



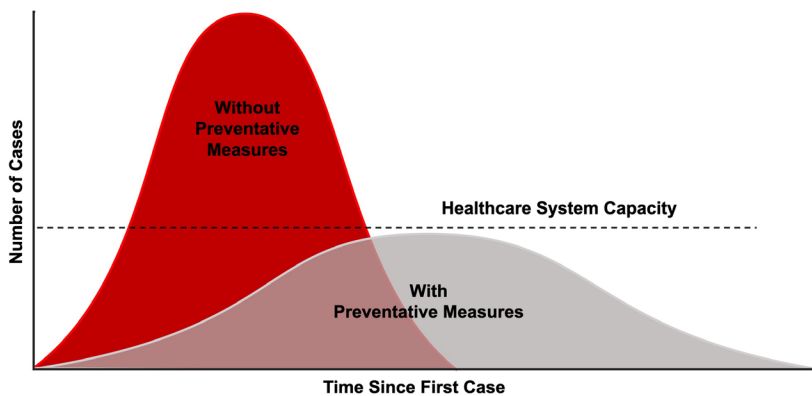
THE OHIO STATE
UNIVERSITY

April | 2020

CARBON MANAGEMENT AND SEQUESTRATION CENTER

C-MASC NEWSLETTER

Buckeyes Flatten the Curve!



On Thursday March 12th, the second day of Spring Break, much of the Ohio State University community woke up to a surprise. There were “only” three cases of the coronavirus COVID-19 identified in the state of Ohio, but OSU President Michael Drake, with the guidance and support of Governor Mike DeWine and Ohio Department of Health Director Amy Acton were taking it very seriously. Face-to-face classes were to be discontinued immediately through the end of March, many events through April were cancelled, and all foreign

travel suspended. This was just the beginning: within 7 days, life at OSU was completely upended. Every OSU campus - almost 50,000 people - was by and large moved online, except for the vital staff protecting lives in the Wexner Medical Center and a few other essential workers in other areas. Students were sent home for virtual classes for the rest of the semester, and Kottman Hall went quiet. Dr. Lal and the rest of (con't page 3)

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Spring has **Sprung**

A beautiful hellebore blooms in Kottman's front gardens, reminding us that even in uncertain times, life and hope bloom anew with the end of COVID-19.

Quarterly Viewpoint

FROM THE DESK OF RATTAN LAL

3 April 2020

COVID-19: The World is One Family

The Sanskrit phrase *Vasudhaiva Kutumbakam* (The World is One Family) is more relevant now than ever before. The virus pandemic has spread rapidly throughout the world in developed and developing countries, rich and poor nations, advanced and emerging economies, and among friends and foes alike. It is the formidable enemy of all of humanity, regardless of differences in race, language, culture, religion, ethnicity, gender and political ideology. Therefore, its effective and swift mitigation demands a united approach of helping one another, maintaining a strict code of social distancing, adopting high standards of hygiene and cleanliness, and taking care of others in need of help. We must salute and appreciate the services of health-giver professionals who are on the frontline of the World War against an invisible and a microscopic enemy of the human race.

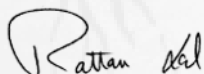
The global tragedy of COVID-19 necessitates a paradigm shift in the thinking of the scientific community towards addressing future research and education priorities. Obviously, international cooperation on issues of global significance is a high priority. The daunting challenge of the sustainable management of finite and fragile natural resources must be based on strong international cooperation. The global soil resource, and its management for food and nutritional security through adoption of nutrition-sensitive agriculture, is an example of the need for protecting and managing a precious resource, which must never be taken for granted. Not only should food be produced by using conservation-effective strategies of “producing more from less,” the waste must also be minimized.

The food waste, equivalent to one-third produced globally, may be exacerbated by COVID-19 because of unnecessary hoarding and panic buying. Wastage of prime soil, through degradation of its quality by indiscriminate and inappropriate use of inputs and by conversion to other land uses (rapid and ad-hoc urbanization), must be addressed by adopting the concept of the “Rights-of-Soil” and global soil protection policy.

