



Carbon Management and Sequestration Center

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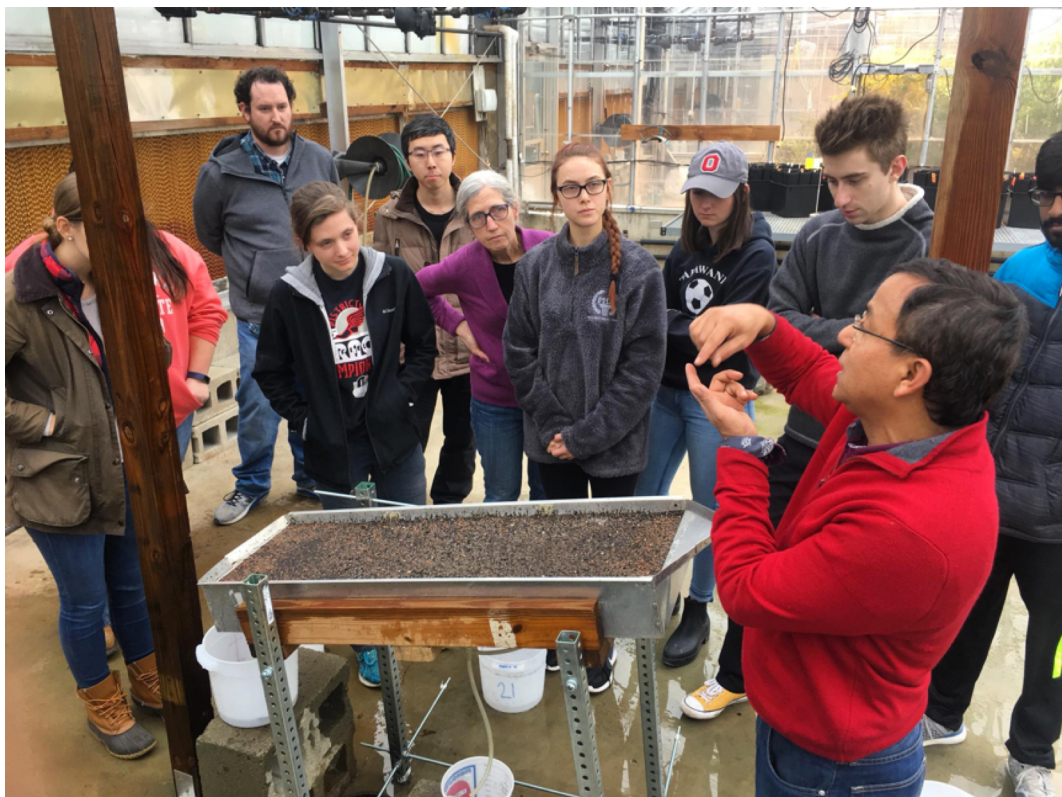


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Future Soil Scientists in the Making

The class of Environmental Soil Physics (ENR 5621) in Spring Semester 2018 is watching the rainfall simulation test in a greenhouse. Factors affecting soil erodibility (e.g., texture, structure, mineralogy, soil organic matter content) can be assessed by using a rainfall simulator. Students enrolled in ENR 5621 learn how to evaluate soil structure by using different methods: water, stable aggregates, mean weight diameter (MWD), geometric mean diameter (GMD), aggregate strength, infiltration rate, and erodibility as determined by the rainfall simulation test. The test is being demonstrated by Mr. Basant Rimal.

A snowy scene of OSU campus and downtown Columbus from the fourth floor of Kottman Hall. Since January, there has been a snowfall accumulation of ~18 inches (45 cm). However, a record high temperature of 77°F (25°C) was reached on 20th February.





Visiting Scholars



CHANGQI ZHANG

Master graduate student
China Agricultural University
Beijing, China



Changqi Zhang is a master graduate student of China Agricultural University, and she joined the C-MASC as a visiting student from March 1st, 2018 for one year. Zhang majors in environmental science, and her domestic research is about 'effects of fertilization and irrigation measures on nitrogen leaching and greenhouse vegetable production', which concentrates on how reduced fertilizer and water can impact the yield and environmental issues to provide support for optimized agricultural production under the condition of high input of resources in China current greenhouse vegetable cropping system. Changqi hopes to get a more comprehensive understanding of agriculture process and learn some optimized farmland management methods. She also prepares to conduct soil column experiment which has connection with her domestic experiment.

