



THE OHIO STATE  
UNIVERSITY

CARBON MANAGEMENT AND SEQUESTRATION CENTER

# C-MASC NEWSLETTER

June | 2018



## IN THIS ISSUE:

Current Graduate Students .....	2
Where are They Now?.....	3
Visiting Scholars .....	4
PhilRice Visit .....	6
University of Costa Rica Visit ...	7
Prof. Lal's Travels .....	8
Dannon Workshop .....	9
Patagonia Visit .....	10
C-MASC Publications .....	11

## Spring Gathering

### OARDC, Wooster

On 31<sup>st</sup> March 2018, C-MASC visiting scholars and Prof. Lal attended the annual Spring Gathering Event at the OARDC campus, Wooster, OH. Photographed above (left to right) is Ms. Manman Fan (Nanjing University, China), Ms. Changqi Zhang (China Agricultural University, China), Prof. Rattan Lal, Dr. Bruce McPheron (Executive Vice President and Provost, OSU), Muhammad Shaukat (University of Agriculture, Faisalabad, Pakistan), Dr. Milson Serafim (IFMT/UFMT, Brazil), Mr. Jingtao Yao (China Agricultural University, China), and Dr. Zhenwei Song (Chinese Academy of Agricultural Sciences, China).



# Current Graduate Students

## Chloe Turner

In the Spring of 2018, Chloe Turner completed the Master's of Science program at the Ohio State University. Her coursework primarily consisted of soil science as a natural resource including carbon sequestration, soil development and pedology, nutrient recycling, ecology, restoration techniques and physics. She says it has been a great experience working with Dr. Lal and the CMASC unit.

Currently, post-program, Chloe is working on writing and submitting manuscripts based on her thesis research conducted in collaboration with the University

of Iceland and the Ohio State University. The thesis title was "Soil chemical properties dynamics in glacial moraines across a chronosequence: Breiðamerkurjökull outwash plane, Iceland." The research paper looks at the development of glacial soil in Iceland under the influence of with and without direct inputs from local colonies of seabirds.



## Steven Doyle

Steven Doyle is a Master's student in the School of the Environment and Natural Resources, specializing in soil science at The Ohio State University. At the beginning of his program in August 2016, Steven's graduate studies were funded by dual fellowships from the Ohio Agricultural Research and Development Center. His thesis research was funded by International Programs in Agriculture at OSU and focuses on "the relationships between cropping practices, soil quality, and maize yield on smallholder farms in the Morogoro Region of Tanzania." This study examined both the two-

way relationship between cropping practices and soil properties and the effects of soil quality on maize production. It concentrated on fields managed by smallholder farmers, utilizing locally appropriate inputs and management practices. Steven successfully defended his thesis on May 2<sup>nd</sup>, 2018 and will graduate in August 2018. He is currently completing internships with multiple agricultural development nonprofit organizations focused on Sub-Saharan Africa as he prepares to graduate. He is currently working in Washington, D.C.





# Where Are They Now?

## *Former C-MASC Students Share Their Current Work*



### **Patrick Bell**

Patrick is the Director of Research and Development (R&D) for One Acre Fund Kenya - a company serving more than 600,000 smallholder farmers throughout Eastern and Southern Africa. In this role, Patrick oversees a large R&D portfolio spanning; forestry, agriculture, solar lighting, livestock, health, program innovations, and monitoring and evaluation (M&E). Before starting at One Acre Fund, Patrick worked as a consultant to the World Agroforestry Centre (ICRAF), as a Program Manager for a USAID project in Tanzania, and served as a U.S. Borlaug Fellow in Global Food Security at Sokoine University of Agriculture (SUA) in Tanzania.

The International Program in Agriculture (IPA) of the College of Food, Agriculture, and Environmental Sciences sponsored four graduate students to conduct their thesis research at SUA, Morogoro, Tanzania: Pat Bell, Claire Sutton, Eric Stein and Steven Doyle.