The focus of the world community on COVID-19 will adversely affect the progress of the Sustainable Development Goals (SDGs) or the Agenda 2030. Yet, sustainable management of soil is essential to achieving SDG #2 (Zero Hunger), #3 (Good Health and Wellbeing), #4 (Clean Water and Sanitation), #13 (Climate Action) and #15 (Life on Land). The tragedy of COVID-19 has refocused the attention on restoration and management of soil health as stated in SDG #3 (Global Health and Wellbeing) and SDG #15 (Life on Land).

The general education curricula, at all levels (from primary school to the college and graduate level), must be revisited to enhance focus on the “One Health” concept: the health of soil, plants, animal, people and environment is one and indivisible. The need for soil protection also necessitates formulation and implementation of the “Soil Quality Act” to complement the two existing acts of US-EPA as Water Quality Act (1965) and Air Quality Act (1967).

Sincerely,



Rattan Lal

Distinguished University Professor of Soil Science, SENR

Director, Carbon Management and Sequestration Center

Past President, International Union of Soil Sciences

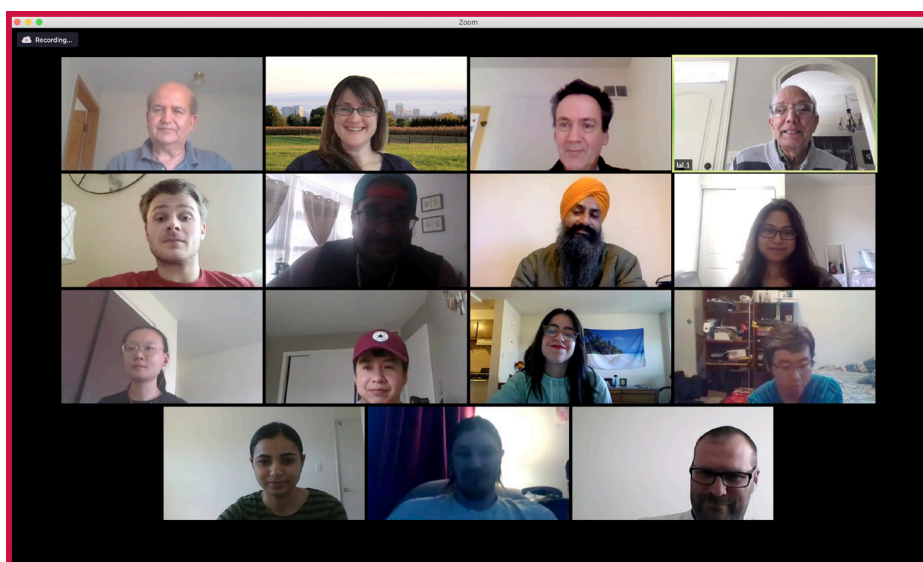


(con't from page 1) our C-MASC colleagues scrambled to shift all of our activities to online, through Zoom meetings for classes to an online weekly C-MASC seminar. Though we have all faced several challenges during these difficult times, it has been comforting to know that we are in this together. We have discovered that we can depend on the wonderful leadership from the faculty and staff at OSU and SENR guide us through this, and though there have been some bumps in the road, we can depend on each other to surmount obstacles in our way. Our hearts go out to the students and visiting scholars who may not be in the most comfortable position away from home, and we all hope that we will come out of this situation stronger and healthier.

OSU Moves Online to Protect Ohio

Columbus, Ohio, USA

April 3



C-MASC Seminar on Zoom Top row: Presenter José M^a Álvarez de la Puente, Maggie Willis, Klaus Lorenz, Rattan Lal. Second Row: Francis Clarke, Nall Moonilall, Gurmeet Singh Dheri, Karabi Pathak. Third Row: Hao Su, Yingde Xu, Patrícia Cordero Irizarry, Hengkang Zhao. Bottom Row: Manjeet Kaur, Kyle Sklenka, Vladmir Ivezic. Absent due to previous commitments: Ellen Maas, Mah-Noor Azad, Henry Peller.

