THE OHIO STATE UNIVERSITY

September | 2019
CARBON MANAGEMENT AND SEQUESTRATION CENTER

C-MASC NEWSLETTER

Fall Fever comes to The Ohio State University

Students, faculty, family, and friends alike stream onto The Ohio State University's campus to celebrate everyone's favorite fall colors: Scarlet and Gray. The sounds of fall echo through the famous Shoe as everyone cheers for their favorite Buckeyes and enjoys the taste of a juicy ballpark hotdog and refreshing beverage. The weather may be turning colder, but school spirit is just getting warmed up for the 2019-2020 academic year. Three cheers for sweater weather, coming holidays, warm cups of cocoa, fall, and O-H-I-O!

Background Photo by Gwen Ellioti; Inset by Marikathryn Bartosik Valenti

IN THIS ISSUE:

C-MASC Welcomes A New Program Coordinator

Maggie Weidner-Willis is excited to join the C-MASC team this fall. With a diverse background in languages, psychology and art, she hopes to bring her experience as a Production Assistant at Pixar on films like WALL•E to the C-MASC offices. She wants to do her part to protect the future of our fragile planet for all people, including her three-year-old twin boys and her husband.

Quarterly Viewpoint

FROM THE DESK OF RATTAN LAL

30 September 2019

Global Carbon Sink Capacity

There exists a strong interest among media and some industry regarding the amount of carbon (C) that can be sequestered in the soil, and what fraction of anthropogenic emissions (11 GtC for 2018) can be offset through soil C sink. There are at least as many answers to the question as are the number of "experts" willing to respond. Indeed, there are a lot more "myths" but fewer facts about this timely and critical question. Most of the available information shows that soil C sink capacity of managed ecosystems (e.g. croplands, grazing lands, mine lands) can offset about 15-20% of the anthropogenic emissions. Whereas this answer can be disappointing to some who have high hopes on this strategy, it can also raise the eyebrows of others who often argue that soil C sequestration is a "pie in the sky." Some recent publications show that total soil C sink capacity, based on the estimate of historic C loss through past land use and soil degradation processes, is 100-130 GtC. The technical potential rate of global C sequestration, if everything is done as it should be for site-specific biophysical and socio-economic conditions, is about 2.5 GtC/yr. Even if the actual rate of C sequestration is about 50% of the maximum, the historic C loss can be re-sequestered within a century.

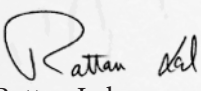
These simplistic and back-of-the-envelope calculations do not consider some other options of the terrestrial C sequestration. Notable among these are: 1) sequestration of inorganic C in soil, including formation of secondary carbonates and leaching of bicarbonates into the groundwater, and 2) C sequestration in biomass of trees and other perennial vegetation.

Whereas the terrestrial sequestration cannot offset the ever-increasing anthropogenic emissions from fossil fuel combustion and land use conversion (e.g., deforestation, drainage of wetlands), it is a critical strategy with numerous co-benefits. For instance, improvement in soil health is essential to advancing several Sustainable Development Goals (SDGs) of the U.N. In particular, SDG #2 (Zero Hunger), SDG #13 (Climate Action), and SDG # 15 (Life on Land) can only be realized if soil health is restored through sequestration of soil organic carbon.

Because only a small fraction of the anthropogenic emissions can be offset by soil C sequestration, humanity must also focus on decarbonization of the economy by developing non-carbon fuel sources (e.g., wind, solar, hydro, geo-thermal, nuclear, bio). By 2050, fossil fuels should be a minor contributor to the world's energy demand.

Thus, soil C sequestration is a bridge to the future. It buys humanity some time until the no-C fuel sources take effect. It is also a low-hanging, cost-effective, natural solution that lies underfoot, and is based on the power of soil. It is also a truly win-win-win option because it advances three critical SDGs.

Sincerely,



Rattan Lal,
Distinguished University Professor of Soil Science, SENR
Director, Carbon Management and Sequestration Center
Past President, International Union of Soil Sciences

