



Happy Holidays And A Peaceful 2015
from

Carbon Management & Sequestration Center



C-MASC gathers for a recent weekly seminar. From left to right: Arun Nath, Atanu Mukherjee, Rattan Lal, Meiling Zhang, Reed Johnson, Laura Hughes, Nall Moonilall, Huiying Zhang, Raj Shrestha, Yiming Zhao, Basant Rimal, Sami Khanal, Vincent Obade, Surender Singh Yadav, Klaus Lorenz, Antonio Pereira Filho, Richard Liu, Tangyuan Ning, Clever Briedis, Scott Mayhew, Jose Guzman and Chris Eidson.

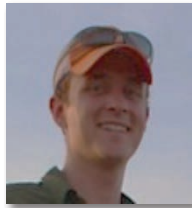
Others not present in the photo include:



David Ussiri



Claire Sutton

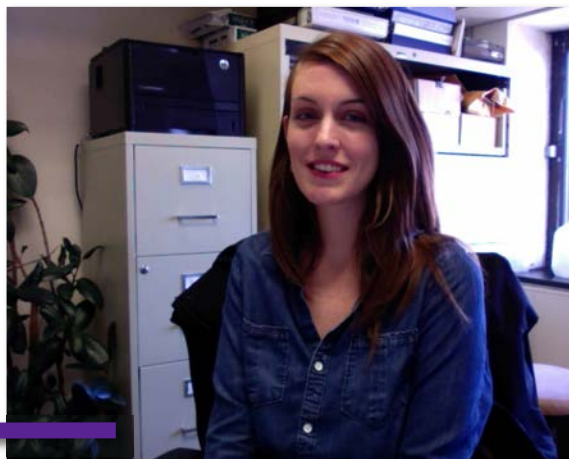


Pat Bell

C-MASC Has a New Office Manager

Laura Hughes joins the C-MASC team as the new office manager. She graduated from SENR with a degree in Environmental Policy.

Welcome Laura!



Issue 4:2014

C-MASC can now be found on Facebook under: **C-masc Osu**

Our old page has been discontinued, please follow the new one for the latest information on C-MASC!



Follow Dr.Lal on Twitter @lal_rattan



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Visiting Scholars - An Integral Component of C-MASC



Antonio Pereira Filho
Visiting Scholar – Brazil
Ph.D Student, UNICAMP
Assistant Professor, UNIVASF
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Brazil is currently one of the largest melon (*Cucumis melo* L.) producer from South America, with 17 % of total production. The melon cultivation predominates in semi-arid regions characterized by low rainfall. A sustainable method of management system studied by Embrapa Semiárida (Brazilian Agricultural Research Corporation's) in San Francisco River Valley is the use of several plant species as green manure and mulch, known as plant cocktail. This project work is a part of a long-term study in the Embrapa Semi-Arid Experimental Field, Petrolina – Pernambuco, Brazil and it aims to identify a system of soil management, using plant cocktails, which reduce nutrient losses and promote better synchronization between decomposition and release of nutrients.

Antonio Pereira Filho is an Assistant Professor at Universidade Federal do Vale do São Francisco (UNIVASF). At the Carbon Management and Sequestration Center (C-MASC), he will use data collected from experiments conducted in the Brazilian semi-arid area, and conduct analysis for better understanding of the research output.



Tangyuan Ning
Visiting Scholar – China
Associate Professor
Shandong Agricultural University
ningty@sdau.edu.cn

Dr. Tangyuan Ning is a professor in Agricultural College, Shandong Agricultural University. His expertise are in straw returning and tillage methods on soil carbon sequestration, crop carbon fixation, and water- nutrition utilization in maize and wheat cropping system, and water-soil-waste nexus in maize and wheat cropping system.

