us the guidance and support we needed under last-minute conditions, and I cannot express how grateful I am to them for that.

When I first discussed with Dr. Lal moving to a part time position last May, because it was becoming clear that my family was needing more of my attention, he very kindly discussed the possibility where I might be able to stay in a part time capacity. Unfortunately, it did not work out in a way that would meet my family's needs or the needs of the center. So just as Dr. Lal has taught us the importance of respecting our planetary limits, I have learned that I need to start respecting the limits of a slightly more local sphere and move into part-time remote work as a tutor. I do hope to contribute as I can to C-MASC's mission in the future in my own smaller way. I hope to keep in touch with all the lovely people that I've met here. Please feel free to reach out to me at maggieawillis@gmail.com.

I'm deeply grateful for an amazing goodbye party, even under the difficult circumstances of COVID-19. Thank you again Trisha, Kyle, and Umesh for the lovely images in the article, and everyone who organized and came to the event. I know that even in the face of obstacles in the future, nothing can stop the C-MASC train.

C-MASC Recent Publications

Refereed Journal Articles

- Lal R. Fate of Soil Carbon Transported by Erosional Processes. *Applied Sciences*. 2022; 12(1):48. <https://doi.org/10.3390/app12010048>
- Lal, R. 2021. Soil Erosion and Gaseous Emissions. In Katra, Itzhak (Ed). *Soil Erosion: Dust Control and Sand Stabilization*. Applied Sciences and MDPI: Basel, Switzerland. <https://doi.org/10.3390/books978-3-03943-890-7>. ISBN 978-3-03943-889-1. (Reprint of 2020 #30)
- Lal, R., J. Bouma, E. Brevik, L. Dawson, D.J. Field, B. Glaser, R. Hatano, et al. 2021. Soils and Sustainable Development Goals of the United Nations: An International Union of Soil Sciences Perspective. *Geoderma Regional* 25, no. June 2021: e00398. <https://www.sciencedirect.com/science/article/pii/S2352009421000432>.
- Layek, J., Das, A., Ramkrushna, G. I., Krishnappa, R., Ghosh, P. K., Lal, R., Choudhury, B. U., Mohapatra, K. P., Babu, S., Yadav, G. S., & Dey, U. (2021). Managing rice fallow lands of the Eastern Indian Himalayas: Impacts of residue management and varietal interventions on soil properties, carbon stocks, and productivity. *Land Degradation & Development*, 1– 18. <https://doi.org/10.1002/ldr.4067>
- Yadav, G.S., A. Das, S. Babu, K.P. Mohapatra, R. Lal, and D. Rajkhowa. 2021. Potential of Conservation Tillage and Altered Land Configuration to Improve Soil Properties, Carbon Sequestration and Productivity of Maize Based Cropping System in Eastern Himalayas, India. *International Soil and Water Conservation Research*. <http://www.sciencedirect.com/science/article/pii/S2095633921000010>

