



THE OHIO STATE
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CARBON MANAGEMENT AND SEQUESTRATION CENTER

C-MASC NEWSLETTER



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It was a blustery December 19th today, as temperatures dropped to 12° Fahrenheit (-11°C). C-MASC students and staff bundled up on their way to their desks on the fourth floor of Kottman, stopping only briefly to admire the second snowfall of the season or maybe to grab a hot chocolate from the vending machines outside Kottman's main office. Ohio winters are always brisk and beautiful, and hopefully will remain so—thanks in no small part to the hard work of everyone collaborating with C-MASC!

Quarterly Viewpoint

FROM THE DESK OF RATTAN LAL

31 December 2019

Soil Organic Matter and Water Retention

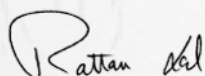
In many ancient civilizations, soil is considered one of the natural factors of importance to human wellbeing and nature. For example, soil, water, fire, air and space were considered important in India; soil, water, fire gold, and wood in China; and soil, water, fire, and air in Greece. Selman Waksman, the 1952 Nobel Prize Laureate for his discovery of streptomycin, stated that “Humus plays a leading part in the storage of energy of solar origin on the surface of the earth.” Indeed, several ancient cultures understood the beneficial impacts of humus, or soil organic matter (SOM), on soil health. For example, the English word “human” is derived from the Latin word “humus,” or the ground. Similarly, the Hebrew word Adamah (ground) is derived from the Hebrew word “Adam,” which means human. The Roman philosopher Virgil, about 1 A.D., used the terms “humus,” “terra,” “soil,” and “earth” interchangeably. Accordingly, Virgil called a loamy soil “pinguis humus.” The importance of humus as being dark in color is vividly depicted by Ibn-Al-Awam, a Moorish philosopher of the 12th century. In his book, Kitab-El-Felaha, he stated “One must also take into consideration the depth of the soil, for it often happens that its surface layer may be black.”

Among numerous mechanisms of making soils and agro-ecosystems climate-resilient is the hypothesis that increasing SOM content can enhance plant-available water capacity (PAWC) and mitigate the frequency and intensity of pedologic and agronomic drought. Increasing SOM in degraded and depleted soils can increase the retention of green water (PAWC) in the rootzone. Similar to most scientific issues, there are also two contrasting views about the impact of SOM on PAWC. One states that there is a strong increase in PAWC with increase in SOM content. For example, some argue that SOM can hold up to 20 times its weight in water. Others claim that with each one percent increase in SOM content, soil can hold 20,000 gallons more water per acre. In contrast, some believe that increasing SOM content has a limited if any effect on PAWC.

Expectedly, the truth lies somewhere in between these two contrasting views. The response of PAWC to an increase in SOM depends on numerous controls: soil properties such as the antecedent SOM content (depleted vs. adequate), texture (low or high clay content), clay mineralogy (2:1 expanding lattice versus 1:1 fixed lattice clay minerals), internal drainage (poor vs. excessive), effective rooting depth (shallow vs. deep), etc. Additionally, the response also depends on soil management (i.e., conservation agriculture with mulch versus plow-tillage without mulch, with or without input of organic amendments, etc.). Cropping/farming systems, crop rotations, crop species, and with or without integration of crops with trees and livestock are important controls.

Furthermore, there may be an optimal range of SOM content beyond which the PAWC does not increase with an increase in SOM content. Limits of such an optimal range may also depend on factors outlined above. Even if the increase in water retention with increase in SOM by 1% in the plow layer is merely 4,000 gallons/acre, yet it can make a strong impact on crop growth and production in a drought-prone environment. While some scientific information is available, credible data from replicated and properly designed field or laboratory experiments are indeed scanty. Thus, alleviation of drought stress by restoring SOM content is a researchable priority, especially in a changing and uncertain climate.