Our colleagues at C-MASC have risen to the challenge of moving our entire program online to support the efforts of Governor Mike DeWine and ODH Director Amy Acton to prevent the spread of the dangerous COVID-19 virus through social distancing. We have enthusiastically embraced the benefits of Zoom and are enjoying attending Dr. Lal's ENR-5261 (Environmental Soil Physics) and ENR-5268 (Soil and Climate) classes via Zoom, in addition to the weekly C-MASC seminar. This still allows us to connect virtually with our friends from work and expands our learning opportunities even during these difficult times.



Dr. Lorenz presents a certificate to Dr. Lucchesi for his presentation at the weekly C-MASC Seminar

C-MASC Seminar

Columbus, Ohio, USA March 6

Dr. Antonio Corrêa Lucchesi came to Kottman Hall to speak about Agronomy & Sustainability: Environmental Aspects of Brazilian Agriculture. His informative and fascinating lecture engaged and educated everyone in attendance, and we are grateful that we could have him there.

Gurmeet Singh Dheri



I am Dr Gurmeet Singh Dheri, a Visiting Scholar from Punjab Agricultural University (PAU), Ludhiana, Punjab, India. It's a matter of privilege and a great honour to be part of the Carbon Management and Sequestration Center (C-MASC) and work

under the guidance of Dr Rattan Lal. My visit is sponsored under the National Agricultural Higher Education Project (NAHEP) and Centre of Advanced Agricultural Science and Technology (CAAST) funded by Indian Council of Agricultural Research (ICAR). I am working as a Soil Chemist at PAU handling the All India Coordinated Research project on Long-Term Fertilizer Experiment funded by ICAR.

My field of research at PAU is to understand the effect of long-term application of fertilizer and manure on soil quality, crop productivity and greenhouse gas (GHGs) emissions under maize/

rice-wheat system. I am working to quantify carbon (C) sequestration and GHGs emissions under different fertilizer, crop residue, tillage and irrigation regimes to identify low C emissions crop production technologies.

My research at C-MASC focuses on interactive effects of residue and N fertilizer application under different moisture regimes on GHG emissions. The study aims to understand how C:N ratio of residue and moisture regulate the emissions of GHG. I will also attend classes and seminars to get exposure on teaching and academic activities of C-MASC. I am delighted to work with Dr Lal and his team to acquire new knowledge and improve my analytical skills in the field of soil science.

Mah-Noor Azad

I am Mah-Noor Azad, a visiting scholar from PMAS-Arid Agriculture University in Rawalpindi, Pakistan. It is a great honor for me to work with Dr. Rattan Lal and to be a part of C-MASC. I received my bachelor's degree from the University of Azad Jammu and Kashmir in Muzafarabad, Pakistan, where I was supervised by Prof. Dr. Kaleem Abbasi. I became a Ph.D. under the supervision of Dr. Shahzada Sohail Ijaz at the PMAS-Arid Agriculture University in Rawalpindi, Pakistan. My research at C-MASC focuses on the loss of carbon fractions by soil erosion

under different cultivation practices in sub-mountainous areas. Most of the northern part of Punjab, Pakistan is sub-mountainous and faces a problem of soil erosion during the summer rainy season, where farmers leave the fields fallow during summer and uncovered and use conventional tillage for cultivation. I am also going to apply RUSLE model on the basis of my two-year research in that area which I already have completed there. I hope to attend classes and other academic activities to learn more about soil science and climate change at C-MASC, which is a big



challenge for world nowadays. I am here to work with new people to obtain new knowledge and learn from their cultures also.

Soil Science as well as of European Agroforestry Federation (EURAF).