BORIS BOINCEAN

Head
Dept. Sustain. Farming Syst.
Selectia Res. Inst. of Field Crops
Alecu Russo
Balti State University, Moldova



Dr. Boris Boincean is the Head of the Department of Sustainable Farming Systems at the Selectia Research Institutes of Field Crops, and Chief Chair of Natural Sciences and Agroecology at Alecu Russo, Balti State University, Moldova. He joined C-MASC in August 2017 – February 2018, funded by a Fulbright Scholarship. During his time at C-MASC, he attended several conferences and extension activities. In January, Dr. Boincean was invited to give a presentation to school children about the importance of soil (photographed left). This was received with much enthusiasm.



Dr. Boincean spent six months writing a books about sustainable management of Chernozems and global warming. It discusses the challenges faced by modern and future agriculturalists in the Balti Steppe Region.



DEVIN SMITH

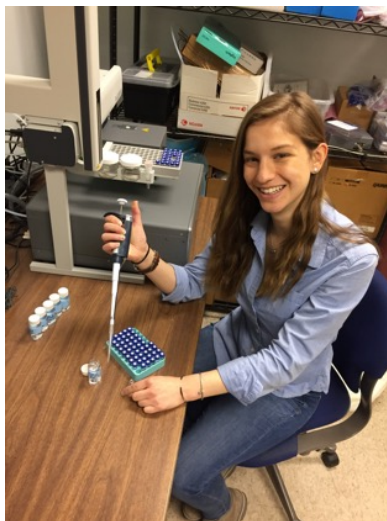
Master Graduate Student
Earth Sciences
The Ohio State University

NALL MOONILALL

PhD Student
C-MASC
The Ohio State University



Students



Devin Smith, a M.S student in Earth Sciences, is examining water cycling in the shallow subsurface at the Waterman Farm at The Ohio State University. Her research investigates the validity of the two water worlds hypothesis. She seeks to delineate water movement within the soil profile to determine whether this agricultural system is dominated by a conventional mixing model, (translatory flow) or if water is stratified into distinct pools within the subsurface (the two water worlds hypothesis). Using a combination of geochemical and soil hydraulic analyses Devin is tracking water through atmosphere, soil, vegetation systems. Her study relies on the usage of stable water isotopes $\delta^{18}\text{O}$ and δD to differentiate pools of water within the

subsurface. In combination with this technique, soil water moisture and soil water potential are continuously monitored to provide a comprehensive picture of subsurface water movement. Devin is advised by Dr. Anne Carey and is working with Dr. Rattan Lal, Dr. Michael Durand and Dr. Thomas Darrah, combining soil mechanics, geochemistry and hydrology, to delineate water cycling through the critical zone and advance scientific knowledge of green water cycling and usage.



Ph.D student and course (ENR 5261) teaching assistant, Nall Moonilall, took the students of the Environmental Soil Physics class out to the “field” to demonstrate one way to measure water infiltration. On the lawn in front of Kottman Hall the students learned about the Mini-Disk Portable Infiltrometer. They recorded some data that will be used to calculate infiltration rate, and inputted into a model to generate parameters like transmissivity, sorptivity, and the equilibrium infiltration rate or infiltrability.