Sincerely,



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



International Scholar Research Exposition

Office of International Affairs, OSU, USA

November 7

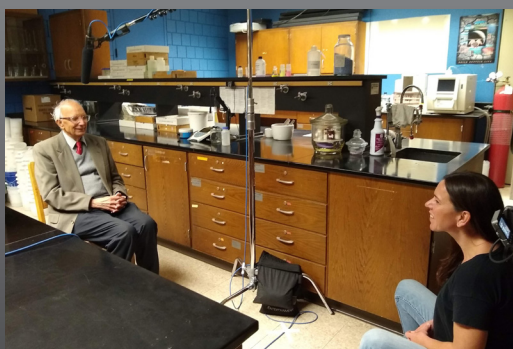


Visiting Scholars Xiaodan Gao, Fengkui Qian, Yingde Xu, Nour El Houda Abed and Karabi Pathak were invited by the OSU Office of International Affairs to the Annual International Scholar Research Exposition. There, Drs. Gao and Qian presented posters of the research that they completed during their time as Visiting Scholars at C-MASC and received recognition for their work in the form of an official certificate and commendation from OSU's President, Dr. Micheal Drake. They enjoyed the support they received from their colleagues in C-MASC as well as delicious refreshments and the chance for great comederie as they shared the new insights they discovered at C-MASC.



Counterclockwise from top: Visiting Scholar Fengkui Qian; Dr. Lal with Xiaodan Gao and Fernando Unzueta, Associate Vice Provost; Yingde Xu, Nour El Houda Abed, Xiaodan Gao, and Karabi Pathak

Patagonia Film Crew Visits C-MASC



Dr. Lal with Director Carissa Tudor

On Thursday, November 14th, a film crew from Patagonia stopped by on their way back from Rome to interview Dr. Lal and C-MASC's Visiting Scholars about regenerative agriculture, soil, and climate change. Carissa Tudor, Emily Grant and Dwight Tudor set up shop in the lab for some deep conversation about the importance of soil and the health of our planet. Keep an eye out for Patagonia's film on regenerative organic agriculture, due for release mid-March of 2020!

Nour El Houda Abed



Nour El Houda Abed is from Algiers, Algeria. She was a USDA Borlaug scholarship trainee for three months at the Carbon Management and Sequestration Center (C-MASC) from August 25, 2019 to November 22, 2019

under supervision of Professor Rattan Lal. She was really pleased and honored to join the C-MASC team, even if it was for a relatively short period.

During her visit to C-MASC, Nour attended important events such as the Farm Science Review and the World Food Prize, where she met very high-level

and greenhouse gas emissions.

Nour's work at C-MASC was of great relevance to climate change since its purpose was to highlight the importance of nitrogen fertilizer use in influencing greenhouse gas emissions and soil texture. She greatly improved not only her language skills, but also her soil science skills and thus expanded her knowledge on soil fertility and crop production improvement. She has also gained many friends abroad, and she is hoping to not only continue their friendship but also to build work connections with them.

Her last word goes to Professor Rattan Lal. She is very thankful to him for accepting her on the C-MASC team. Nour learned a lot from him, from his hard working character to his humble personality.

Xiaodan Gao

I am Xiaodan Gao, from Shenyang Agricultural University in Shenyang, China. I joined C-MASC as a Visiting Scholar on November 16th, 2018. This past year, I really enjoyed working in such an amazing and attractive department with friendly colleagues. I also enjoyed attending both of Dr. Lal's classes and the C-MASC weekly seminar.

During my time at OSU, I carried out research on soil organic-mineral complexes and the stability of organic matter with the guidance of Dr. Lal. I took part in the 14th

Annual International Research Exposition and SENR Soil Science Research Day, where I presented my posters, which benefitted me a lot. My C-MASC experience is unforgettable. I am eager to apply new ideas to my future teaching and research.

I sincerely appreciate the great help from Dr. Lal. Thanks to him for giving me the opportunity to work here. It is an honor to know all of the family members here. Thank you for the support, gratitude and encouragement I have received from you!