### **Reed Johnson**

Reed completed his M.Sc. with C-MASC in 2016 and began work for the U.S.D.A. Natural Resources Conservation Service (NRCS) that fall. He is currently stationed in Morrow County, as a Soil Conservationist, but works with private land owners and farmers in Marion, Crawford, and Wyandot counties as well. He is nearing completion of the requirements to become a Certified Conservation Planner, an essential step in his goal of becoming a District Conservationist with NRCS, and has completed level 1 and 2 of the Ohio Department of Agriculture's Technician Development Program. As a Soil Conservationist, Reed administers federal conservation programs and provides technical assistance on a range of projects including wetland delineation, nutrient/soil management, and wildlife habitat establishment. Reed is passionate about enabling landowners to manage their property sustainably and describes the best aspect of his current work as being able to use his education and past experience to help the public address resource concerns.



# Visiting Scholars

## Muhammad Shaukat

University of Agriculture, Faisalabad, Pakistan



Photographed above, Muhammad Shaukat gives a presentation to a group at the “Climate Smart Agriculture and Crop Modeling” Conference.

Muhammad Shaukat participated in a two-day national conference on “Climate Smart Agriculture and Crop Modeling” organized by Department of Agronomy, The University of Agriculture Peshawar-Pakistan. Main goals of the conference were to:

- Address the emerging problems of climate change in Pakistan especially in Khyber Pakhtunkhwa.
- Explore possible actions to combat climate change
- Devise policies/strategies to implement the proposed actions in Khyber Pakhtunkhwa

He presented a very interesting talk on “Effects of Biochar addition and N fertilization on dynamics of greenhouse gases (GHGs) emission from paddy rice”. This experiment was conducted in greenhouse of Kottman Hall, The Ohio State University, USA. The major findings of my experiment were very impressive for the audiences. The stakeholders including farmers, extensionists, students, researchers and teachers appreciated his work and recommended to set up similar work in Pakistan.

At the end of conference, a number of comprehensive recommendations/possible actions, on the bases of results presented, were devised for provincial legislative body in order to implement proposed strategies to combat climate change impacts. The results from his study played a leading role to include biochar in possible recommendations as a climate smart intervention to promote sustainability in this agro-ecosystem. However, it was suggested that the potential impacts of all available biochars on soil health, crop productivity and GHGs emission in agro-climatic conditions of Pakistan would be assessed before recommending to the farmers. For this, a number of pilot projects would be designed to seek funding opportunities from various national and international organizations.

## Dr. V. Sejian

ICAR, Bangalore, India



Dr. V. Sejian, Senior Scientist, ICAR-National Institute of Animal Nutrition and Physiology, Bangalore, India has been recognized as one of the top 10 researchers in the field of Environmental Science in India. The award is given by career 360 organization. The award is given based on publications in peer reviewed international journals and Scopus citation index. Dr. Sejian was a visiting scholar to The Ohio State University and he is an active C-MASC Alumni.



Photographed above is a copy of the award certificate.





## Muhammad Azhar Completes PhD Degree

University of Agriculture, Faisalabad, Pakistan

Muhammad Azhar's PhD dissertation assessed the effect of biochar (cotton sticks biochar, wheat straw biochar, rice husk biochar), farm manure, poultry manure and press mud on cadmium (Cd) availability, uptake and translocation (root-shoot-grain) in wheat and subsequent rice plants. Cadmium is non-essential heavy metal toxic at very low concentrations. The Cd pollution is an emerging concern in many industrial areas, mainly where raw effluents are released from industries and cities. In Pakistan, these effluents are used to grow grain crops and vegetables despite some of these effluents having higher levels of metals such as Cd. The experiments were conducted in pot and field conditions. The field receiving raw city effluents from last thirty years in the suburbs of Multan city, Punjab Pakistan (Lat/Long 30° 14'59" N, 71° 23'36" E, 120 m above sea level) was selected for field trial. The organic amendments were applied at 2% w/w in pot experiment and 0.5% w/w in field trial. Overall, it was concluded that application of rice husk biochar and press mud resulted in lower Cd accumulation in both wheat and rice relative to other amendments due to higher cation exchange capacity, organic carbon

and silicon contents. These data indicate safe production of these crops from Cd contaminated soil. Muhammad says he remembers and acknowledges the golden time spent with C-MASC family during International research support initiative program (IRSIP) for six months being funded by Higher Education Commission, Pakistan. Finally, he will try his best to put innovative and positive share in science particularly in his specialized field.