While at C-MASC, Dr. Ning has visited the experimental stations in Zanesville and USDA research experiments located there, and received a wealth of information for soil and GHGs and ¹³C analyzing from postdoctoral researchers and visitors at C-MASC. He also presented a seminar entitled "Diversity tillage systems are important for high-yield sustainability and carbon sequestration" for the weekly seminar. Currently he is writing a chapter for the Encyclopedia of Soil Science (3rd Edition) entitled "Coupled use of subsoiling and controlled release urea".





Visiting Scholars - An Integral Component of C-MASC



Meiling Zhang

Visiting Scholar – China
Associate Professor
Gansu Agricultural University
657936537@qq.com

Meiling Zhang is an associate professor of Center for Quantitative Biology, College of Science, Gansu Agricultural University (GSAU), Lanzhou, China. Her research interest area is ecological model and carbon cycle, and is conducting her research under the guidance of Dr. Lal and the study objectives in C-MASC is as follows: i) on the basis of previous studies, collecting MODIS remote sensing image, meteorological data, vegetative physiological and ecological statistical information to modeling grassland NPP and carbon sequestration of United States; ii) Comparing the modeling result to China, verify the improved model of previous, iii) to illustrate the key driving factors of carbon cycle, revealing the interaction mechanism of succession and carbon cycle of grassland classes under climate change condition; iv) writing and submit article about these researches.

She attends weekly seminars of the research group, and presented a seminar entitled, “Modeling NPP of Natural Grassland in China Using an Improved CASA Model Based on CSCS”. There were frequent interactions with other researchers of C-MASC which added to her understanding of different aspects of soil carbon.



Clever Briedis

Visiting Scholar – Brazil
Ph.D Student
Universidade Estadual de Ponta Grossa
cleverbriedis@yahoo.com.br

Clever Briedis' research focus at C-MASC is to understand how SOC accumulation is affected by SOC saturation behavior on long-term NT lands, and SOC sequestration capacity. Conversion of natural vegetation to agricultural land by plow-based tillage promotes SOC loss, and conservation agriculture (e.g., no-till) associated with high and diverse biomass-C input may restore the lost SOC over time and improve soil quality. The focus of his Ph.D research is exploring how SOC accumulation behaves in response to increasing biomass-C inputs in these no-till improved soils, the mechanisms that govern the SOC stabilization, and the saturation level in these soils (especially in weathered soils, such as the Brazilian Oxisols).





New Visiting Scholars



Arun Nath
Visiting Scholar – India
Assam University
arunjyotinath@gmail.com
November 2014–April 2015

Dr. Nath is an assistant professor in the Department of Ecology and Environmental Science at Assam University. While at C-MASC, Dr. Nath is will focus his research on the following objectives:

- I. Assessment of soil carbon stocks in soil aggregates under tilled, no-tilled, pasture and forest land uses
- II. Effect of ground water levels on greenhouse gas emission in farm lands



Surender Singh Yadav
Visiting Scholar – India
Maharshi Dayanand University
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October 2014 – March 2015

Dr. Surender Singh Yadav is an assistant Professor in Department of Botany at Maharshi Dayanand University, Rohtak (Haryana) India. His area of interest includes medicinal plants, homegarden ecosystems, floristics, biodiversity conservation and natural resource management.

Dr Yadav has been awarded Raman Post-Doctoral Fellowship by University Grants Commission, Government of India to study carbon sequestration potential of homegarden ecosystems for mitigating climate change. He joined the center on October 02, 2014.



Huiying Zhang
Visiting Scholar – China
Hechi University
zhy5158@126.com
November 2014- October 2015

Dr. Huiying Zhang is an associate professor in College of Chemistry and Bioengineering, Hechi University. Her expertise is in Inorganic Chemistry and Analytical Chemistry.

While at C-MASC, her research is focused on synthesizing new classes of nano-materials for CO₂ absorption and testing their characters on Wooster campus.

Thomson Reuters Highly Cited Researchers

For his research in the field of Agricultural Sciences, Prof. Lal was named among the Thomson Reuters Highly Cited Researchers, a listing of the world's leading scholars in the sciences and social sciences.