International Decade of Soils 2015-2024

Farm Science Review

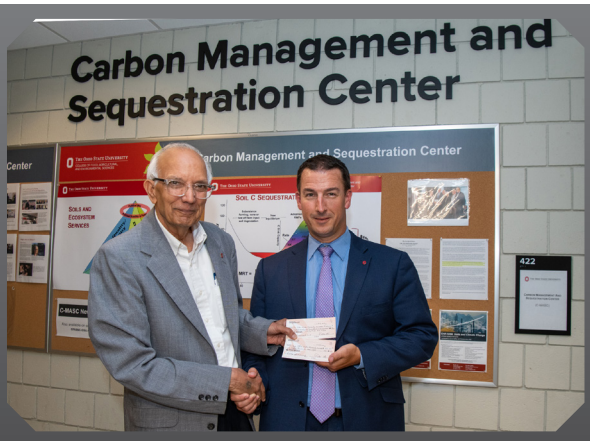
September 17

On September 17th, Dr. Lal and the C-MASC team went to the annual Farm Science Review at the Gwynne Conservation Area in London, Ohio. There they were treated to demonstrations of the latest farming techniques and technology, such as avoiding toxicity in warm-season forages and specially-designed erosion control mats. Attendees saw farm equipment of impressive size and learned at talks ranging from tax strategies and government policy for farmers to CRISPR gene editing in livestock. Dr. Lal and his students had a wonderful time mingling with great company and taking in all the latest in agriculture.

Counterclockwise from top: Dr Lal with C-MASC Students; Dr. Lal with Governor DeWine; CFEAS Dean Cathann Kress, Central State University Dean of CESTA Alton B. Johnson and Dr. Lal. *Photos by Jo McCulty*

Dr. Lal Donates the Japan Prize, the World Agricultural Prize, and the World Soil Prize to The Ohio State University

July 17

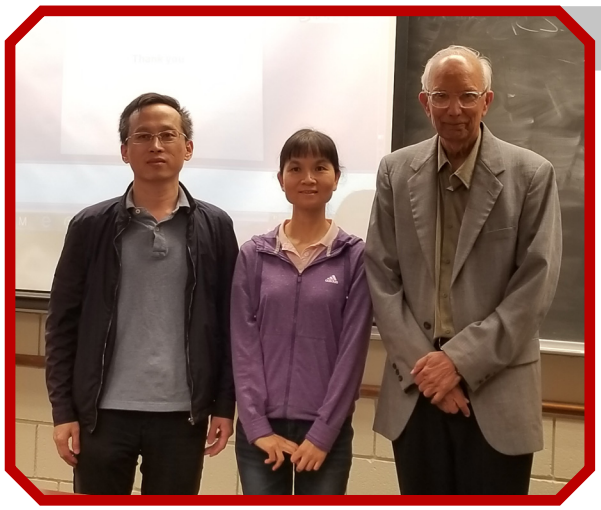


Mr. Keith DiDonato of Development received the checks.

Dr. Lal donated three awards back to the institution that gave him support as a burgeoning soil scientist when he arrived at Ohio State in 1965 as a graduate student dedicated to soil research.

In January 2019, Dr. Lal received the Japan Prize, known as the Nobel Prize in Japan for scientists who have made significant impact not only on their scientific field, but also to human society. He received the GCHERA World Agricultural Prize in China in October 2018. He also donated the honorarium of the Glinka World Soil Prize from FAO ($15,000) to the Endowment. Here he hands the three prizes, totalling $540,000, to CFAES's Chief Advancement Officer Keith DiDonato.

C-MASC Departures



Junjie Li

I am Junjie Li from China. I studied as a visiting scholar at the Carbon Management and Sequestration Center (C-MASC) from Aug. 14, 2018 to Aug. 29, 2019. My supervisor was Prof. Lal, and I successfully completed my studies at OSU under his supervision. It was my honor to study following his guidance. His diligence and serious attitude toward teaching and research impressed me deeply. I express my great gratitude to him for his help and guidance in my research work .

During my time at C-MASC, I enthusiastically attended many academic activities, such as seminars and presentations about my research. I also read many books and literature related to soil sciences, which were a big benefit for me to develop my new research proposal. I also attended several classes in soil science, such as "Environmental Soil Physics," "Soil and Climate" and so on, which contributed to my theories about and knowledge of soil science. In addition, I attended several classes related to American culture and history. It was a valuable opportunity for me to learn about America and improve my oral English as well.

In conclusion, I improved greatly in developing research designs, oral English and knowing about American culture. I thank Prof. Lal, the faculty and staff of C-MASC for your help during my study at OSU.

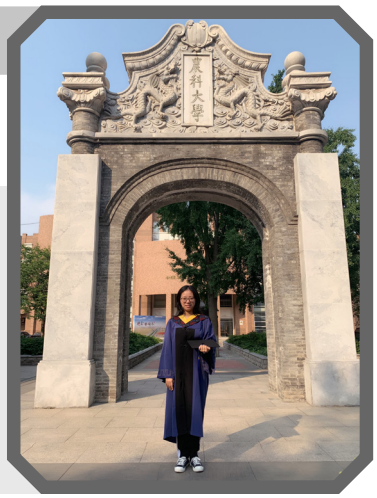
Abigail Henson

Abbey Henson dedicated the last three months to the C-MASC office, and we are all grateful for her poise, professionalism, and hard work during this transition. Thank you so much and we wish you all the best in your latest adventures.