*Photographed above, Muhammad Azhar presents his PhD dissertation at the University of Agriculture, Faisalabad.*





## Philippines Rice Research Institute

### Muñoz, Philippines

Kristine Samoy-Pascual was a Borlaug Fellow at C-MASC from September-December 2017. During her stay at C-MASC, Kristine conducted a factorial greenhouse experiment designed to assess the effects of biochar and water regime on emission of greenhouse gases (GHGs) under rice. The factorial experiment consisted of three water regimes (continuous flooding, intermittent irrigation and field capacity), two levels of biochar (with and without) and three replications. Gaseous emissions were measured on weekly basis for 12 weeks along with the monitoring of plant growth parameters. Therefore, Prof. Lal's visit to PhilRice was aimed at learning about the follow up in-field experiments being conducted in Muñoz by Eng. Kristine Pascual. While at PhilRice, Prof. Lal presented a seminar entitled "Managing Soil in the Warming World of 11 Billion," which was attended by scientists and students, as well as Dr. Floreliza H. Bordey, Deputy Executive Director of Research, and Dr. Karen T. Barroga, Deputy Executive Director for Development and Outreach. On 19th April 2018, Prof.

Lal and Kristine also met with Mr. Jeffery Albanese (Agricultural Attaché) and Mr. Perfecto G. Corpuz, the Agricultural Specialist at the U.S. Embassy in Manila to discuss the importance of the Borlaug Fellow program and the need for its continuation and strengthening. *(continued on next page...)*



*Photographed above is Kristine working on her field experiment, which is similar to the concept of the greenhouse study that she conducted at C-MASC.*



The modern 6-lane highway, from Manila to about two-third of the distance to Munoz, is impressive and has modern stops enroute. However, the country-road for the remaining one-third distance is more interesting from an agricultural perspective. The scenic road in the countryside passes through the “Rice Bowl” (Rice Belt) of the Philippines. This was the harvest season, with farmers harvesting rice either with the modern combine or manually. Despite the dry season, the flat terrain on which rice was being harvested indicated signs of water-logging, the drastic soil disturbance being caused by the machinery, and thus the potential of methane ( $\text{CH}_4$ ) and nitrous oxide ( $\text{N}_2\text{O}$ ) emissions even during the post-harvest (dry) period. The 2-lane countryside road, partly under construction using the cement (rather than asphalt), has wide berms on both sides. These berms are judiciously used to dry the paddy. The scenes of spreading rice, bagging rice, and even drying of mung bean pods are impressive and provide an enthusiastic “wow” trip through a natural “solar-drying systems of rice.” The rice straw harvested has numerous competing uses, and thus is taken away on small carts driven by a motorcycle.



## University of Costa Rica

### San Jose, Costa Rica

Cristina Chinchilla Soto was a Borlaug Fellow at C-MASC from January-March 2017, and researched the theme of “Soil carbon dynamics in tropical grasslands.” Prof. Lal visited Cristina at the University of Costa Rica 4-7 April 2018. He presented a seminar entitled “Managing soil carbon for food and climate” to students and faculty at the university, and visited the CICA Laboratories and Parrita Experiment Station. The experiment, at the planning stage, is designed to study the soil organic carbon dynamics and gaseous emission in relation to compost application from sugarcane bagasse.

The photo on the top right with Dr. Chinchilla Soto is at the entrance to the convention center of the university. Recycling of food and other waste is widely practiced in Costa Rica. The waste collection system (right) is a part of the facility at the Hotel Ave del Paraiso near the University of Costa Rica.