<http://highlycited.com/>





C-MASC Alumni

Dr. Toru Nakajima Returns to Japan



Toru Nakajima

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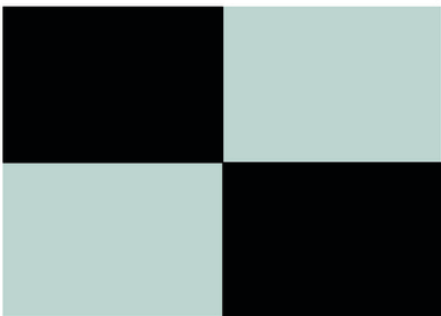
October 2011– October 2014

Dr. Toru Nakajima was a postdoctoral researcher at C-MASC from 19th October 2011 to 19th October 2014 under USDA project "The Cropping Systems Coordinated Agricultural Project (CSCAP): Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems". Study objectives were to 1) develop standardized methodologies using photoacoustic spectrometer (PAS) and perform baseline monitoring of carbon, air and water footprints at agricultural test sites across the Midwest, 2) evaluate how crop management drainage, cover crop, and tillage impact carbon, air and water footprints at research station at Waterman Farm Drainage Plot, Columbus OH, 3) develop soil quality index (SQI) using data collected to develop a soil quality index to aggregate results, and 4) conduct and set up soil gas diffusion experiments on soils under different agricultural practices.

As a member of the research team, he has used standard methodologies for measuring soil quality, carbon sequestration and greenhouse gas emissions including CO₂, N₂O, and CH₄. He has used a PAS as an alternative to the conventional gas chromatograph method of the greenhouse gas flux from soils. Further he has collected soil samples from multiple farms in Ohio and Michigan for measuring soil physical, chemical, and biological properties under different management systems. These samples were collected from diverse land use under on-farm conditions.

In addition, he has also served as a teaching assistant in the 2012 and 2013 Spring semester for "Environmental Soil Physics" which consisted of both graduate and undergraduate students. He has worked with other members of the team and frequently exchanges research ideas with other postdoctoral researcher and visiting scientist from diverse professional/ethnic backgrounds.

Toru currently joined Tokyo Metropolitan University as a project assistant professor. He is grateful for his time at C-MASC and believes that the experience gained here will help him in his future work. He gratefully acknowledges the support and hospitality received from Dr. Rattan Lal, C-MASC staff and students.



TOKYO METROPOLITAN UNIVERSITY

首都大学東京





Soil News

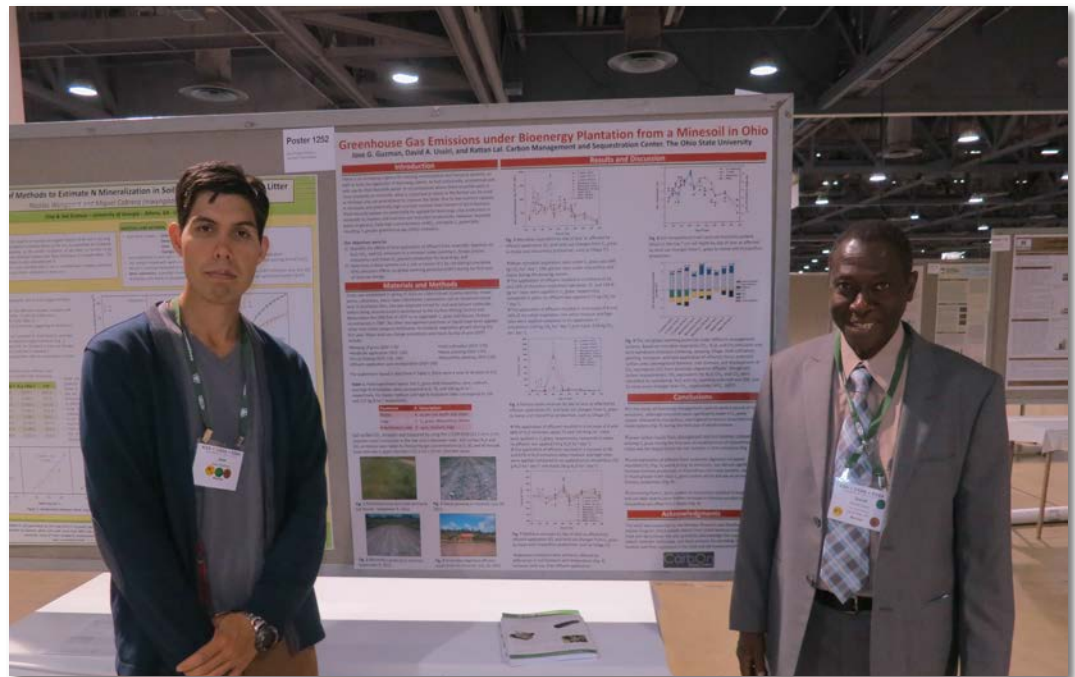
ASA, CSSA, SSSA International Annual Meeting