Changqi Zhang

Con"Graduation!"

June 2019



I graduated from China Agricultural University (CAU) in June, 2019, and started working at a county environmental protection agency last week. I really appreciate the experiences studying at CAU and C-MASC, which made me grow a lot. For now, I am mainly responsible for coordinating work, listening to meetings and writing materials. It's a little busy work here, but I really enjoy it. I can learn many working skills and touch the first line of environmental protection. I hope the environment can be better everywhere in the near future.

C-MASC Arrivals

Photo by Joshua Edmonds

Patricia Cordero Irizarry

Growing up in Guayanilla, Puerto Rico, I was exposed to horticulture and natural resources from an early age. As I became more aware of my surroundings, I realized the gravity of the food safety issue in Puerto Rico and of the negative effects horticulture can have on the environment. I became profoundly concerned with this issue; it encouraged me to pursue an agricultural career and my first step was to obtain a bachelor's degree in Crop Protection at the University of Puerto Rico-Mayagüez Campus, as well as a minor in Professional and Practical Ethics.

Currently, I am a Master's Student in the Environment and Natural Resources Program, focusing on Soil Science at The Ohio State University. Mentored by Dr. Rattan Lal, my research is based on the effect that land management systems have on the soil organic carbon, soil structure and soil hydrology. As a member of the Carbon Management and Sequestration Center, I hope to learn how atmospheric carbon can be sequestered throughout perennial crop systems and how soil can be a warrior in the battle against climate change. I am also excited about meeting new people, learning about their stories and working together, as a team, to increase awareness of the importance of soils because life, as we know it, depends on them. Ultimately, I aspire to return to Puerto Rico and collaborate with the horticultural industry to implement sustainable and agroecological soil management practices that will enhance the environment's health and maximize farmers' yields. Along the way, I hope to empower others to reach their full potential, as well as to encourage them to become part of the solutions to the issues that threaten the planet's survival.

Nour El Houda Abed

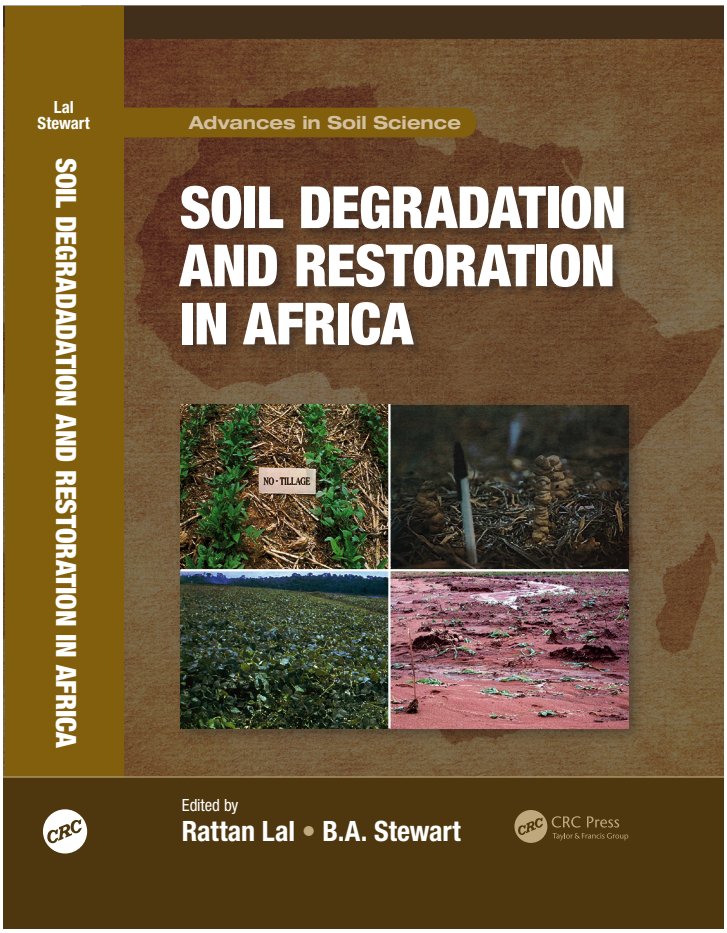
Coming from Algiers, Algeria, Nour El Houda Abed is a Borlaug Program trainee at the Carbon Management and Sequestration Center (C-MASC) laboratory under the supervision of Dr. Rattan Lal. Her training at C-MASC consists of comparing greenhouse gas emissions (GHGs) between organic and inorganic fertilizer, whether combined or not, to soybean leaves as cover crop. She earned her degree in Microbiology at the University of Algiers. Then she gained specialization in rhizobia-legumes symbiosis when she moved to the west of the country, in Oran, to get her Masters and PhD in Biotechnologies of Interaction Plant-Microorganism.