Vladimir Ivezić

Dr.Sc. Vladimir Ivezić is a Fulbright Postdoctoral Researcher at C-MASC at The Ohio State University. He is currently working at the Faculty of Agrobiotechnical Sciences in Osijek, Croatia, where he is participating in teaching courses in agroforestry, soil science, and fertilization. His previous education consisted of a bachelor's degree in forestry from the Faculty of Forestry in Zagreb Croatia, a master's degree in Environmental Science and Policy from Central European

University in Budapest, Hungary, and a doctoral degree in soil science from Norwegian University of Life Sciences in Aas, Norway. His main interests are agroforestry systems and alley cropping. He is currently coordinating a project funded by the Croatian Science Foundation on the topic of intercropping of arable crops within walnut orchards. His research at C-MASC focuses on meta-analysis of organic matter in agroforestry systems. He is also a member of Croatian Society of



Soil Science as well as of European Agroforestry Federation (EURAF).



I am Manjeet Kaur, a Visiting Scholar at Carbon Management and Sequestration Centre (C-MASC). It's a great honour to be a member of C-MASC, taking part in discussions on the different aspects related to soil health and soil quality with Dr. Rattan Lal and his team. My proposed research at C-MASC is on the "Decomposition of organic residues and their effect on greenhouse gas emissions under various moisture regimes." I am really pleased to work with Dr. Rattan Lal, who has the most

innovative, hard-working, and humble personality.

I completed my master's in soil science at the Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India. I am a Ph.D. scholar in the Department of Soil Science at Punjab Agricultural University, Ludhiana, India, working on the "Quantification of greenhouse gas emissions under different management practices in rice-wheat systems," under the guidance of Dr. G.S. Dheri. In view of the suspected danger of climate change associated with increasing atmospheric concentration of GHGs (greenhouse gases), there is a need to develop certain inexpensive strategies to curtail GHG emissions from agricultural fields. Rice cultivation is often overlooked, even though it is prime source of GHG emissions. There is

Manjeet Kaur

a present need to develop accurate estimates of GHG emissions from rice-wheat cropping systems as a whole to suggest options or to develop suitable technology, not only for mitigating GHGs, but also for increasing crop productivity in a sustainable manner.

I am thankful to the "ICAR NAHEP-CAAST Project on Natural Resources Management for Sustainable Agriculture" and the Department of Soil Science, PAU Ludhiana, for giving me this opportunity. I hope working at this amazing and attractive institute C-MASC will be a great experience that will help to improve my knowledge and skills in the field of carbon sequestration and agricultural greenhouse gas emissions. I am grateful to the whole C-MASC team especially Dr. Rattan Lal and Maggie Wills for their cooperation.

Con“grad”ulations to Nour El Houda Abed

Nour El-Houda Abed was one of many visitors to the Carbon Management and Sequestration Center (C-MASC). Originally from Algiers, Algeria, she was an intern with the Borlaug Fellowship from August 25th, 2019 to November 22nd, 2019 under the supervision of Professor Rattan Lal. As a researcher at the National Institute of Agronomic Research of Algeria (INRAA), Dr. Abed's field of work is soil fertility, with a focus on her academic background as a microbiologist specializing in plant-microorganism interactions.

Thanks to her stay at C-MASC, she was able to complete her profile on soil fertility technically via pedological studies, but also with important moral implications, since she was also deepened her understanding of the impact of various fertilizers on climate change. Though her training at C-MASC was regrettably short, she essentially keeps the deep friendships and human warmth of all the people she met, especially the wisdom and humanity of Prof. Rattan Lal, whose merit stems from his passion and his fight against malnutrition in the world.