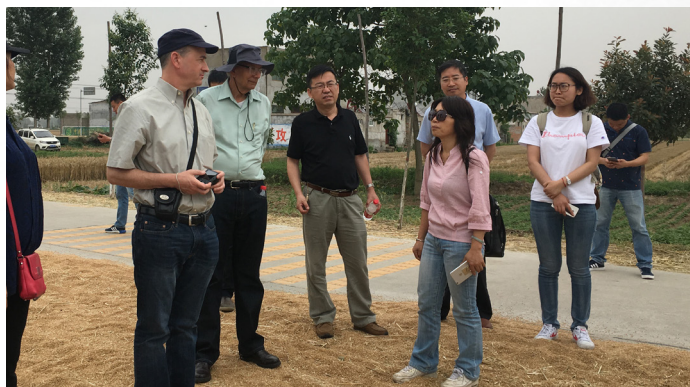


# Where in the World is Prof. Lal?

## Climate-Smart Staple Crop Production Project, World Bank

### China

Prof. Lal visited several field experimental sites in China in relation the Project “Climate-Smart Staple Crop Production Project” managed by the World Bank and funded by the Global Environment Facility (GEF). The project is sited in Yexian County, Henan Province; Hefei, Anhui Province; Hefei, Anhui Province; and Bengbu, Anhui Province. The visit in the end of May coincided with the wheat harvesting season. The bumper crop of wheat is dried along the roadside, in front of offices and shops and on the roof top. Prof. Lal (3rd from left) and Dr. Bill Sutton (2nd from left) visited several field sites from 29th May to 1st June. Others in the photo are Prof. Chen Fu (4th from left) and Jianwen Liu (1st from left) and Lin Xue (far right) of the Agriculture Ministry. Chen Yu Qiang (Cathy; in the foreground) was the interpreter. Improved management practices to be adopted include: conservation agriculture, soil-test based fertilizer management, and land leveling to improve irrigation efficiency. In the photo on the right, Prof. Lal and Dr. Weijian Zhang (Institute of Crop Sciences, CAAS) are discussing the no-till seeder developed in China.



## Charles Valentine Riley Memorial Lecture

### Washington, D.C.

The Charles Valentine Riley Memorial Lecture was presented by Dr. Alison Van Eenennaam (2nd from left) on 5th June 2018 at the AAAS auditorium in Washington, D.C. The lecture was entitled “Does Agriculture have a Parallel Science Problem.” The event was chaired by Mr. Rush D. Holt (CEO of AAAS), moderated by Lowell W. Randel (far left). Two panelists were Dr. Jay T. Akridge (1st from right, Provost at Purdue) and Prof. Rattan Lal.







# Dannon Workshop

Columbus, Ohio

On 3<sup>rd</sup> May 2018, C-MASC hosted a soil sampling and C monitoring workshop with representatives from Dannon and Ecopractices. The goal of the workshop was to train staff in soil sampling for measurement and monitoring of soil carbon.

Topics included an overview of soil carbon sequestration (Rattan Lal), field sampling and measurements (Klaus Lorenz), rainfall simulator (Nall Moonilall), and modelling carbon sequestration (Ellen Maas).

Photographed (left to right): Rattan Lal, Kyle Sklenka, Nall Moonilall, David Ussiri, Jeff Sharp, Paul McVeigh (Dannon), Basant Rimal, Ryan Bergman (Dannon), Jenny Jensen (Ecopractices), John Harsch (Ecopractices), Ryan Sirolli

(Dannon), Matt Hughes, Klaus Lorenz, Laura Conover, and Kyle Lavetsky (Office of Advancement, CFAES).