Fengkui Qian

Fengkui Qian was a Visiting Scholar at C-MASC for a year from November 26, 2018 through December 24, 2019. During this time, he studied farmland quality evaluation and protection in northeast China and implementing the Land Evaluation and Site Assessment (U.S LESA) system for basic farmland protection in Lingyuan County, China. While at C-MASC, he completed five research manuscripts.

On November 3rd, 2019, he received a promotion to Professor at Shenyang Agriculture University. He is the Chairman of Land

and Environment at Shenyang Agricultural University. He is also the Vice Secretary-General of the Liaoning Geological Society and a senior member of the Soil Science Society, the Geographical Society of China, and the China Society of Natural Resources.

He says his C-MASC experience was unforgettable. C-MASC is an amazing and attractive department with great achievements and honors awarded to its founder Professor Rattan Lal. He sincerely appreciates the great help from Dr. Lal and all his colleagues. He will remember the good old days



and always maintain his friendships with all his colleagues in the future.

祝大家身体健康，万事如意！
(I wish all of you good health and good luck!)



Dr. Biswajit Das, Principal Scientist under the Indian Council of Agricultural Research, posted at the north eastern state Tripura, visited C-MASC, OSU as Visiting Scholar from 12th April to 2nd October, 2019. He was sponsored by the Department of Biotechnology, Ministry of Science and Technology in the Government of India for his Post-Doctoral Research on the 'Mulching effect

on soil organic carbon dynamics and mitigation of greenhouse gases emissions' under the supervision of Dr. Rattan Lal, Director, C-MASC. The objectives of his study were the effects of long-term mulch and nitrogen on soil physical properties, soil C & N content, and on soil respiration and greenhouse fluxes. The salient findings of his study were that long term organic residue mulching (@ 16 Mg ha⁻¹), along with nitrogen (@ 244 Mg ha⁻¹) significantly improved the soil bulk density, aggregate stability, available water content, total porosity, saturated hydraulic conductivity, permeability, and carbon and nitrogen content in comparison to other mulch (@ 8 Mg ha⁻¹) or control plots. Soil microbial respiration in terms of CO₂ flux was also higher under

mulch. He acquired the techniques of handling advanced instruments, apart from attending classes as well as seminars. He also delivered two seminars, one on 'Orchard nutrition management in the Himalayan region of India', and another on his research work conducted at C-MASC. He also learned the skill of writing high quality research papers.

This particular experience will be beneficial for him to formulate his future research projects back in India and also in preparing high quality research papers. He expressed his gratitude to Dr. Rattan Lal for valuable guidance and teachings during the course of his research work. He also thanks all other faculty members and staff of C-MASC for all technical help extended to him.

Biswajit Das

Karabi Pathak

Dr. Karabi Pathak is a Fulbright-Kalam Climate Postdoctoral Researcher at C-MASC at The Ohio State University. Previously, she was a Shastri Indo-Canadian Research fellow at University of Toronto and Erasmus Mundus doctoral scholar at University of Oxford and Assam University. Pathak belongs to the Assam state of northeastern India. She is enthusiastic to explore the hidden secrets of soil and its opportunities for climate change mitigation. Her doctoral thesis unfolded the understanding of

soil's carbon sequestration potential in Imperata grasslands, which are culturally managed in landscapes of northeast India.

She is currently researching the question "can soil help combat climate change?" Presently, soils remove about 25 percent of the world's fossil fuel emissions each year, and to accelerate the process of carbon sequestration in global landmasses, her Fulbright research



project focuses on the effect of erosion and erosion control measures on soil organic carbon dynamics.



I am Hao Su, a Visiting Scholar from Harbin, Heilongjiang province, China. It's really an honor

Hao Su

to be a member of the Carbon Management and Sequestration Center (C-MASC), studying under the supervision of Dr. Rattan Lal with the support of the China Scholarship Council (CSC). I received my Bachelor's degree in Land Resource Management at Jilin University and became a PhD student supervised by Professor Cifang Wu in the Department of Land Management, Zhejiang University.