Image credit: <https://www.acsmeeetings.org/>

More than 4,000 scientist, professionals, educators, and students attended the 2014 International Annual Meetings, “Grand Challenges, Great Solutions”, hosted by the American Society of Agronomy, Crop Science of America, and Soil Science Society of America in Long Beach, CA from Nov. 2-5. Over 1,600 oral presentations and 1,500

poster presentations were given at this year’s meetings. Like previous years, C-MASC had a huge presence in the meetings, with oral or poster presentations coming from Dr. Rattan Lal, Dr. David Ussiri, Dr. Klaus Lorenz, Dr. Atanu Mukherjee, Dr. Vincent Obade, Dr. Tangyuan Ning, Dr. Xiangbin Kong, Dr. Jose Guzman, Clever Briedis, Ricardo Bordonal, and many other previous C-MASC scholars.



Dr. Jose Guzman and Dr. David Ussiri (pictured above) present a poster titled, “A Method for Quantifying Recent Soil Organic and Geogenic Carbon in Reclaimed Minesoils Planted with Miscanthus and Corn for Biofuel Production.”

Dr. Rattan Lal was an invited keynote speaker at the “Climate Change Impacts on Soil Carbon: Understanding and Estimating the Extent and Rates of Reactions, Processes, Interactions and Feedbacks” symposium, in which he made a presentation titled “Pedospheric Processes and Climate Change”.

Presenting at conferences like this is a great way to discuss and receive feedback from one’s research with fellow scholars in their respected fields. Additionally, this is a great networking opportunity to catchup with previous colleagues, or to start new collaborations for future research projects. Graduate students can also compete in oral and poster presentation and apply for scholarships and awards. Next year’s meeting will be held in Minneapolis, MN from Nov. 15-18.





Soil News

World Soil Day

The World Soil Day (WSD) was initiated by the Council of IUSS in August 2002 during the 17th World Congress of Soil Science, which was opened by her Highness Princess of Thailand. The decision was taken by the council members, who defined the 5th of December, which is the birthday of his Majesty King Bumibhol Adulyadej of Thailand, as the “International Day of the Soil”. Therefore, for the last 10 years, the WSD has been commemorated by numerous national soil science societies all over the world, thus initiating the celebration of the Soil of the Year as a continuous annual event in order to enhance awareness of the beauties, the potential, and the vulnerability of the world soils. After an audience of 3 IUSS representatives with his Majesty King Bumibhol of Thailand in April 2012 in Bangkok, the Government of Thailand submitted officially a proposal for the International Day of the Soil to the FAO Council for support at the UN General Assembly in New York. In December 2013 the UN not only installed the WSD but also 2015 as the “Year of the Soil”. From 2015 onwards, the WSD will be celebrated by the IUSS in close cooperation with UN /FAO, Global Soil Partnership (GSP) and other worldwide organisations.