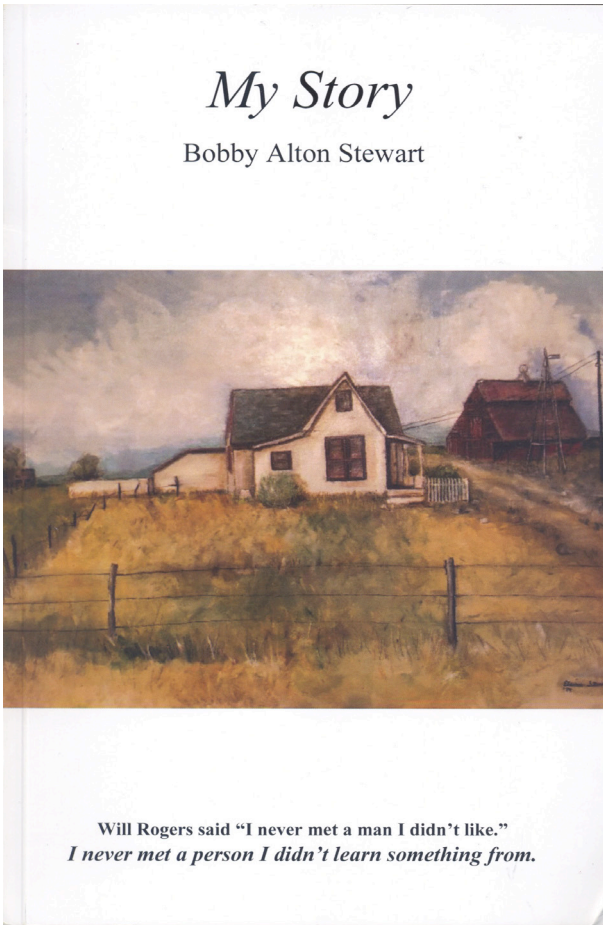
She is also a researcher at the National Institute of Agronomic Research of Algeria (INRAA), where she works as a microbiologist on yield and crop tolerance improvement of food legumes, involving rhizobial isolation from root nodules, as well as genetic and symbiotic characterization. Another aspect of her work consists of greenhouse vegetal production improvement by hydroponic systems using local soil substitute like pouzzolana, and date palm fiber or cork powder instead of imported peat and coco fiber. She looks forward continuing her work on GHGs and making a successful collaboration between C-MASC and INRAA.

Bobby Alton Stewart

Dr. Bobby Stewart has written "My Story," which vividly depicts his professional career that spanned over 65 years of very distinguished service to soil science professionally both domestically and internationally. He was President of the Soil Science Society of America in 1981, and he started the "Advances in Soil Science" series in 1984 with Springer. The series was continued later with Taylor and Francis. Dr. Stewart invited Rattan Lal to join him as a co-editor, and the new series with two editors has continued from 2010 through 2019. Dr. Stewart's contributions to improving "Dryland Agriculture" and sustainable management of soil water are pathbreaking and innovative.

Dr. Stewart suggests that his book may be accessed at the following link: **bastewart.jaloda.com/mystory.pdf**





C-MASC Scholar Viewpoint

FROM THE DESK OF FENGKUI QIAN

30 September 2019

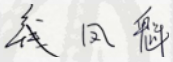
Basic Farmland Protection

Basic farmland is a scarce resource that provides a guarantee of food security for and stability of rural society. However, under the pressure of urbanization and industrialization, the decreasing quantity and declining quality of farmland has attracted attention from the government and scholars to implement strict policies and pursue in-depth research for solutions in China. The land evaluation and site assessment (LESA) system, widely tested and applied for farmland protection in the U.S., is introduced in Lingyuan County, Liaoning Province, Northeast China.

The LESA system, tested in Lingyuan County and comprised of land evaluation (LE) and site assessment (SA) subsystems, was established from soil factors suitable for agriculture use and site conditions factors compatible for other land uses. The ratio of 6:4 between LE and SA subsystems in Lingyuan County was calculated by model of coupling coordination degree, and represents its variability and flexibility for various decisions. The final LESA scores illustrated comprehensive characteristics of farmland from suitability and compatibility. Four farmland protection and utilization zones were grouped into the basic farmland zone, the potential basic farmland zone, the ecological restoration zone, and the construction reservation zone.