My research at C-MASC focuses on cropland system health and land use management. My area of study is the northeastern part of China, which is well-known

for its high fertility, but it is facing challenges resulting from either climate changes or human activities. Cropland is a complex system with a series of interconnected internal components. Research on the health of the cropland system is of great significance for human health, food security and society sustainability. I hope to attend classes and academic activities to learn more about soil science, climate change and the mechanisms of interaction between them at C-MASC. I am looking forward to working with new people and obtaining new knowledge and skills.

They said it:

"Be it deep or shallow, red or black, sand or clay, the soil is the link between the rock core of the earth and the new living things on its surface. It is the foothold for plants to grow. Therein lies the main reason for our interest in soils."

— Roy Simonson, USDA Yearbook of Agriculture, 1957

A C-MASC Family Fall Feast

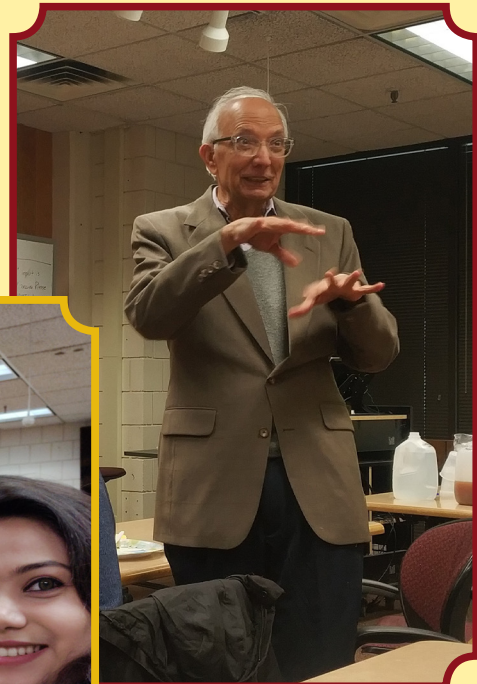
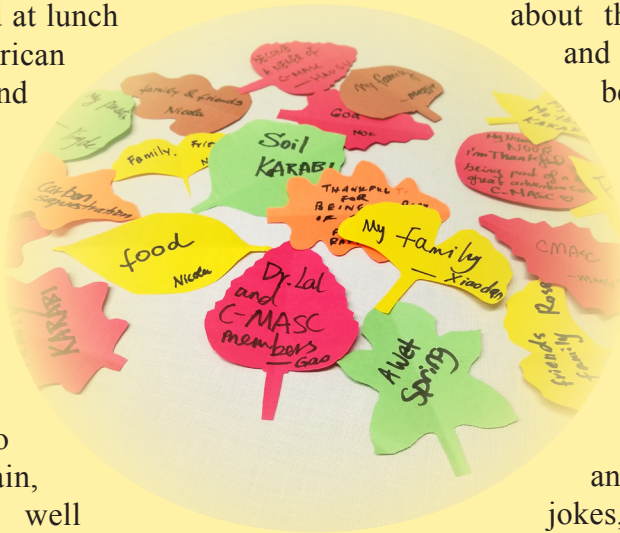
Kottman Hall, OSU, USA

C-MASC celebrated a Fall Feast together in Kottmann Hall on Friday, November 22nd. Our Visiting Scholars, graduate students, staff and colleagues gathered at lunch to enjoy traditional American Thanksgiving dishes and customs, as well as to share dishes and recipes from home. Our colleagues brought us homemade dal, gajar ka halwa, and rice from India, spring rolls and fānqié chao dàn (tomato-egg stir fry) from China, tortilla de patatatas o tortilla Española from Spain, mhadjeb from Algeria, as well as Weihnachtsstollen and gingerbread from Germany and much more! Some of our Visiting Scholars tried American sweet potatoes

November 22

and stuffing for the first time. We shared stories about different harvest feast customs from around the world and had a lively discussion about the history of certain foods and the way their origins get lost because cultures share cooking techniques so freely. Food really bonds us all. We also wrote down things in our lives that we were thankful for on colorful leaves cut out by our Program Coordinator, Maggie Willis.