This very positive and supportive link between the IUSS as a scientific organisation and various other international organisations (e.g., FAO and UN) allow to promote soil awareness and to foster the knowledge about soils as a non-renewable and very sensitive and fragile ecosystem. Therefore, soils must be used carefully and according to their resilience and elasticity for the long-term maintenance of key properties and processes, thus meeting the demands of the growing world population. Through land misuse and soil mismanagement, soils have been increasingly degraded and some were irreversibly lost. Therefore, we have to make clear, that just public concern is not sufficient to protect soils and to use them sustainably. We need to take action! The strategy is to reach sustainable intensification for achieving food security, sufficient drinking water supply, and the reduction of greenhouse gas emissions. This means the mitigation of global change processes for maintaining healthy soils.

Therefore, it is essential for scientists and the interested community to know more about soils and their functions. Additionally it is important to convince politicians, decision makers, landowners, and the world community about the importance of soils for the provision of goods and services for humankind.

It has been more than 500 years ago the famous artist and scientist Leonardo Da Vinci pointed out that “we know more about celestial bodies than about soils underfoot”. As is indicated by the celebrations of the WSD today soils should receive the importance which they rightfully deserve. They should be placed at the forefront of the scientific agenda, on the roster of policy makers, and in the awareness of the general public. Soils, as we know, are the most complex biomaterials on the planet and are a self-regulating biological factory. Thus, it is absolutely essential that soil degradation, as the most insidious and underestimated challenge of the 21st century, must be defeated. At present, the vulnerability of soils because of global change and under anthropogenic impacts is unprecedented. Severe degradation, including widespread contamination, accelerated erosion, severe depletion of carbon and nutrients, rapid urbanization, and frequent hazards are threatening sustainable food production, adequate water supply, global ecosystem services, and the quality of human life. Soil carbon sequestration, soil restoration, the conservation of biodiversity and other important soil functions are important for the sustainable land and soil use (Continued on page __)

“Therefore, we have to make clear, that just public concern is not sufficient to protect soils and to use them sustainably. We need to take action!”





Soil News

World Soil Day (continued)



The Ohio State University Prof. Rattan Lal, center, addressing the UN, on behalf of International Union of Soil Sciences (IUSS).

The IUSS will cooperate with UN and other organisations to improve the scientific knowledge and to promote the global acceptance of soils as one of the most important natural resources. The IUSS will also strengthen the awareness concerning the vulnerability of soils to abiotic and biotic stresses and the limitation of diverse land use approaches. As the world’s leading soil sciences union and member of ICSU, IUSS in cooperation with FAO, UN and other organisations, has the capacity and the responsibility to jointly undertake initiatives to improve the visibility of soil related issues to the public at large. It should also convince landowners, farmers, foresters and the policy makers to observe soil properties and functions as well as their threats and limits. On this auspicious occasion of the WSD, IUSS as the founding organisation of the WSD in 2002, congratulates the FAO and the UN for celebrating the World Soil Day together with the launch of the International Year of Soils 2015.

Finally, I express my sincere wishes for a strong cooperation between IUSS and UN/FAO. Together we can enlarge the scientific knowledge, strengthen the understanding of the soil as a finite and non-renewable resource, promote the sustainable use of soils, and enhance awareness about the importance of soils for the production of food, adaptation and mitigation of climate change, and the provision of water. Soil is the basis of all terrestrial and aquatic life. It must be used, restored and improved for human wellbeing and nature conservation.

Prof. Rainer Horn
Prof. Rattan Lal
Prof. Jae Yang
(IUSS)



Pictured above is David Lindbo, Robert Bonnie, Under-Secretary of USDA, Rattan Lal, Pedro Sanchez (Photo credit: SSSA).