Book Chapters

- Das, A., J. Layek, G.S. Yadav, R. Lal, S. Saha, et al. 2021. Managing Soil Organic Carbon in Croplands of the Eastern Himalayas, India. In: Lal, R., editor, *Soil Organic Matter and Feeding the Future: Environmental and Agronomic Impact*. 1st ed. CRC Press LLC, Boca Raton, Florida. p. 26
- Meena, R.S., S. Kumar, S. Sheoran, M.K. Jhariya, R. Bhatt, et al. 2021. Soil Organic Carbon Restoration in India: Programs, Policies, and Thrust Areas. In: Lal, R., editor, *Soil Organic Matter and Feeding the Future: Environmental and Agronomic Impacts*. 1st ed. CRC Press LLC, Boca Raton, Florida. p. 34
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- Lal, R. 2021. Educating Future Agricultural Scientists and Academicians in India. World Bank Employees of Indian Region in Washington. IIAG Advisory Group, Washington D.C., USA.
- Lal, R. 2021. Laureate Lounge. 18 October 2020. Borlaug Dialog. World Food Prize Foundation (WFPF), Des Moines, Iowa, USA. Panelist.
- Lal, R. 2021. Global Youth Institute: Roundtable Presentations. 18 October 2021. Borlaug Dialog Side Event. World Food Prize Foundation (WFPF), Des Moines, Iowa, USA. Panelist. Online.
- Lal, R. 2021. U.K. Consulate General Side Event. 19 October 2021. Borlaug Dialog. World Food Prize Foundation (WFPF), Des Moines, Iowa, USA. Online.
- Lal, R. 2021. Decarbonising the Agriculture Sector with Climate-Smart Innovation. 19 October 2021. British Consulate to the U.S. Borlaug Dialog Side Event. World Food Prize Foundation (WFPF), Des Moines, Iowa, USA. Online.
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- Lal, R. 2021. Nutrition & Climate Change: A Conversation with World Food Prize Laureates Rattan Lal and Shakuntala Haraksingh Thilsted--Implications for Feed the Future and Achieving the SDGs. 21 October 2021. USAID. Borlaug Dialog Side Event. World Food Prize Foundation (WFPF), Des Moines, Iowa, USA. <https://www.youtube.com/watch?v=Mm6XZEkrX7Q>
- Lal, R. 2021. Sistemas agroalimentarios en la región: los desafíos y acciones necesarias. 21 October 2021. Instituto Interamericano de Cooperación para la Agricultura (IICA). Borlaug Dialog Side Event. World Food Prize Foundation (WFPF), Des Moines, Iowa, USA.
- Lal, R. 2021. A food systems approach to transforming Africa's soil health: policy, science, implementation and impact 22 October 2021. International Fertilizer Development Center (IFDC). Borlaug Dialog Side Event. World Food Prize Foundation (WFPF), Des Moines, Iowa, USA.
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- Lal, R. 2021. Transforming India's Food Production Systems. 28 October 2021. Bio-Innovations for Regenerative Agriculture. Bio-Agri Input Producers Association. Hyderabad, India.
- Lal, R. 2021. Innovations in soil health monitoring for nature and people. 28 October 2021. From Research to Resilience Webinar Series. CGIAR Research Program on Water, Land and Ecosystems. Panelist. Online.
- Lal, R. 2021. Opening Remarks. MoU entre PepsiCo y el IICA: Ceremonia de firma virtual. 28 October 2021. Inter-American Institute for Cooperation on Agriculture (IICA), San Jose, Costa Rica. Online.
- Lal, R. 2021. Uniting the World to Tackle Climate Change: Perspectives from Religion and Politics. 29 October 2021. COP26 CSRP Scholars Conference. University of St. Andrews, Scotland, UK. Online.
- Lal, R. 2021. Returning Land to Nature by Sustainable Management of Soil and Agriculture. 30 October 2021. World Laureates Mobius Forum VII. The 4th World Laureates Forum: Lecture Channel WLF 4. Shanghai, China. Online.
- Lal, R. 2021. World Laureates Association Panel Session: Sustainable Food and Agriculture. 1 November 2021. World Laureates Association. Shanghai, China. Panelist. Online.
- Lal, R. 2021. Sustainable agriculture data: What's missing, what can be improved, and what needs validation? 2 November 2021. 50x2030 Soil Sessions: Strategizing to improve soil health data in agricultural surveys. 50x2030 Data-Smart Agriculture. Online.
- Lal, R. 2021. Launch of Living Soils of the Americas: Uruguay. 2 November 2021. Inter-American Institute for Cooperation on Agriculture (IICA), San Jose, Costa Rica. Online.
- Lal, R. 2021. From the Ground Up: Soil Health for Climate Change Mitigation, Resilience, and Food System Transformation. 3 November 2021. World Business Council for Sustainable Development. COP 26. Glasgow, Scotland, U.K. Online.
- Lal, R. 2021. Protecting, Restoring, and Managing the Fragile Living Skin of the Earth. Global Soil Health Programme. 8 November 2021. Badische Anilin und Soda Fabrik (BASF). COP26. Glasgow, Scotland, U.K. Online.
- Lal, R. 2021. Retink, Refresh, and Reimagine Agriculture in Africa Today for a Better Tomorrow. 9 November 2021. Symposium Special Session--the Soil-Plant-Human Nutrition Nexus in Africa. ASA, CSSA, SSSA International Annual Meeting A Creative Economy For Sustainable Development. Salt Lake City, Utah, USA.