With full bellies
and full laughter at Dr. Lal's
jokes, we shared a wonderful
time. We hope you will enjoy a couple
of recipes from our C-MASC colleagues from
around the world!



Counterclockwise from top: Karabi Pathak, Nour El Houda Abed, Xiaodan Gao, Hao Su, and Maggie Willis; Karabi Pathak takes a picture of all of the C-MASC attendees at C-MASC's Family Fall Feast; Dr. Lal entertains everyone with his jokes.

番茄炒蛋 Tomato and Egg Stir Fry from Hao Su

4 eggs
2 tomatoes
Salt
Sugar
Vegetable oil

1. Boil the tomatoes until the water is boiling and turn off the heat after 2 minutes. Remove the tomatoes and peel them for later use.

2. Crack eggs into a bowl, add 1/2

teaspoon salt and mix well.

3. Heat 1 tablespoon oil in a medium sized skillet over medium high heat. When oil is ready, add egg and cook until the bottom side is done, but the top is still raw. Stir with a spatula, chopping the egg into bite sized pieces, until egg is just cooked. Turn to lowest heat, transfer egg to a plate, and set aside.

4. Add 1/2 tablespoon of oil and turn back to medium high heat. Add tomatoes and stir fry until the edges are slightly charred and texture becomes soft. Add egg back into skillet and spread salt and sugar(depends) on top of it. Quickly mix everything together with a spatula until evenly seasoned.

Source: [The Omnivore's Cookbook](#)

Tortilla de Patatas o Tortilla Española from José M^a Álvarez de la Puente

Ingredients

6 to 7 medium potatoes (peeled)
1 yellow onion (diced)
1/2 tablespoon salt (or to taste)
2 to 3 cups olive oil (for pan-frying)
5 to 6 large eggs (the better the eggs, the better the tortilla)

1. Cut the peeled potatoes in half lengthwise. Then, with the flat side on the cutting surface, slice the potato into pieces approximately 1/8-inch thick. If you slice them thick, don't worry—it will simply take a little longer for them to cook.

2. Place potatoes and onions into a large bowl and mix them together. Salt the mixture.

3. In a large, heavy, nonstick frying pan, heat 1 1/2 cups of the olive oil on medium-high heat. Carefully place the potato-onion mixture into the frying pan, spreading it evenly over the surface. The oil should almost cover the potatoes. You might need to turn down the heat slightly so the potatoes do not burn. You want them to slowly fry, not becoming crisp like french fries, but rather tender and creamy. It is important to use good olive oil, as the potatoes will absorb quite a bit of the oil.

4. Leave the mixture in the pan until the potatoes are cooked. If you can poke a piece of potato with a spatula and it easily breaks in two, your potatoes are done. Remove from the pan with a slotted spoon or spatula that allows the oil to drain and let cool.

5. Crack the eggs into a large and beat by hand with a whisk or fork. Pour in the cooled potato-onion mixture. Mix together with a large spoon. Let sit for about five minutes.

6. Pour 1 to 2 tablespoons of the remaining olive oil into a small, non-stick frying pan (approximately 9 to 10 inches in diameter) and heat on medium heat. Be careful not to get the pan too hot because the oil or the tortilla will burn. When hot, stir the potato-onion mixture once more and "pour" into the pan and spread out evenly. Allow the egg to cook around the edges. Then you can carefully lift up one side of the omelet to check if the egg has slightly browned. The inside of the mixture should not be completely cooked and the egg will still be runny.

7. When the mixture has browned on the bottom, you are ready to turn it over to cook the other side. Take the frying pan to a sink. Place a

large dinner plate—about 12 inches in size—upside down over the frying pan. With one hand on the frying pan handle and the other on top of the plate to hold it steady, quickly turn the frying pan over and let the omelet fall onto the plate.