Therefore, the implementation of U.S. LESA system has proven to be more efficient and scientific in guaranteeing stability and permanence of farmland compared with ad hoc administrative interference in the basic farmland protection. This research was done at C-MASC, an amazing and attractive department with great achievements and honors awarded to its founder Professor Rattan Lal. I sincerely appreciate great help from Dr. Lal and all our colleagues.

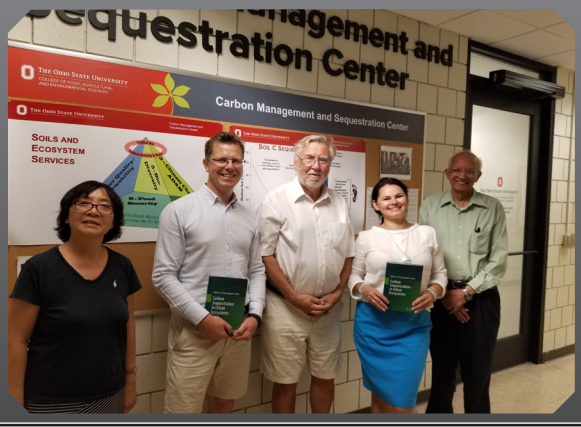
Sincerely,



Fengkui Qian
College of Land and Environment, Shenyang Agriculture University, Shenyang
National Engineering Laboratory for Efficient Utilization of Soil and Fertilizer Resources

C-MASC Visitors

August 6



Tuesday, 6 August 2019, Dr. Bill Mitsch and Dr. Li Zhang (formerly at Ohio State) stopped by to see Dr. Lal with some visitors from Poland, Dr. Edyta Kiedzyński and Dr. Marcin Kiedzyński. Dr. Lal presented our visitors with C-MASC T-shirts, padfolios, and signed copies of his book, Carbon Sequestration in Urban Ecosystems. The group posed for photos outside the C-MASC sign.

Where in the World is Dr. Lal?

Summer Commencement 2019

August 4

Soil scientist Rattan Lal, one of The Ohio State University's most decorated faculty researchers, addressed the university's summer graduates. Approximately 1,500 degrees were awarded at the summer commencement ceremony, which began at 2 p.m. on Sunday, Aug. 4., at the Jerome Schottenstein Center.

"I am pleased to welcome Distinguished University Professor Rattan Lal to speak at our 422nd commencement ceremony this summer," said President Michael V. Drake. "A world-renowned scholar and Buckeye alumnus, Dr. Lal has devoted his career to addressing some of the most pressing issues of our time, from food scarcity to climate change - scholarship that will uplift and inspire our graduates as they prepare to make their own mark on our world."

During the ceremony, the university also presented Distinguished Service Awards, recognizing individuals who have rendered exceptional service to the university, to Gifford Weary, professor emeritus and former chair of psychology and former divisional dean for Social and Behavioral Sciences, and posthumously to Richard A. Hollingsworth, who completed his 35-year Ohio State career as vice president for Student Life, retiring in 2009.

Dr. Lal was awarded the the Commencement Medal by President Michael Drake

Alumni Medalist Award

September 20

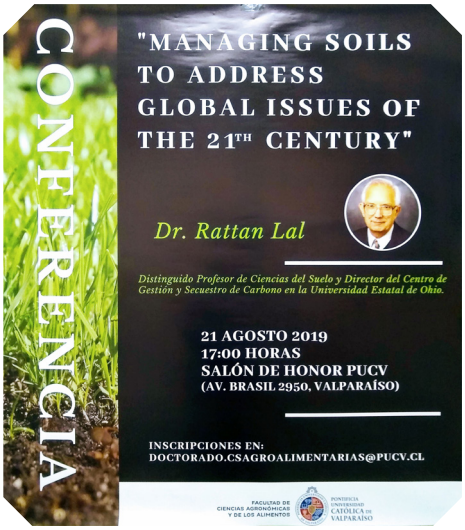
Rattan Lal, Ohio State Distinguished University Professor of Soil Science, has earned the 2019 Alumni Medalist Award for his revolutionary contributions to the understanding of earth's most basic, life-giving resources.

Lal, whose internationally recognized work spans five decades, foresaw potential negative effects of 1950s -and 60s-era agricultural methods, and sought to counteract them with conservation agriculture and no-till farming to enable crop growth without the soil disturbance. He also pioneered the concept of restoring soil by improving the concentration of its organic carbon, ultimately leading to the significant reduction of land necessary for cereal production. This work was described as "the most promising option to restore soil health, advance food and nutritional security, sustain production and improve the environment" by Lal's nominator, Jeff Sharp, director of Ohio State's School of Environment and Natural Resources.

Lal was recognized on Friday, Sept. 20, at the Fawcett Center during the program's 61st year of awarding graduates who have brought extraordinary honor to Ohio State.