Nour, as she was called by all the team members, is now a Doctor. She defended her doctoral thesis on January 9th, 2020 in Algeria, addressing the question of the role of microorganisms in soil fertility. In addition, she has been nominated at INRAA as head of the department of planning and programming of scientific research and external relations. She hopes that C-MASC can be a solid partner to her institution in the field of soil fertility and climate change through cooperation and collaboration projects, which she hopes to concretize with the forthcoming visit of Prof. Lal Rattan to Algeria



HOW TO MAKE MHADJEB / MAHDJOUBA

Source: [Halal Home Cooking](#)

350 grams fine semolina
150 grams all-purpose flour (plain flour)
Pinch of salt
Water, as needed about 350ml
For dipping, shaping etc:
Oil, as needed

In a medium size bowl mix together semolina, flour and salt. Gradually add the water until it forms a wet sticky dough.

Continue kneading the dough for 10 minutes until you obtain a soft, slightly sticky to the touch dough. If your dough feels like it's drying out at any point during kneading, add a tablespoon at a time of wa-

ter until you achieve the desired consistency.

Grease a tray and your hands and have 1/2 cup oil to hand for dipping. Divide dough in to 10 balls - take medium handfuls of dough about 80g each and roll into balls, dip each in oil then place on tray.

Cover tray with cling flim that you've lightly drizzled with oil and allow to rest for 30 mins or until the filling has completely cooled.

Using your hands pat to flatten the dough. Carefully lift and gently stretch the dough one side at a time into a rectangular shape. Flatten any thick sides with your fingertips.

Fold the top side of the rectangle into the middle. Fold the side closest to you over the filling until it meets the already folded top side - in the middle. Repeat folding the left/right sides into a parcel.

Drizzle a little oil over the mhadjeb. While lifting and transferring to the metal tadjine, gently pull each side to stretch and make slightly bigger.

Cook: Place mhadjeb on pre-heated cooking surface, carefully (it's hot!) yet quickly, press out the surface to widen the mhadjeb slightly. Cook each mhajeb for a minute or two on both sides turning regularly, until lightly golden brown.



C-MASC Scholar Viewpoint

FROM THE DESK OF VLADIMIR IVEZIĆ

Agroforestry systems combine permanent wood species with agricultural crops on same parcel of land which results in a positive influence on soil fertility, diversity of production in one vegetation, biodiversity, protection against plant disease, pests and weeds, better use of nutrients and water in soil, as well as increased SOC compared to monoculture crop fields. The significance of intercropping is in the cultivation of plant species in systems that are less susceptible to different stress conditions. Furthermore, agroforestry has been recognized by the IPCC (2000) to have the greatest potential for C sequestration of all the land uses analyzed in the Land-Use Change and Forestry report.

In many parts of Europe, as well as in Croatia, farmers are switching from crop production to walnut or hazelnut production as they see it as more profitable. However, walnut orchards are usually planted in very wide alleys leaving enough space to continue with crop production in-between the rows of walnuts.

The aim of our research is to investigate the interaction between grafted walnuts and agricultural crops and their influence on microclimates and, consequently, on crop yields, soil biodiversity (microbiological activity in soil and nematode community structure), soil conservation, as well as on the occurrence of plant diseases.

The five-year long field trial is set up at two locations in eastern Croatia. Each field trial consists of three parcels: the control plot of agricultural crops without walnuts, walnut orchards with intercropped agricultural crops, and a permanent walnut orchard without intercropped agricultural crops. Microclimates are monitored at all locations as well as soil properties such as infiltration, SOC, soil compaction, microbial activity and nematodes. Based on the obtained results, a computer model will be created to predict the influence of intercropped walnut systems on the investigated parameters.

One of the challenges is to determine the influence of such systems on SOC stocks and C sequestration. In the initial stage, a meta-analysis investigating the world-wide influence of alley cropping on SOC will be conducted here at C-MASC.

This work was supported by the Croatian Science Foundation (UIP-05-2017 - *Intercropping of wood species and agricultural crops as an innovative approach in agroecosystems*) and Fulbright Association. Finally, I would like to express my gratitude to professor Lal who made all this possible.