Below: Rattan Lal is making presentation at the U.N.





Soil News

LATIN AMERICAN CONGRESS OF SOIL SCIENCE



Photo credit: www.xxcongresolatinoamericanodesuelosperu.org

Prof. Rattan Lal recently visited Cusco, Peru for the Latin American Congress on Soil Science (9-12 November 2014), where he was a keynote speaker on the topic of “Managing Soil Carbon”. Pictured above is Prof. Lal with Mr. Getulio (former visiting scholar) and his academic advisor, Dr. José Eduardo Corá, at the University of Mato Grosso. Prof. Ildefonso Pla Sentis is in the background.

LIMA CLIMATE CHANGE CONFERENCE

The United Nations Framework Convention on Climate Change 20th Conference of the Parties meets in Lima, Peru (1-12 December 2014). They are discussing details for a major international climate treaty anticipated to be signed by 195 countries in December 2015 in Paris, France. The debatable issue is “past vs. Future users of fossil fuels.”

<http://unfccc.int/2860.php>

U.S.-CHINA JOINT ANNOUNCEMENT ON CLIMATE CHANGE

On 11 November 2014, President Obama announced an ambitious 2025 target to cut U.S. climate pollution by 26-28 percent from 2005 levels. A similar treaty with other emerging economies would be a step in the right direction.

<http://www.whitehouse.gov/the-press-office/2014/11/11/us-china-joint-announcement-climate-change>



Soil News

2015: International Year of Soils

Soil is the essence of all terrestrial life. Ancient civilizations and cultures evolved and flourished on fertile soils (e.g., Mesopotamia, Mohenjodaro-Harrappa, Mayan), However, once thriving civilizations perished when the soils which supported them were degraded and taken for granted. Furthermore, global issues of 21st Century (e.g., climate change, food and nutritional security, water quality and renewability, biodiversity, energy) are all directly or indirectly related to soil. Numerous ecosystem functions and services are provisioned by soil. Yet soil soils are becoming extinct because of land misuse and soil mismanagement.

Thus, 2015 U.N. International Year of Soils aims at enhancing awareness among policy makers and the general public regarding the importance of soils to human well being and nature conservancy. Prime soil is an essential but a finite resource, unequally distributed geographically, and prone to misuse. Thus, this essential resource must be used, improved and restored for generations to come.



Soil Is Life & Life is Soil

Meeting of the Scientific Staff of UNU- FLORES at Dresden, Germany on 26th November 2014



Scientific Advisory Board of FACCE- JPI in London, U.K., 10 September 2014



Recognitions of C-MASC Alumni and Graduate Students



Dr. Venkatesh Madasur Subba Bhat was visiting scholar of CMASC during September-December, 2013. He is serving as Principal Scientist (Soil Science) at the Indian Institute of Pulses Research (IIPR), Kanpur, Uttar Pradesh state (India) under Indian Council of Agricultural Research (ICAR), New Delhi. He has been now transferred to newly established IIPR-Regional Research Station, at Dharwad, Karnataka state (India) as "Centre Incharge" and joined with effect from 28th April, 2014. The objectives of the centre of IIPR at Dharwad would be to improve the productivity of pulses in southern peninsular India and also to act as Off-season nursery for hastening breeding cycle of pulses.

Dr Venkatesh says that his new placement could be possible due to blessings of Director (IIPR), Director (CMASC) and his exposure to CMASC during his programme.



Congratulations to Dr. Anup Das for being elected as Associate of National Academy of Agricultural Sciences, New Delhi!



Current Ph.D student, Nall Moonilall, has been chosen for an Ohio Nursery and Landscape Scholarship. Congratulations Nall!

Congratulations to Dr. Guðrún Gísladóttir, Professor from the University of Iceland, who received an award in Sweden. She was a visiting scholar at C-MASC, and co-advisor to many graduate students.