Where in the World is Dr. Lal?

Honorary Degree in Chile *August 17 - August 24*



Professor Lal receiving an honorary degree from Rector Dr. Claudio Elontegui on 21st August 2019.

Dr. Lal received an honorary degree from Pontifical Catholic University in Valporaiso on the 21st of August. He presented two lectures at PUCV. The first lecture during the award ceremony on 21st August was entitled "Managing Soils to Address Global Issues of the 21st Century." This lecture was presented at the main campus of the university in the coastal city of Valparaiso. The second lecture was presented on the 22nd of August at the campus of the Escuela de Agronomia, La Palma, Quillota. The second lecture comprised of computing the carbon footprint of agricultural systems, examples of how to monitor the gaseous flux using a static chamber technique, and assess the rate of soil carbon sequestration.

The hosts, Dr. Ximena Besoain Canales and Dr. Eduardo Salgado, organized field tours of several plantations including vineyards, cherry, walnut, avocados, citrus, and kiwi. The field trip was also attended by several graduate students who took active part in the discussion (photo below right).

One of the major problems facing plantation agriculture in Chile is the drought stress. While the drip irrigation is widely used, the evaporation losses are high. Thus, adopting drip sub-irrigation (burying the pipe) and enhancing soil organic carbon content would minimize the risks of drought stress and also improve water use efficiency.

Prof. Lal also visited Her Excellency Carolina Schmidt Zaldivai, Minister of the Envionment and President of COP 25 to be held in Santiago, Chile in December 2019 (photo left). Prof. Lal will be a participant in COP 25.

Where in the World is Dr. Lal?

IUBS Centennial in Oslo, Norway *July 30-August 2*

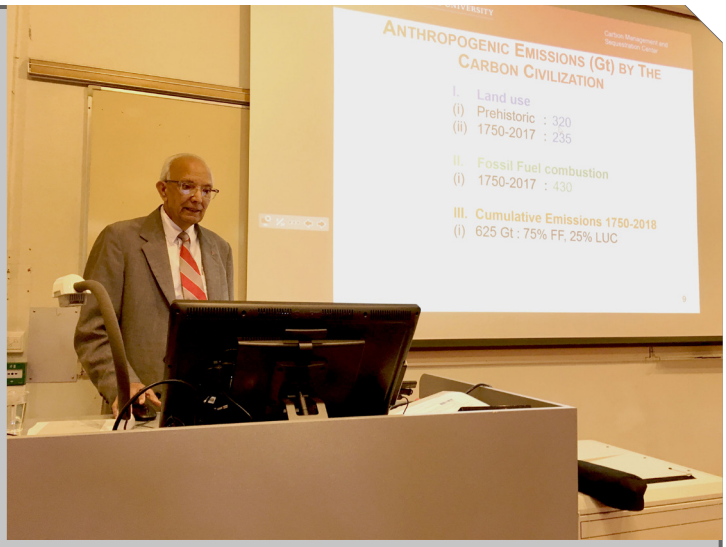
Professor Lal attended the centennial conference of IUBS held in Oslo. The two day event was held for the first day at the Norwegian Academy of Science and Letters and on the second day at the University of Oslo (30-31st of July). At the IUBS, Prof. Lal presented the theme of "Soil Science Education and Global Issues." The session was chaired by Prof. John Buckridge.

On the 1st and 2nd of August, Prof. Lal visited the Norwegian University of Life Sciences, Aas, Norway. There he met Prof. Bal Ram Singh (second from the left) and Prof. Oystein Johnsen, Prorector (third from the left).

At the University, Prof. Lal presented the seminar entitled "Rights of Soil" (below right). The seminar was attended by the faculty, staff, and students and chaired by Prof. Johnsen.

Prof. Lal was invited by the Norwegian Academy of Science and Letters for a one-day seminar on the theme of sustainable soil management and climate change. The title of Prof. Lal's presentation was "Carbon Storage in Soil in Relation to Climate Change" (below left). There were a total of four speakers: Prof. Van der Putten presented "Opportunities for Soil Sustainability in Europe." Dr. Ann Bardalen and Dr. Astrid Solvag Nesse were the other two speakers. The seminar concluded with the panel discussion. Panelists were Dr. Thomas Hartnik, Dr. Erling Aacs Eng, Dr. Oystein Johnsen, Dr. Anne Jortveit, and Dr. Solveig Skaugvoll Fosr. The moderator of the seminar was Mr. Rune Kibsgaard Sjohelle, who is a journalist.

Seminar at the Norwegian Academy of Science and Letter on the 23rd of September 2019.



Seminar at NMBU on the 1st of August 2019.

Where in the World is Dr. Lal?