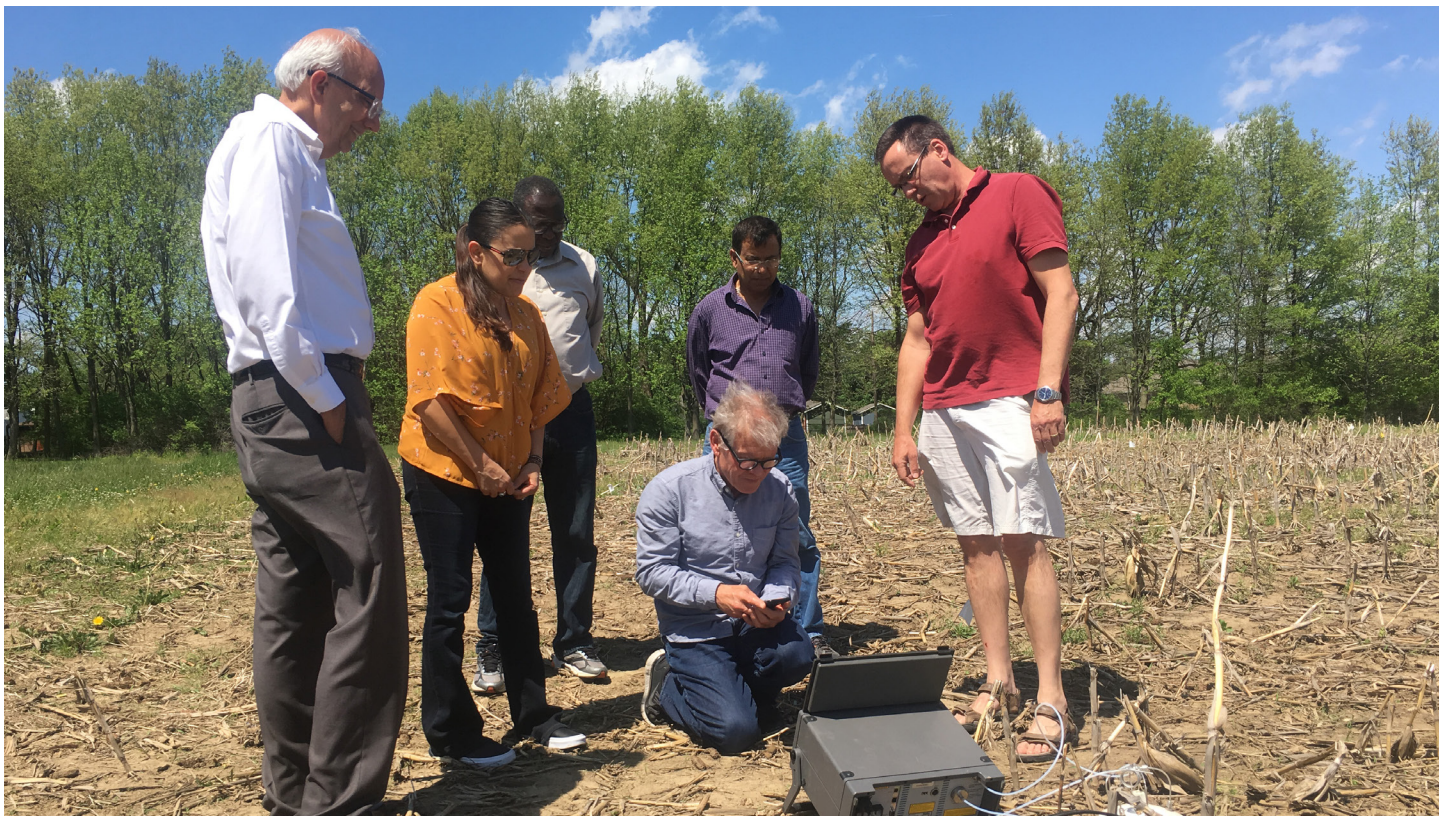
The Dannon Pledge is the company's commitment to a range of progressive practices focused on sustainable agriculture, transparency and naturality. DanoneWave will be advancing its soil health research program with the aim of the soil health initiative is to identify ways to regenerate soils, looking at enhancing organic matter and soil fertility with long-term benefits such as soil C sequestration, reduced chemicals use, soil water holding capacity, biodiversity and economic resilience of farmer communities. Key activities with participating growers, dairy farmers, and third-party soil health experts

will include soil sampling, review of yield, grower engagement, data collection and analysis, first reports and field days with farmers to provide training around soil health best practices.



*Photographed above, Dr. Lal presents on "Soil Carbon and Soil Health."*





## Patagonia Visit

Columbus, Ohio

Mr. Rick Ridgeway (Vice President, Public Engagement; above center) and Ms. Cara Chacon (Vice President, Social and Environmental Responsibility, second from left) of Patagonia visited C-MASC on 10<sup>th</sup> May 2018. The

objective of their visit was to familiarize with C-MASC research, education and outreach program. Prof. Lal and Mr. Ridgeway were panelists at a conference organized by the Dannon Company in Bonn, Germany under the auspices of

the COP23 (November 2018). The focus of this conference was soil carbon sequestration to improve soil health for food and climate.

## Faculty Recognition Reception

The Faculty Recognition Event was organized on 3<sup>rd</sup> April 2018 at the Faculty Club. President Michael Drake (far right) and Interim Senior Vice President for Research (far left) presented the awards to the OSU faculty. A total of 150 faculty members were recognized. Among attendees were members of President's Cabinet, deans, department Chairs, OAA Leadership, AAAS Fellows, and members of the awardee's family.