Keynote and Panel Presentations

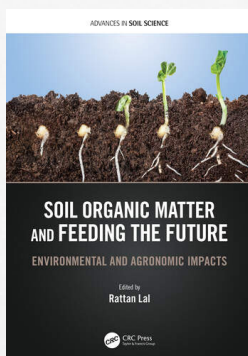
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- Lal, R. 2021. Masterful Conference: Protecting and recovering natural resources: ensuring food for future generations. 11 November 2021. Expo Agroalimentaria Guanajuato: "Transforming the future of Sector". Global Agri-Food Forum. Irapuato, Guanajuato, Mexico.
- Lal, R. 2021. Winter School: Circular Economy for the Sustainable Bio-based Products: from Waste to Soil. 16 November 2021. Department of Biotechnology, University of Verona. Verona, Italy.
- Lal, R. 2021. Greetings. 19. November 2021. President Kristina Johnson's Investiture Ceremony. The Ohio State University. Columbus, Ohio, USA.
- Lal, R. 2021. Improving Agriculture for India's Food and Nutritional Security. 24 November 2021. The 5th International Agronomy Congress on Agro-Innovations to Combat Food and Nutritional Challenges. PJSTAAAU, Rajendarnagar, Hyderabad, India.
- Lal, R. and Acharya, U. 2021. Carbon Accounting for Coffee-Based Farming Systems. 16 November 2021. World Coffee Research Webinars: Rethinking Coffee Carbon Accounting. Portland, Oregon, USA.
- Lal, R. 2021. Launch of Living Soils of the Americas: Brazil. 23 November 2021. Inter-American Institute for Cooperation on Agriculture (IICA), San Jose, Costa Rica. Online.
- Lal, R. 2021. Celebrating the Importance of Soil. IICA World Soil Day. 3 December 2021. Inter-American Institute for Cooperation on Agriculture (IICA), San Jose, Costa Rica. Online.
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- Lal, R. 2021. World Soil Day Commemoration. 3 November 2021. Mexico Department of Agriculture and Rural Development. Mexico City, Mexico.
- Lal, R. Bridging the Gap. 8 December 2021. The Climate Underground 2021. Carthage, Tennessee, USA.
- Lal, R. 2021. Restoring Soil Health for Strengthening Ecosystem Services. 13 December 2021. Webinar on Limiting the Global Warming and Adapting to Climate Changes in the Context of the "Glasgow Climate Pact" Stipulations. Moldovan Academy of Science. Chişinău, Moldova.
- Lal, R. 2021. Evaluation of seasonal effects of tillage and drainage management practices on soil physical properties and infiltration characteristics in a Silt-Loam soil. 15 December 2021. International Conference on Access to Recent Advances in Engineering and Digitalization. RDCONF: International Conference on Design, Research and Development. Nuh Naci Yazgan University, Kayseri, Turkey. Online.

Miscellaneous Publications

- Hodson, E., Niggli, U. Kitajima, K., Lal, R., Sadoff, C. 2021. Boost Nature Positive Production: A Paper on Action Track 3. A Paper from the Scientific Group of the UN Food Systems Summit. 18 July 2021. Rome, Italy.
- Lal, R. 2021. Evaluation of seasonal effects of tillage and drainage management practices on soil physical properties and infiltration characteristics in a Silt-Loam soil. 15 December 2021. International Conference on Access to Recent Advances in Engineering and Digitalization. RDCONF: International Conference on Design, Research and Development. Nuh Naci Yazgan University, Kayseri, Turkey.

Books Edited





Looking forward to a refreshing winter break and a safe, productive Spring 2022 Semester
Image courtesy The Ohio State University Signature Image Gallery

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Do you have contributions for our next newsletter?
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