Japan

August 30-September 5

Professor Lal was invited by the Japanese Society of Soil Sciences and Plant Nutrition to attend the annual conference held in Shizuoka, Japan. The visit started with participation in the special symposium organized by the Japan Science Council on the 2nd of September entitled "How Soils Can be Utilized for Sustainable Development Goals." The photo on the left depicts the poster for this symposium, and Prof. Lal is accompanied by Prof. Takashi Kosaki, the current president of IUSS. Four thematic presentations were followed by a panel discussion with questions from the audiences.

The annual conference of the JSSS+PN was attended by about 500 participants. The current President of the JSSS+PN, Dr. Ryusuke Hatano, is the the Chair of Division #1 of the IUSS. The seminar presented at the annual meeting of the JSSS+PN in Shizouka was entitled "Eco-Intensification of Agro-ecosystems for Food Security and Mitigation of Climate Change." The photo on the left shows Prof. Kosaki and Prof. Hatano in the background, and Prof. Inubushi and several of this colleagues and graduate students in the foreground. The event, organized on the 3rd of Septemember, began with the presentation of the awards to distinguished scientists from the JSSS+ PN. The afternoon session was followed by a banquet chaired by the mayor of Shizuoka.

Mr. Junichi Sato of Patagonia (in Japan) organized a panel discussion at the International House of Japan from 10am to 12 noon on the 2nd of September 2019. The discussions were moderated by Mr. Oose from the NHK (Japanese National Broadcast). In addition to Prof. Lal, panelists consisted of Mr. Hishinuma from MAFF, Prof. Inubushi, and Mr. Sato. The photo on the left includes panelists and some participants on the lawn of the International House.

Quarterly Publications

Upcoming Important Meetings and Conferences

1. The Climate Underground, Caney Fork Farm, Carthage, TN, 14-15 October, 2019
2. World Food Prize, Des Moines, IA, 15-18 October, 2019
3. AAA Board Meeting, Morocco, 4-5 November, 2019
4. Embracing the Digital Envrionment, ASA-CSSA-SSSA International Annual Meeting, San Antonio, TX, 10-13 November, 2019
5. COP 25, U.N. Climate Summit, Santiago, Chile, 1-17 December, 2019

Referred Journal Articles

- Anghinoni, G., Tormena, C.A., Lal, R., Zancanaro, L., Kappes, C. 2019. Enhancing soil physical quality and cotton yields through diversification of agricultural practices in central Brazil.Land Degradation & Development. 30(7): 788-798.
- Lal, R. 2019. Carbon Cycling in Global Drylands. Current Climate Change Reports. 5(3): 221-232.
- Lal, R. 2019. Rights of Soil. J. of Soil and Water Conserv. 74(4): 81A-86A.
- Liu, S.L., Wang, X., Ma, S.T., Zhao, X., Chen, F., Xiao, X.P., Lal, R., Zhang, H.L. 2019. Extreme stress threatened double rice production in Southern China during 1981-2010. Theoretical and Applied Climatology. 137(3-4): 1987-1996.
- Lorenz, K., Lal, R., Ehlers, K. 2019. Soil organic carbon stock as an indicator for monitoring land and soil degradation in relation to United Nations' Sustainable Development Goals. Land Degradation & Development. 30(7): 824-838.
- Meena, R.S., Kumar, S., Bohra, J.S., Lal, R. Yadav, G.S., Pandey, A. Response of alley cropping-grown sesame to lime and sulpher on yield and available nutrient status in an acidic soil of Eastern India. Energy, Ecology & Environment. 4(2): 65-74
- Yadav, G.S., Das, A., Lal, R., Babu, S., Datta, M., Meena, R.S., Patil, S.B., Singh, R. 2019. Impact of no-till and mulching on soil carbon sequestration under rice (Oryza sativa L.)-rapeseed (Brassica campestris L. var. rapeseed) cropping system in hilly agro-ecosystem of the Eastern Himalayas, India. Agriculture Ecosystems & Environment. 275:81-92.
- Yadav, G. S., Lal, R., Meena, R.S., Subhash, B., Anup, D., Bhowmik, S.N., Datta, M., Layak, J., Saha, P. 2019. Conservation tillage and nutrient management effects on productivity and soil carbon sequestration under double cropping of rice in north eastern region of India. Ecological Indicators. 105:303-315.
- Yadav, G.S., Lal, R., Meena, R.S. 2019. Long term effects of vehicular passages on soil carbon sequestration and carbon dioxide emission in a no-till corn-soybean rotation on a Crosby silt loam in Central Ohio, USA. J. Plant Nutr. Soil Sci. 182:126-136.