Sincerely,

Dr. Vladimir Ivezić
Department of Agroecology and Environment Protection
Faculty of Agrobiotechnical Sciences Osijek, Croatia

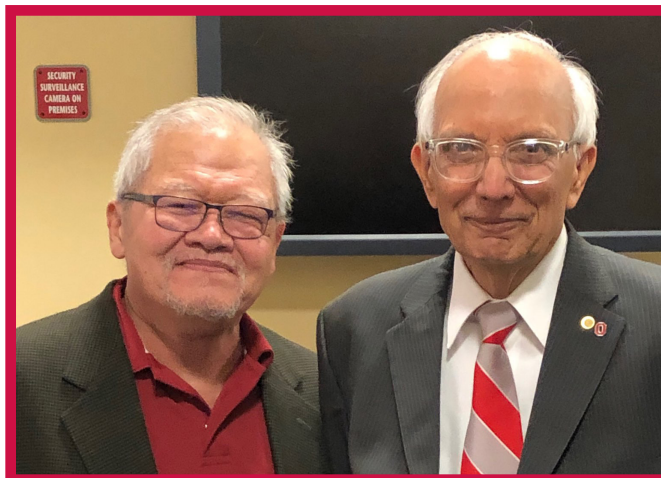


Washington State University: CAHNRS

Pullman, WA, USA

January 24

Invited by Professor William Pan, Professor Lal presented his lecture “Soil and Global Issues: Solutions Under Foot” at Washington State University’s College of Agricultural, Human, and Natural Resources weekly seminar series for the Department of Crops and Soil Sciences. The weekly seminars provide a vibrant forum of learning for WSU’s Soil Science 501 and Crop Science 510 students. Dr. Lal’s presentation is online here: <https://youtu.be/o8lZI8DE9Ao>



Dr. William Pan, President of the Soil Science Society of America, and Dr. Rattan Lal



Dr. Lal speaks to OSU Food and Technology students.

Parker Food Science Seminar

Columbus, OH, USA February 25

Dr. Lal enjoyed the invitation to speak next door at The Ohio State University’s Parker Food and Technology Building. He drove home the importance the use of good soil and mulch management practices and reduction of food waste to packed crowd.

26th Annual ICUS

Seoul, Korea

February 3-5

At the 26th Annual International Conference on the Unity of the Sciences, Dr. Lal presented “Enhancing Food Quality and Quantity by Managing Soil Health.” The theme of the conference was “Resolving Environmental Threats for the Benefit of Humanity.” The International Conference on the Unity of the Sciences (ICUS) is an interdisciplinary academic forum dedicated to examining the important issues confronting our contemporary world.



Dr. Lal presents to attendees of the International Conference on the Unity of the Sciences including Professor Mario Molina, Nobel Laureate (1995,) who sits on right.

UNCCD Science-Policy Interface

Bonn, Germany

February 17-20

Dr. Lal attended the Science-Policy Interface meeting for the United Nations Convention to Combat Desertification (UNCCD) in Bonn, Germany from the 17th to the 20th of February. The importance of these regular SPI meetings cannot be understated as this group of highly accomplished individuals promote dialogue between scientists and policy makers on desertification, land degradation and drought (DLDD). The UNCCD work to protect peoples around the world from the worst effects of land misuse and mismanagement, and they strive to address the most pressing land related issues of our time.



Attendees of the UNCCD Science-Policy Interface Meeting in Bonn, Germany (Dr. Lal in the back row fifth from the left)



Title frame of the film Living Soil

EFS: Living Soil

Columbus, OH, USA February 25

CFAES's Environmental Film Series showcased the film "Living Soil" directed by the Soil Health Institute (SHI), highlighting the importance soil has for "our economy, for food, fiber, biofuels, and our environment, too." Dr. Lal gave a short talk and lead a discussion with guest Frank Yoder about the important ecosystem services soil provides.