# C-MASC Quarterly Publications

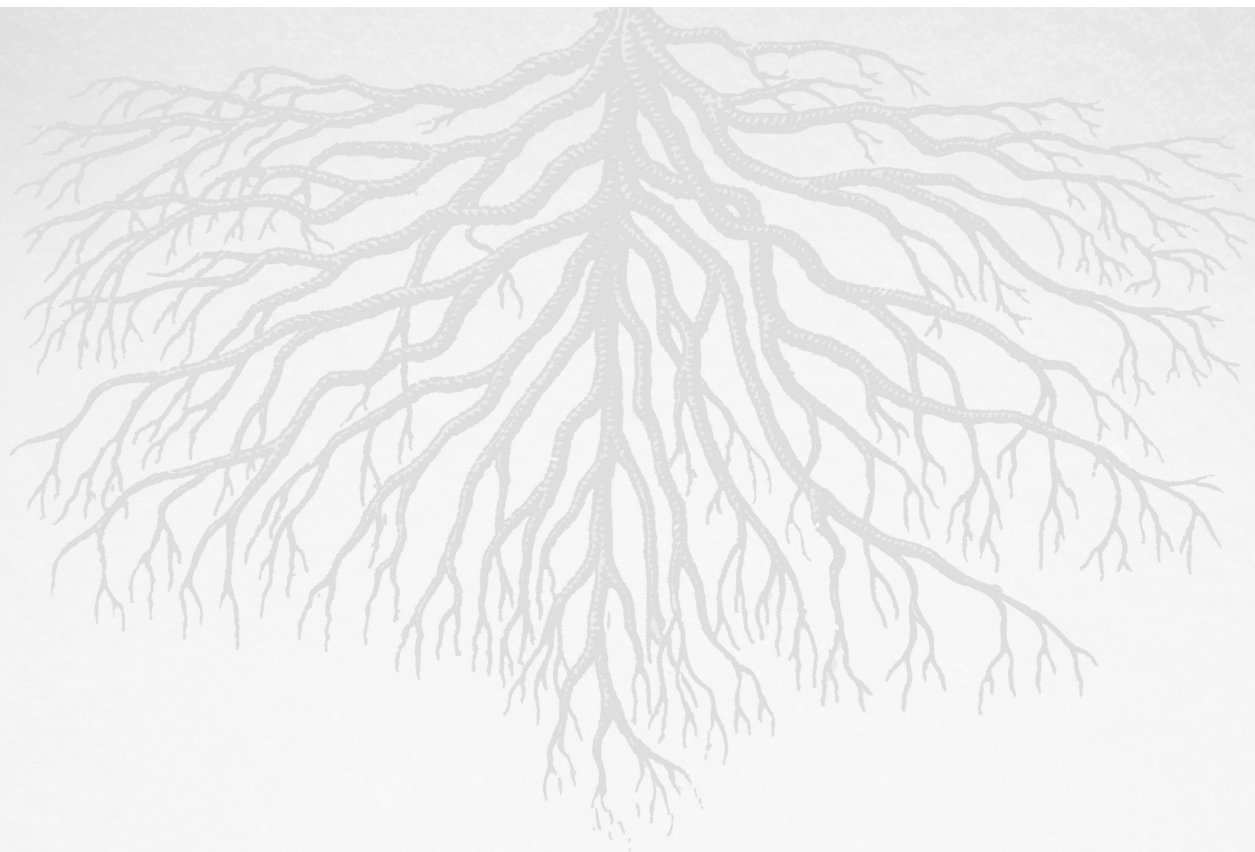
## Referred Journal Articles

- Alvarez, J.M., C. Pasian, R. Lal, R. López, M. Fernández. 2017. Vermicompost and biochar as substitutes of growing media in ornamental-plant production. *Journal of Applied Horticulture* 19(3):205-214.
- Brahma, B., K. Pathak, R. Lal, B. Kurmi, M. Das, P.C. Nath, A.J. Nath, A.K. Das. 2018. Ecosystem carbon sequestration through restoration of degraded lands in Northeast India. *Land Degradation & Development* 29:15-25.
- Cao, Q., H. Wang, Y. Li, Y. Zhang, G.S. Yadav, P. Zheng, R. Wang, R. Lal, X. Ge, J. Liu. 2018. The national distribution pattern and factors affecting heavy metals in sediments of water systems in China. *Soil and Sediment Contamination* 27:79-97.
- Hassan, A., R. Lal, S.S. Ijaz, A. Mehmood. 2018. Ecosystem carbon sustainability under different C-equivalence inputs and outputs in dry land. *Journal of the Serbian Chemical Society* 83:367-377.
- Hussain, M., S. Ahmad, S. Hussain, R. Lal, S. Ul-Allah. 2018. Rice in saline soils: physiology, biochemistry, genetics, and management. *Advances in Agronomy* 148:231-287.
- Lal, R. 2018. Digging Deeper: A Wholistic Perspective of Factors Affecting SOC Sequestration. *Global Change Biology*, 24(8) doi: 10.1111/gcb.14054
- Layek, J., A. Das, R.G. Idapuganti, D. Sarkar, A. Ghosh, S.T. Zodape, R. Lal, G.S. Yadav, A.S. Panwar, S. Ngachan, R.S. Meena. 2018. Seaweed extract as organic bio-stimulant improves productivity and quality of rice in eastern Himalayas. *Journal of Applied Phycology* 30:547-558
- Nath, A., R. Lal, G.W. Sileshi, A.K. Das. 2018. Managing India's small landholder farms for food security and achieving the "4 per Thousand" target. *Science of the Total Environment* 634:1024-1033.
- Somasundram, J., R. Lal, N.K. Sinha, R. Dalal, A. Chitrlekha, R.S. Chaudhary, A.K. Patra. 2018. Cracks and potholes in vertisols: Characteristics, occurrence and management. *Advance in Agronomy* 149:93-159.
- Yadav, G.S., A. Das, R. Lal, S. Babu, R.S. Meena, P. Saha, R. Singh, M. Datta. 2018. Energy budget and carbon footprint in a no-till and mulch based rice–mustard cropping system. *Journal of Cleaner Production* 191:144-157.