8. Place the frying pan back on the range and put just enough of the remaining oil to cover the bottom and sides of the pan. Let the pan warm for 30 seconds or so.

9. Now slide the omelet into the frying pan. Use the spatula to shape the sides of the omelet. Let the omelet cook for 3 to 4 minutes. Turn the heat off and let the tortilla sit in the pan for 2 minutes.

10. Slide the omelet onto a plate to serve.

11. If eating as a main course, cut the omelet into 6 to 8 pieces like a pie. Serve sliced French bread on the side.

If you are serving as an appetizer, slice a baguette into pieces about 1/2-inch thick. Cut the tortilla into 1 1/2 inch squares and place a piece on top of each slice of bread.

Serve and enjoy!



C-MASC Scholar Viewpoint

FROM THE DESK OF XIAODAN GAO

Long residence times of soil organic matter have been attributed to reactive mineral surface sites that adsorb organic species and cause inaccessibility due to physical isolation and chemical stabilization at the organic–mineral interface. Organic coating on the clay surface by adsorption of humic substances is essential for the structural stability of soil aggregates. It was generally found that cations enhanced colloidal aggregation, but the presence of natural organic matter can significantly inhibit the aggregation potential of colloids/nanoparticles.

My study explored the stabilization mechanism of minerals adsorbing organic matter in the mesoscale range of 1-1000 nm, from the perspective of the interaction force between minerals and organic matter. The results showed that the heteroaggregation process of soil humic acid and clay montmorillonite was sensitive to the small amounts of humic acid addition. Higher cation concentration and higher humic acid content were two necessary conditions for promoting humic acid and montmorillonite heteroaggregation. The carboxyl group C-O bonds and hydroxyl group O-H bonds of humic acid were two main adsorption sites by the formation of coordinate bonds with different metal ions. The results suggested that adjusting soil organic and inorganic interaction is a feasible approach to regulate particle aggregation and promote soil organic carbon stability.

This work was supported by the National Natural Science Foundation of China (41601230) and Postdoctoral Science Foundation of China (2017M611265). Thanks China Scholarship Council for the financial support from the State Scholarship Fund (201808210128). Finally, I would like to express my sincere gratitude to the respected Dr. Lal for his guidance and profound influence on my scientific career.

Sincerely,

Dr. Xiaodan Gao

College of Land and Environment, Shenyang Agriculture University, Shenyang

Congratulations to Manman Fan and Jingtao Wu!

From Manman Fan: “Hi guys, I am happy to share the good news with you. I got married last month. The ceremony was hosted in my husband’s hometown on Oct 26th. My husband and I are classmates supervised by the same advisor in China. We feel marriage is an amazing thing which makes us happy and energetic to work harder since we know more responsibility. We are very thankful to our parents’ support and encouragement. We are also very thankful for the help from Dr Lal and other colleagues, visiting scholars, graduates in C-MASC during my stay in OSU. Now we are studying and living in Nanjing, and will find jobs in Nanjing, too. We are both working harder than before in order to graduate hopefully in June 2020. After graduation, I plan to be a teacher in a college, while my husband tries to find a job in an research institute. We hope to update a satisfying result with you next year. We are also looking forward to your visiting in Nanjing!”



The Climate Underground

Carthage, TN, USA

October 14

Dr. Lal attended The Climate Underground conference dedicated to the importance of managing the world's soils to mitigating climate change. Sponsored by former Vice President Al Gore, approximately 400 people attended the event. Dr. Lal made a brief presentation entitled "A Soil-Centric Green Revolution for the 21st Century" and participated in the panel discussion.



Former Vice President Al Gore at The Climate Underground



Members of the panel from left to right: Debbie Reed (moderator), James Collins (Corteva Agriscience), Dr. Rattan Lal, David Festa (EDF), Erin Fitzgerald (USFRA)

The Borlaug Dialogue

Des Moines, IA USA

October 15-16

Dr. Lal accompanied Ms. Nour El Houda Abed, C-MASC's USDA Borlaug scholar to Des Moines, Iowa, for The Bourlaug Dialog event. There, he was also a panelist for the "Climate Positive Panel."