US-UK Scientific Forum

Washington D.C., USA

March 5-6

At the US-UK Scientific Forum on Sustainable Agriculture for the National Academy of the Sciences, Dr. Lal lead the panel for Managing Soil Carbon for Food and Climate, giving a lecture and guiding the discussion thereafter. The US-UK Scientific Forum broached a variety of themes on the topics food and climate, exploring the effect that climate will have on our food systems as well as discussing the ways that agriculture itself impacts biodiversity and environmental health. Dr. Lal's panel can be viewed online here: <https://youtu.be/uL5OIhgxWc>



Dr. Cynthia Rosenzweig (NASA/Columbus University) and Dr. Lal at the US-UK Scientific Forum on Sustainable Agriculture

Student Awards



Congratulations to C-MASC graduate students Nall Moonilall and Patricia Cordero Irizzary for winning scholarships from the Ohio Nursery and Landscape Association (ONLA)! The Phil Kozel Memorial Scholarship Program. Scholarships are based on merit and achievement and are available to college students majoring in landscape, nursery production, or related horticulture subject areas.



Left: Patricia Cordero Irizzary.. Photo credit Joshua Edmonds. Right: Nall Moonilall

Please enjoy the interview *Present and Future: Five Years into the International Decade of Soil Health* with Dr. Lal by Signi Llivingstone-Peters at the International Science Council.
<https://council.science/current/news/present-and-future-five-years-into-the-international-decade-of-soil-health/>

Quarterly Publications

Referred Journal Articles

- Meena, R.S., Kumar, S., Datta, R., Lal, R., Vijayakumar, V., Brtnický, M., Sharma, M., Yadav, G., Jhariya, M., Jangir, C., Pathan, S., Dokulilová, T., Pecina, V. & Marfo, T.D. 2020. Impact of Agrochemicals on Soil Microbiota and Management: A Review. *Land*, 9: 34. <https://doi.org/10.3390/land9020034>
- Fan, M., Lal, R., Zhang, H., Margenot, A.J., Wu, J., Wu, P., Zhang, L., Yao, J., Chen, F. & Gao, C. 2020. Variability and determinants of soil organic matter under different land uses and soil types in eastern China. *Soil and Tillage Research*, 198: 104544. <https://doi.org/10.1016/j.still.2019.104544>
- Qian, Spatiotemporal characteristics analysis of multifunctional cultivated land: a case of Shenyang, Northeast China
- R. K. Singh, R. S. Chaudhary, J. Somasundaram, N. K. Sinha, M. Mohanty, K. M. Hati, I. Rashmi, A. K. Patra, S. K. Chaudhari, & Rattan Lal. 2020. Soil and nutrients losses under different crop covers in vertisols of Central India. *Journal of Soils and Sediments*. (2020) 20:609-620.
- Meena, R.S., Lal, R., Yadav, G.S. 2020. Long-term impacts of topsoil depth and amendments on soil physical and hydrological properties of an Alfisol in central Ohio, USA. *Geoderma* 363 (2020): 114164
- Yadav, S.S., Guzman, J.G, Meena, R.S., Lal, R., Yadav, G.S. 2020. Long term crop management effects on soil organic carbon, structure, and water retention in a cropland soil in central Ohio, USA. *J. Plant. Nutr. Soil Sci.* 2020, 000: 1-8
- Lal, R. 2020. Soil Organic Matter Content and Crop Yield. *Journal of Soil and Water Conservation* 75 (2): 27A-32A
- Moonilall, N., Lal, R. 2020. Energy analysis for maize fields under different amendment applications in Guyana. *Journal of Cleaner Production*, 258 (2020) 120761. doi.org/10.1016/j.jclepro.2020.120761
- Waqas, MA, Li, Y, Lal, R, et al. When does nutrient management sequester more carbon in soils and produce high and stable grain yields in China? *Land Degrad Dev.* 2020; 1– 16.
- Zhao, X, Liu, B-Y, Liu, S-L, et al. Sustaining crop production in China's cropland by crop residue retention: A meta-analysis. *Land Degrad Dev.* 2020; 31: 694– 709