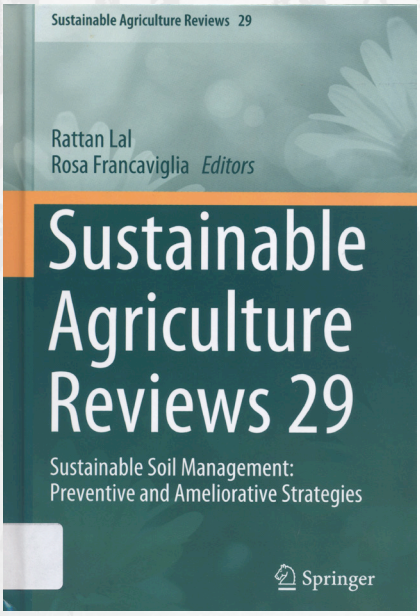
Invited Keynote Presentations

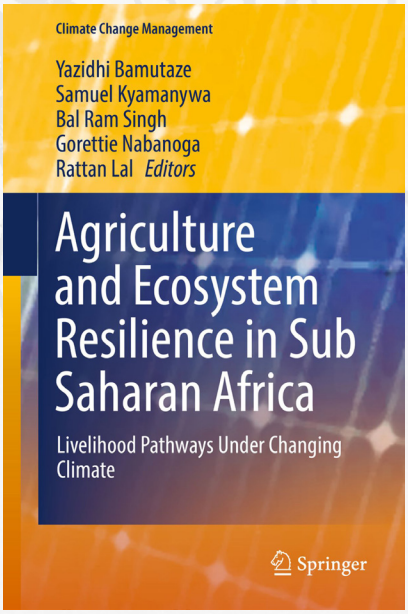
- Lal, R. 2019. Carbon Storage in Soil in Relation to Climate Change. Presentation at The Norwegian Academy of Science and Letters, 23rd September 2019, Oslo, Norway.
- Lal, R. 2019. Managing Soils for negative feedback to climate change and positive impact on food and nutrition security,. Annual meeting of the Japanese Society of Soil Science and Plant Nutrition, 3-5 September 2019, Shizuoka, Japan.
- Lal, R. 2019. Eco-intensification of agro-ecosystems for food security and mitigation of climate change. Presented at the Special Symposium. How the soils can be ultilized for Sustainable Development Goals, 2nd September 2019, Science Council of Japan. Tokyo Japan.

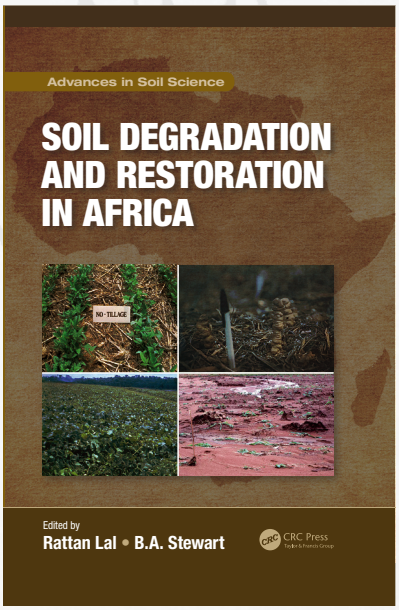
Invited Keynote Presentations (con't.)

- Lal, R. 2019. Managing Soils to Address Global Issues of the 21st Century. Presentation at the Faculty of Agronomic and Food Sciences, Pontifical Catholic University of Valparaìso, 21st August 2019, Quillota, Chile.
- Lal, R. 2019. Managing agricultural soils for global food and climate security international conference on equality. Natural Resources, Agriculture and Society in a Changing Climate, 17-19 August 2019, Kathmandu, Nepal.
- Lal, R. 2019. Summer Commencement Speech, 422nd Commencement The Ohio State University, 4th August 2019, Columbus, OH
- Lal, R. 2019. Managing Soil Carbon for Food and Climate. Presentation at NMBU, 1st August 2019, Ås, Norway.
- Lal, R. 2019. The Rights of Soil. Presentation at NMBU, Norwegian University of Life Sciences, 1st August 2019, Ås, Norway.
- Lal, R. 2019. Residue Management Plots in Ohio. Presentation at NC-1178 Committee Meeting, 25-26 July 2019, Fargo, South Dakota, USA.
- Lal, R. 2019. IUSS Activities in Soil-Climate Education. Presentation at IUBS Centennial Celebration, Norwegian Academy of Science and Letters, July 2019, Oslo, Norway.
- Lal, R. 2019. Soil Health and Food Security in Stark County. Presentation to the Hoover Foundation, 24th June, 2019, Canton, Ohio.

Books







CONTACT INFORMATION

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

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THE OHIO STATE UNIVERSITY