C-MASC Visitors



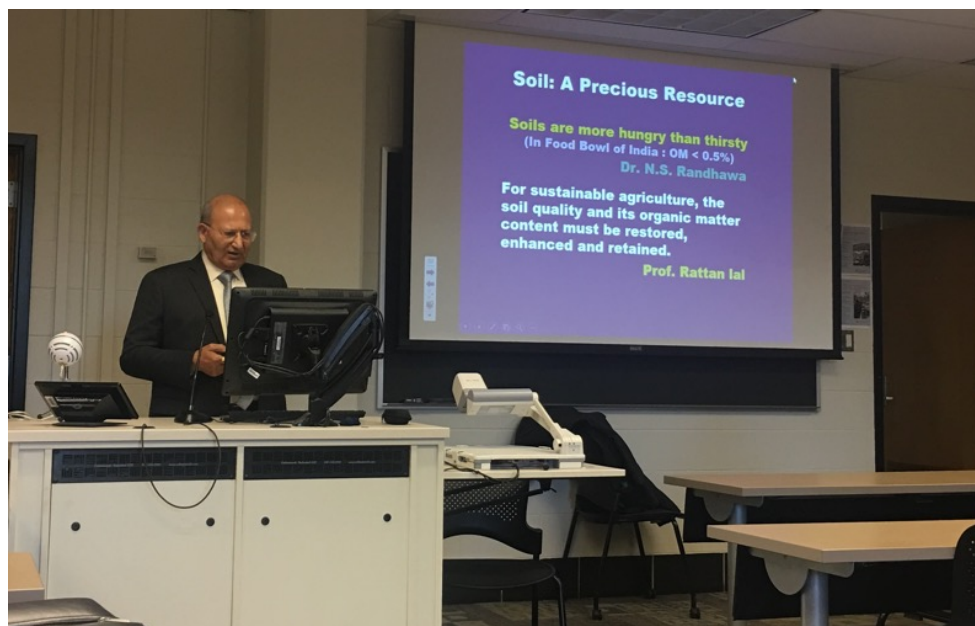
DR. RAJ PARODA

Former Director General, ICAR
Secretary DARE,
Government of India

The ICAR has played a pioneering role in ushering Green Revolution and subsequent developments in agriculture in India through its research and technology development that has enabled the country to increase the production of foodgrains by 5 times, horticultural crops by 9.5 times, fish by 12.5 times, milk 7.8 times and eggs 39 times since 1951 to 2014.



Dr. Paroda received an honorary degree from OSU in August 2000 (photographed above) presented by University President William E. Kirwan.



Dr. Raj Paroda, Former Director General, Indian Council of Agricultural Research (ICAR) and Secretary of the Department of Agricultural Research and Education (DARE), Government of India, visited C-MASC and SENR to present a lecture entitled "Addressing second generation challenges of the Green Revolution while managing natural resources and climate change" on 25th January 2018.

Being an eminent plant breeder, Dr. Paroda began his seminar with an emphasis on the importance of enhancing and sustaining soil health. The latter depends on a widespread adoption of the best management practices encompassing conservation agriculture, retention of crop residues as mulch, integrated nutrient management, and incorporation of a cover crop in the rotation cycle.

Photographed below (left to right): Dr. Mark Erbaugh, Dr. Linda Lobao, Dr. Bobby Moser, Dr. Cathy Rakowski, Dr. Raj Paroda, Dr. Veena Devi Ganeshan, Dr. Dave Hansen, and Dr. Rattan Lal.





Dr. TERUO HIGASHI

Prof. Emeritus of Soil Science
University of Tsukuba
Japan

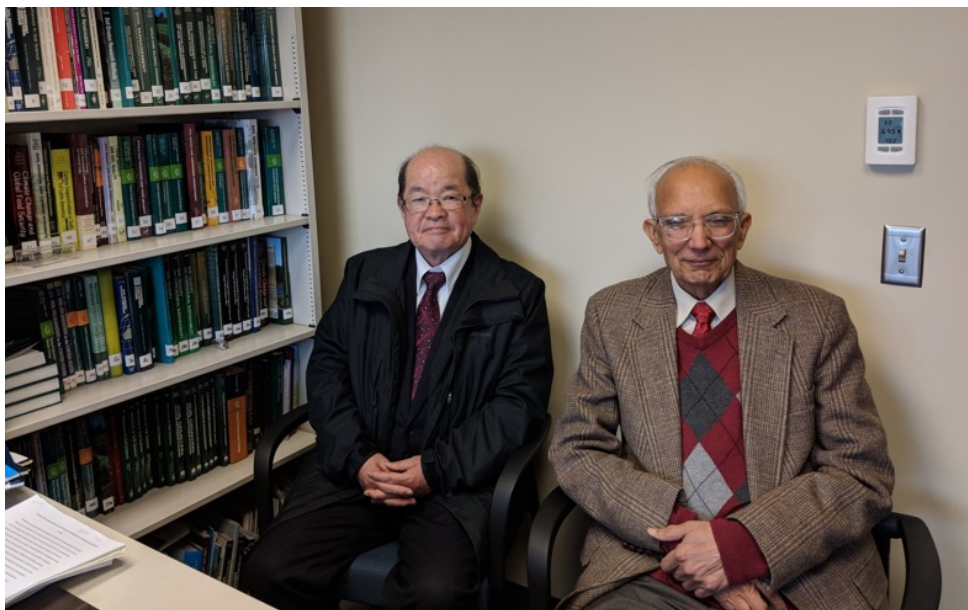
Significant Publications:

Golchin, A., J.A., Baldock, P. Clarke, T. Higashi, J.M. Oades. 1997. The effects of vegetation and burning on the chemical composition of soil organic matter of a volcanic ash soil as shown by ^{13}C NMR spectroscopy. II. Density fractions. *Geoderma* 76:175-192.

Wada, K., T. Higashi. 1976. The categories of aluminium- and iron-humus complexes in ando soils determined by selective dissolution. *European Journal of Soil Science* 27:357-368.

Higashi, T., F. De Coninck, F. Gelaude. 1981. Characterization of some spodic horizons of the Campine (Belgium) with dithionite-citrate, pyrophosphate and sodium hydroxide-tetraborate. *Geoderma* 25:131-142

C-MASC Visitors



Dr. Teruo Higashi visited C-MASC on 21st March 2018, while at Ohio State University as part of a delegation from University Tsukuba, Japan. He is a specially appointed Professor at the Office of Global Initiatives in charge of international relations (Campus-in-Campus Initiative), and Professor Emeritus of Soil Science in the department of Life and Environmental Sciences, University of Tsukuba.

Dr. Higashi has a BA in Agronomy from Kagoshima University, Japan (1973), MA in Agricultural Chemistry from Kyushu University, Japan (1975), MA in Science from the University of Ghent, Belgium, 1978, and PhD in Soil Science from Kyushu University, Japan (1982). Dr. Teruo Higashi has been Professor of Soil Science since January 1999 to 2015, and served as a Provost of Faculty of Life and Environmental Sciences, Univ. Tsukuba from April 2009 to March 2011. He served as a Vice President at the same university from April 2011 to March 2015, having been in-charge of 11 experimental schools including those with disabilities during the first half of the term, and of general affairs and personnel during the latter half. He retired in March 2015, and from April 2015 he was specially appointed as a professor in charge of international relations at the Office of Global Initiatives.

He specializes in soil chemistry and environmental soil chemistry, focusing on effects of global warming and acid deposition on forest soils. He published over 150 scientific papers and book chapters in well-known books and international journals with high impact factors. Total number of citations for published papers is over 1100 times at present, where several highly cited papers were published in *European Journal of Soil Science*, *Journal of Soil Biochemistry*, *Geoderma*, *Soil Science*, *Journal of Total Environments*, *Journal of Soil Science and Plant Nutrition*.



Some Relevant Publications:

Lal, R. 2014. The Nexus of Soil, Water and Waste. Lecture Series – No.1 Dresden: United national University Institute for Integrated Management of Material Fluxes and of Resources.” UNU-FLORES. 1-17 pp.

Lal, R. 2013. The nexus approach to managing water, soil and waste under changing climate and growing demands on natural resources. In UNU-FLORES “Advancing a nexus approach to the sustainable management of water, soil and waste: White Book.” UNU-FLORES, 19-40pp.



UNU-FLORES

5th Anniversary Meeting

7-9 February 2018, Dresden, Germany



Prof. Lal, Chair of the Advisory Committee, participated in the fifth anniversary of the United Nations University Institute for Integrated Management of Material Fluxes and Resources (UNU-FLORES). Photographed above (left to right) are: Dr. Wim Van Vierssen, Dr. Rattan Lal, Dr. Banci Mati, Dr. Reza Ardakanian, Dr. David Malone (Rector, UNU), and Dr. Karl-Heinz Feger.