- Yadav, G.S., A. Das, R. Lal, S. Babu, R.S. Meena, S.B. Patil, P. Saha, M. Datta. 2018. Conservation tillage and mulching effects on the adaptive capacity of direct-seeded upland rice (*Oryza sativa* L.) to alleviate weed and moisture stresses in the North Eastern Himalayan Region of India. *Archives of Agronomy and Soil Science* 64:1254

## Keynote Presentations

- Lal, R. 2018. Soil carbon and climate change. Moonlight on the Marsh Lecture, 1st March 2018, Naples, Florida.
- Lal, R. Agriculture and the environment. IARI, 12th March 2018, New Delhi, India.
- Lal, R. 2018. Managing agricultural soils of Pakistan for food and climate. International 17th Congress of Soil Science, Soil Science Society of Pakistan, 13-15th March 2018, Faisalabad, Pakistan
- Lal, R. 2018. Soil degradation in India and the Positive Role of Plant Breeding. Rao Bahadur Dr. Ram Dhan Singh Memorial Lecture, HAU. 14th March 2018, Hisar, India
- Lal, R. 2018. Soil organic carbon and climate change. Maharishi Dayanand University, 14th March 2018, Rohtak, India
- Lal, R. 2018. Managing soil carbon for food and climate. University of Costa Rica, 5th April 2018, San Jose, Costa Rica.
- Lal, R. 2018. Soil health and India's agriculture. TAAS, 12th April 2018, New Delhi, India.
- Lal, R. 2018. Managing soils in the world of 11 billion people. PhilRice, 19th April 2018, Muñoz, Philippines
- Lal, R. 2018. Managing urban soils for food and environment. SUITMA 9, 22-26th May 2018, Moscow, Russia
- Lal, R. 2018. Measurements and monitoring of soil organic carbon stocks. 28th May 2018, Beijing, China.
- Lal, R. 2018. Historical evolution of agriculture and soil management in China. 30th May 2018, Hefei, Anhui Province, China.
- Lal, R. 2018. Soil-centric approach to advancing global food security. GIFS, 18th June 2018, Saskatoon, Canada.
- Lal, R. 2018. Soil organic carbon for climate, food, and other ecosystem services. French Embassy, 19th June 2018, Washington, D.C.





## CONTACT INFORMATION

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

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