She is pictured here with the King Carl XVI Gustaf of Sweden at the palace in Stockholm, as well as her son Freyr Tómasson and his fiancée, Erna Einarsdóttir.

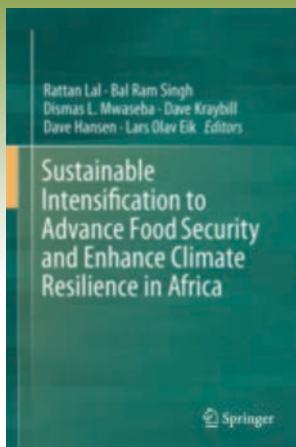




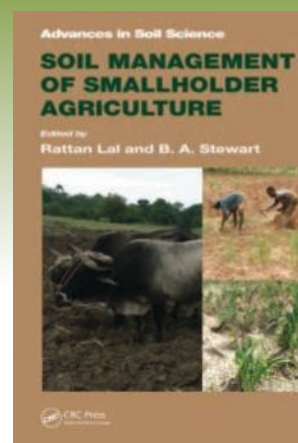
2014 C-MASC PUBLICATIONS LIST

New Books

Lal, R, Singh, BR, Mwaseba, DL, Karybill, D, Hansen, D, Eik, LO. 2014. Sustainable Intensification To Advance Food Security And Enhance Climate Resilience In Africa. Springer, Cham, Switzerland. 665pp.



Lal, R. and Stewart, B.A. 2014. Soil Management of Smallholder Agriculture: Advances In Soil Science Vol. VI. Taylor and Francis, Boca Raton, FL. 406pp.



Books Edited

1. Lal, R, Singh, BR, Mwaseba, DL, Karybill, D, Hansen, D, Eik, LO. 2014. Sustainable Intensification To Advance Food Security And Enhance Climate Resilience In Africa. Springer, Cham, Switzerland. 665pp.
2. Lal, R. and Stewart, B.A. 2014. Soil Management of Smallholder Agriculture: Advances In Soil Science. Taylor and Francis, Boca Raton, FL. 406pp.