Established in a close cooperation with the Technical University of Dresden (TUD), the FLORES was established on 10th December 2012 to identify and validate strategies to address global issues in the sustainable use and integrated management of environmental resources, with specific focus on water, soil and waste. In addition to UNU, the FLORES is also funded by the Federal Ministry of Education and Research (BMBF), the Ministry of Higher Education, Research and The Arts (SMWK) of the Free State of Saxony, and the Federal Government of Germany. The mission of FLORES is to actively pursue research, capacity development, post-graduate teaching and training, and outreach through dissemination of academic and practical information. The UNU-FLORES Advisory Committee, comprising of academicians from around the world, was established in July 2014.

UNU-FLORES made notable progress in achieving its mission. During the five years, the Academic Officers have published 18 journal articles, 11 books, 6 book chapters, and numerous other reports.

UNU-FLORES has also established Cooperation Agreement/MOUs with several organizations in Germany, China, Malawi, Tanzania, Ethiopia, Poland, USA, Australia, Korea, etc. Through a strong cooperation with TUD, PhD students joined UNU-FLORES in 2016, and have expanded the academic mission.



Everglades Wetlands Research Park

Florida Gulf Coast University
Naples, FL

The Everglades Wetland Research Park on the campus of the Naples Botanical Garden, Naples, Florida, is a Florida Gulf Coast University facility designed to provide teaching, research, and service related to wetland, river, and coastal science and ecological engineering. At the research park, they seek to understand: (1) how wetlands function, and (2) if and how wetlands can be created and restored.



Photographed above: Prof. Lal presents a seminar on “Soil carbon and climate change” on 1st March 2018.

Moonlight on the Marsh

Distinguished Lecture Series
1st March 2018, Naples, FL



Prof. Lal was an invited speaker at the *Moonlight on the Marsh* Seminar Series at the Everglades Wetlands Research Park, Florida Gulf Coast University, Naples, FL on 1st March 2018. The lecture “Soil carbon and climate change” was presented to OSU alumni who now reside in Florida. Photographed above is Prof. Lal and Dr. Bill Mitsch, Director of the Everglades Wetlands Research Park.

Dr. Mitsch, the Founding Director of the Olentangy River Wetland Research Park (OSU), was a professor at OSU for 26 years. He has over 600 publications, reports, abstracts and books, including 5 editions of the popular textbook *Wetlands*. He is editor-in-chief of the international journal *Ecological Engineering*. In August 2004 he was awarded the 2004 Stockholm Water Prize by King Carl XVI Gustaf of Sweden. He has also been awarded the Ramsar Convention Award for Merit (2015), an Einstein Professorship from the Chinese Academy of Sciences (2010), the Lifetime Achievement Award from the Society of Wetland Scientists (2007), and the Theodore M. Sperry Award from the Society for Ecological Restoration International (2005). His research and teaching have focused on wetland ecology and biogeochemistry, wetland creation and restoration, ecological engineering and ecosystem restoration, and ecosystem modeling.



Chaudhary Charan Singh Haryana Agricultural University popularly known as HAU, is one of Asia's biggest agricultural universities, located at Hisar in the Indian state of Haryana. It is named after India's seventh Prime Minister, Chaudhary Charan Singh. It is a leader in agricultural research in India and contributed significantly to Green Revolution and White Revolution in India in the 1960s and 70s. It has a very large campus and has several research centers throughout the state. It won the Indian Council of Agricultural Research's Award for the Best Institute in 1997. HAU was initially a campus of Punjab Agricultural University, Ludhiana. After the formation of Haryana in 1966, it became an autonomous institution on February 2, 1970 through a Presidential Ordinance, later ratified as Haryana and Punjab Agricultural Universities Act, 1970, passed by the Lok Sabha on March 29, 1970.