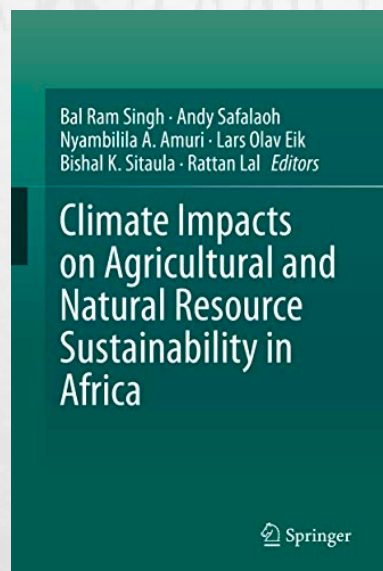
Book Chapters

- Sá, J.C.M., F. Tivet, R. Lal, A. O. Ferreira, C. Briedis. 2020. 7. Carbon management practices and benefits in Conservation Agriculture systems: Carbon sequestration rates. In *Advances in Conservation Agriculture, Volume 2: Practices and Benefits*. Amir Kassam (Ed). Burleigh Dodds.: 498 pp. ISBN-13: 9781786762689
- Sá, J.C.M., F. Tivet, R. Lal, A. O. Ferreira, C. Briedis. 2020. 8. Carbon management practices and benefits in Conservation Agriculture systems: soil organic carbon fraction losses and restoration. In *Advances in Conservation Agriculture, Volume 2: Practices and Benefits*. Amir Kassam (Ed). Burleigh Dodds.: 498 pp. ISBN-13: 9781786762689

Invited Keynote Speeches

- Lal, R. Managing Forests and Agriculture in Indonesia for Food and Climate. 11-12 December 2019. Jakarta, Indonesia.
- Lal, R. 2020. Advancing Sustainable Development Goals by Restoring Soil Health of India's Agroecosystems. 1-6 January, 2020. Bengaluru, India.
- Lal, R. 2020. Managing Soils for Food and Climate. Parker Food Science Seminar. 15th January, 2020. The Ohio State University, Columbus, OH, USA.
- Lal, R. 2020. Soil Health and Its Management. Linking Soil and Watershed Health to In-Field and Edge-of-Field Water Management. 23-24 January, 2020. West Virginia University, WV, USA.
- Lal, R. 2020. Soil and Global Issues: Solutions Under Foot. Department of Crop and Soil Sciences Seminars. 23 January, 2020. Washington State University, Pullman, WA, USA.
- Lal, R. 2020. Enhancing Food Quality and Quantity by Managing Soil Health. ICUS. 2-5th February, 2020. Seoul, Korea.
- Lal, R. 2020. Opportunities in Agriculture to ADAM of Climate Change. EPN Seminar on Living Soil. 25 February, 2020. The Ohio State University, Columbus, OH, USA.
- Lal, R. 2020. Soil Organic Carbon and Renewable Agriculture. UK-US Scientific Forum and Sustainable Agriculture. 5 March 2020. National Academies of the Sciences. Washington, D.C., USA.

Books Edited



Miscellaneous

- Lal, R. 2020. How Soil Can Save Humanity and the Planet. Farming First. 2 February 2020. <https://farmingfirst.org/2020/02/how-soil-can-save-humanity-and-the-planet/>
- J.L. Chotte, E. Aynekulu, A. Cowie, E. Campbell, P. Vlek, R. Lal, M. Kapović-Solomun, G. von Maltitz, G. Kust, N. Barger, R. Vargas and S. Gastrow. 2019. Realising the Carbon Benefits of Sustainable Land Management Practices: Guidelines for Estimation of Soil Organic Carbon in the Context of Land Degradation Neutrality Planning and Monitoring. A report of the Science-Policy Interface. United Nations Convention to Combat Desertification (UNCCD), Bonn, Germany.



Image courtesy The Ohio State University Signature Image Gallery

CONTACT INFORMATION

Do you have contributions for our next newsletter?
Please contact us!

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THE OHIO STATE UNIVERSITY