Referred Journal Articles

3. Jacinthe, Pierre-Andre; Dick, Warren, A.; Lal, Rattan; et al. "Effects of no-till duration on the methane oxidation capacity of Alfisols." *Biology And Fertility Of Soils*. 50(3): 477-486.
4. Sá, J.C.M.; Tivet, F.; Lal, R.; Briedis, C.; Hartman, D.C.; Zuffo, J.; Santos, J.B. 2014. Long-term tillage systems impacts on soil C dynamics, soil resilience and agronomic productivity of a Brazilian Oxisol. *Soil & Tillage Res.*, 136: 38-50.
5. de Sousa Neto, E.L., I. Andrioli, R.G. de Almeida, M.C.M. Macedo and R. Lal. 2014. Physical quality of an Oxisol under integrated crop-livestock-forest system in the Brazilian cerrado. *R. Bras. Ci. Solo*, 38:608-618.
6. Vilmundardóttir, O.K., Gísladóttir, G., Lal, R. 2014. Early stage development of selected soil properties along the proglacial moraines of Skaftafellsjökull glacier, SE-Iceland. *Catena* 121:142–150. DOI: 10.1016/j.catena.2014.04.020
7. Ussiri, D, Jacinthe, PA, Lal, R. 2014. Methods for Determination of Coal Carbon in Reclaimed Minesoils: A Review. *Geoderma*. 214-215:155-167.
8. Cui, Si-Yuan, Jian-Fu Xue, Fu Chen, Wen-Guang Tang, Hai-Lin Zhang, and Rattan Lal. 2014. Tillage Effects on Nitrogen Leaching and Nitrous Oxide Emission from Double-Cropped Paddy Fields. *Agronomy Journal*. 106:1, 15-23. 10.2134/agronj2013.0185
9. Bonin, C. and Lal, R. 2014. Aboveground productivity and soil carbon storage of biofuel crops in Ohio. *GCB Bioenergy*. 6, 67-75. DOI: 10.1111/gcbb.12041.
10. Olson, K. R., M. Al-Kaisi, R. Lal, B. Lowery. 2014. Experimental considerations, treatments and methods in determining soil organic carbon sequestration rates. *Soil Sci. Soc. Am. J.* 78:348–360 DOI:10.2136/sssaj2013.09.0412
11. Stavi, I., Lal, R. 2014. Achieving Zero Net Land Degradation: challenges and opportunities. *Journal of Arid Environments* Ref: JAE13-389R1 DOI: 10.1016/j.jaridenv.2014.01.016
12. Adhikari, S., Lal, R., Wang, H.P. 2014. Carbon sequestration in the soils of aquaculture ponds, crop land, and forest land in southern Ohio, USA. *Environmental Monitoring and Assessment* 186:3, 1569-1574. DOI: 10.1007/s10661-013-3474-y
13. Nakajima, T., Lal, R. 2014. Tillage and drainage management effects on soil gas diffusivity. *Soil Tillage Res.* 135:71-78. DOI: 10.1016/j.still.2013.09.003
14. Kong, X., R. Lal, B. Li, H. Liu, K. Li, G. Feng, Q. Zhang, B. Zhans. 2014. Fertilizer intensification and its impacts in China's HHH Plains. *Adv. Agron.* 125:135-169.
15. Jha, P., Lakaria, B.L., Biswas, A.K., Saha, R., Mahapatra, P., Agrawal, B.L., Sahi, D.K., Wanjari, R.H. Lal, R., Singh, M., Subba Rao, A. 2014. Effects of carbon input on soil carbon stability and nitrogen dynamics. *Agric. Ecosyst. & Env.* 189: 36-42. 10.1016/j.agee.2014.03.019
16. de Paul Obade, Vincent, and Rattan Lal. 2014. Soil quality evaluation under different land management practices. *Environ Earth Sci* DOI 10.1007/s12665-014-3353-z.
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20. Mukherjee, A., Lal, R., and Zimmerman, A. 2014. Effects of biochar and other amendments on the physical properties and greenhouse gas emissions of an artificially degraded soil. *Science of the Total Environment*. 487: 26-36.
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22. Lal, R. 2014. Biofuels and carbon offsets. *Biofuels*. 5(1), 21-27.
23. de Paul Obade, V., & Lal R. 2014. Using meta-analyses to assess pedo-variability under different land uses and soil management in central Ohio, USA. *Geoderma* 232–234: 56-68.
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25. Liu, R. & Lal, R. 2014. Quality change of mine soils from different sources in response to amendments - A laboratory study. *Environmental and Natural Resources Research* 4:2 20-38. DOI: 10.5539/enrr.v4n2p20
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30. Dikgwatlhe, S.B., Chen, Z.D., Lal, R., Zhang, H.L., Chen, F. 2014. Changes in soil organic carbon and nitrogen as affected by tillage and residue management under wheat-maize cropping system. *Soil and Tillage Research* 144:110-118.
31. Mostafa, A.I., and R. Lal. 2014. Anthropogenic impacts on soil carbon and silicon pools across a drained soil catena in central Ohio, USA. *Catena. Soil Horizons*, 1-8. DOI:10.2136/sh14-04-0004
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33. Guzman, J.G., and R. Lal. 2014. Miscanthus and switchgrass feedstock potential for bioenergy and carbon sequestration on minesoils. *Biofuels* 5(3): 313-329.
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35. Beniston, Josh. 2014. Soil organic carbon dynamics 75 years after land-use change in perennial grassland and annual wheat agricultural systems *Biogeochemistry*. 120(1):37-49. doi:10.1007/s10533-014-9980-3
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77. Lal, R. Climate Strategic Agriculture. Indian Institute of Soil Science, Bopal, India. 10-13 March 2014.
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