Haryana Agricultural University

Rao Bahadur Dr. Ram Dhan Singh Memorial Lecture
14th March 2018, Hisar, India



Prof. Lal was an invited speaker for the Rao Bahadur Dr. Ram Dhan Singh Memorial Lecture, at Haryana Agricultural University, Haryana, India, on 14th March 2018. His presentation was on the topic of "Soil Degradation in India and the Positive Role of Plant Breeding." Photographed above in the center of the front row (from right to left) are Dr. Rattan Lal, Dr. R.S. Paroda, and Dr. K.P. Singh (Vice Chancellor). Dr. Surender Singh Yadav, an alum of C-MASC from Maharishi Daya Nand University at Rohtak, is at the far left of the front row.

Rao Bahadur Dr. Ram Dhan Singh (1891-1977) made significant impacts on agriculture in the Indian Sub-continent through development of improved varieties of wheat, rice, barley and pulses. The major achievements in cereals production and productivity during Green Revolution in the states of Haryana and Punjab can be attributed to the strong foundation of crop improvement programs he established. Dr. Ram Dhan Singh met with Dr. Norman Borlaug, a Nobel Laureate, in 1971 at wheat research experiments of HAU, Hisar. When Dr. Borlaug enquired about his successful development of wheat varieties, Dr. Ram Dhan Singh explained that repeated testing of genotypes at multi-locations gave him desired results in terms of yield and stability.

Prof. Lal was presented with an award (right).





Dr. Benjamin Peary Pal
1906-1989

Dr. B.P. Pal was the Director of IARI from 1965 to 1972. His major scientific contributions were in wheat genetics and breeding. He was deeply interested in human resource development for agricultural education and established at IARI in 1958. This enabled scholars to earn M.Sc and Ph.D degrees in India rather than going abroad.

*"The gate of life swings to and fro
and soon, too soon, it closes
and that is why, beside my door,
I grow red roses"*

—B.P. Pal

"The Rose- its Beauty and its Science"

Indian Agricultural Research Institute

Special Lecture on Agriculture and the Environment
12th March 2018, New Delhi, India



Prof. Lal was an invited speaker at the International Agricultural Research Institute (IARI) on 12th March 2018 at the B.P. Pal Auditorium in New Delhi. He delivered a presentation on "Agriculture and the Environment."

During the 1950s, the advancement of scientific disciplines constituted the core program of IARI and provided the base for its fast expansion in the 1960's and 1970's. It attained the status of a Deemed University in the year 1958. The Green Revolution was directly impacted from research of IARI in the development of wheat varieties which contributed an estimated on billion tones of addition production. As the mother of several ICAR institutions, IARI continues to be the leading institution for agricultural research, education and extension in the country.

Photographed from left to right: Dr. R.S. Paroda, Prof. R. Lal, Dr. A.K. Singh (Director, IARI) and Prof. B.S. Dwivedi (Head, Department of Soil Science at IARI).





The India Policy Foundation (IPF) is a non-profit Think Tank dedicated to exploring constructive solutions to contemporary problems through its intellectual pursuits, a platform for eminent personalities of all walks of life to come together, discuss and debate, paving the way for a consensus on public policies in line with India's rich philosophical content and intellectual legacies. Established in 2008, the Foundation has been engaged in research, publications, and conducting of seminars, brainstorming sessions, symposia, and panel discussions to collect voice and mind for India in regional and global pursuits. The IPF seeks to understand the ethical-moral interplay of State-society relationship in shaping, re-shaping and consolidating the country's nationhood in the face of internal and external exigencies associated with the task of nation-building. Prof. Rakesh Sinha is the honorary Director of India Policy Foundation and scholar in Political Science domain, he has published books, Monographs, reports and research papers.

India Policy Foundation

13th March 2018, New Delhi, India



The seminar on March 13th was organized by the Policy Foundation at the India International Center, New Delhi. The overall theme was "India's Challenges of Agriculture." The seminar was attended by participants from several embassies (Australia, Austria, New Zealand, Brazil, France) along with those from FAO and the private sector: Photographed from right to left are: Dr. Vibha Dhawan (TERI), Dr. Anne-Sophie Poisot (FAO), Prof. Lal, Mr. H.K. Bhanwale (Chairman, National Bank for Agriculture and Rural Development) and Mrs. Veena Nayyar (Executive Director, Policy Foundation).





Publications of C-MASC: January – March 2018

Referred Journal Articles

- Briedis, C. J.C.M. Sá, R. Lal, F. Tivet, J.C. Franchini, A. de Oliveira Ferreira, D. Hartman, R. Schimiguel, P.T. Bressan, T.M. Inagaki, J. Romaniw, D. R Gonçalves. 2018. How does no-till deliver carbon stabilization and saturation in highly weathered soils? CATENA 163:13-23.
- Daigh, A.L.M., W.A. Dick, M.J. Helmers, R. Lal, J.G. Lauer, E. Nafziger, C.H. Pederson, J. Strock, M. Villamil, A. Mukherjee, R. Cruse. 2018. Yields and yield stability of no-till and chisel-plow fields in the Midwestern US Corn Belt. Field Crops Research 218:243-253.
- Das, A. D. Lyngdoh, P.K. Ghosh, R. Lal, J. Layek, R.G. Idapuganti. 2018. Tillage and cropping sequence effect on physico-chemical and biological properties of soil in Eastern Himalayas, India. Soil & Tillage Research 180:182-193.
- Ferreira, A.O., J.C.M. Sá, R. Lal, F. Tivet, C. Briedis, T.M. Inagaki, D.R.P. Goncalves, J. Roanie. 2018. Macroaggregation and soil organic carbon restoration in a highly weathered Brazilian Oxisol after two decades under no-till. Science of the Total Environment 621:1559-1567.
- Khanal, S., R. Lal, G. Kharel, J. Fulton. 2018. Identification and classification of critical soil and water conservation areas in the Muskingum River basin in Ohio. Journal of Soil and Water Conservation 73(2):213-226.
- Lal, R. 2018. Sustainable intensification of China's agroecosystems by conservation agriculture. International Journal of Soil and Water Conservation 6:1-12.
- Lal, R. 2018. Sustainable intensification of China's agroecosystems by conservation agriculture. International Soil and Water Conservation Research 6(1):1-12
- Liang, L., R. Lal, B.G. Ridoutt, Z. Du, D. Wang, L. Wang, W. Wu, G. Zhao. 2018. Life Cycle Assessment of China's Agroecosystems. Ecological Indicators 88:341-350
- Liang, Y.R., R. Lal, S.L. Gou, R.Q. Liu, Y. Hu. 2018. Impacts of simulated erosion and soil amendments on greenhouse gas fluxes and maize yield in Miamian soil of central Ohio. Nature Scientific Reports 8:520.
- Liang, L., R. Lal, B.G. Ridoutt, G. Zhao, Z. Du, L. Li, D. Feng, L. Wang, P. Peng, S. Hang, W. Wu. 2018. Multi-indicator assessment of a water-saving agricultural engineering project in North Beijing, China. Agricultural Water Management 200:34-46.
- Liang, L., R. Lal, W. Wu, B.G. Ridoutt, Z. Du, L. Li, D. Feng, L. Wang, P. Peng, S. Hang, G. Zhao. 2018. The water footprint and validity analysis of ecological engineering in North Beijing, China. Journal of Cleaner Production 172:1899-1909.
- Stewart, B.A., R. Lal. 2018. Managing water to enhance global cereal yields. Journal of Soil and Water Conservation 73(2):49A-52A
- Yadav, S.S., R. Lal. 2018. Vulnerability of women to climate change in arid and semi-arid regions: The case of India and South Asia. Journal of Arid Environments 149:4-17.
- Zhang X., T. Ning, H. Han, T. Sun, G. Li, Z. Li, R. Lal. 2018. Effects of waxy maize relay intercropping and residue retention on rhizosphere microbial communities and vegetable yield in a continuous cropping system. Pedosphere 28:84-93.

Book Chapters

- Hussain, M., S. Ahmad, S. Hussain, R. Lal, S. Ul-Allah, A. Nawaz. 2018 Rice in Saline Soils: Physiology, Biochemistry, Genetics, and Management. In D.L. Sparks (Ed) Advances in Agronomy, Academic Press, Volume 148, 231-287 pp.
- Lal, R. 2018. Foreword. In M.Á. Muñoz, R. Zornoza (Eds.) Soil Management and Climate Change. Academic Press, xiii-xiv pp.

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

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