The 2019 GCHERA Event

Nanjing, China

October 28-29

At the 7th Annual Global Confederation of Higher Education Associations for Agricultural and Life Sciences (GCHERA) event, where the theme in 2019 was "Transforming Higher Education," Dr. Rattan Lal discussed "Preparing Graduates to Be Leaders in Solving Global Environmental Challenges." The GCHERA Laureate 2019 is José Miguel Aguilera, Professor Emeritus of the Department of Chemical and Bioprocess Engineering, Pontificia Universidad Católica de Chile.



Members and presenters at 2019 GCHERA event with Laureate José Miguel Aguilera

Adaptation of African Agriculture (AAA)

Marrakesh, Morocco

November 5

Professor Rattan Lal was in Marrakesh, Morocco to attend the meeting of the Board of the Adaptation of African Agriculture (AAA) and the Annual Ministerial Conference AAA. These are meetings of the ministers of agriculture of countries in Africa. The focus of discussion was the “Initiative for the Adaptation of African Agriculture to Climate Change,” adopted three years ago in 2016 during COP22. At this year’s meeting, Dr. Lal presented the IUSS’s highest honor, the Distinguished Service Medal to His Excellency, Moroccan Minister

of Agriculture, Aziz Akhannouch for his leadership to AAA.

This year’s AAA meeting focused primarily on “Food Security and Climate Change” and advocates the efforts to ensure food security in Africa by adopting recommended practices which are adapted to the changing climate. Dr. Lal, a member of AAA’s Scientific Board, presented a keynote lecture titled “Greening Africa” which discussed the ways



that Africa can most effectively utilize its vast resources to feed its growing population in ways that China and India did in the second half of the 20th Century.

From Moroccan periodical Vaaju.com:

Morning – Aziz Akhannouch receives the International Union of Soil Sciences medal

The medals for the International Union of Soil Sciences (IUSS) were awarded on Tuesday to Benguerir, the Minister of Agriculture, Sea Fisheries, Rural Development and Water and Forests, and the President of the Foundation for Adaptation of African Agriculture to Climate Change (AAA), Aziz Akhannouch. This distinction was made at the second annual ministerial conference of the African Climate Change Initiative, which was held under the theme “Food Safety for Climate Change” at the University of Mohammed VI Polytechnic (UM6P). Ben Guerir. This very prestigious award was presented to the minister by Professor Rattan Lal, an outstanding professor at Ohio State University, Nobel Laureate and honorary member of the AAA Foundation, for his work in support of sustainable agricultural

development and the promotion of sustainable agriculture. African adaptation to the climate change initiative. Extensive and supported by His Majesty King Mohammed VI, the “Triple A” initiative was launched by the Kingdom at COP 22 and was given following the high instructions of the sovereign by a foundation chaired by Mr Akhannouch. Note that on Tuesday, the UM6P hosted the second annual ministerial conference for the African Climate Change Initiative (AAA initiative), a high potential solution for managing food insecurity and climate change in Africa. This high-level event, organized in partnership with UM6P and the OCP Group, brings together 28 foreign delegations, including 20 African Ministers, representatives of African governments, international financial institutions such as the World Bank, the United Nations Food and Agriculture (FAO), the African Development Bank (AfDB), donors and several internationally renowned researchers.

— <https://vaaju.com/morroco/morning-aziz-akhannouch-receives-the-international-union-of-soil-sciences-medal/>

ASA-CSSA-SSSA International Meeting

San Antonio, TX, USA

November 10-13

“Embracing the Digital Environment” was the theme of the Annual ASA-CSSA-SSSA International Meeting. Participants from C-MASC included Visiting Scholar Nour El Houda Abed from Algeria, PhD candidate Ellen Maas, and Prof. Rattan Lal. Ellen Maas made a presentation entitled “A Model Ensemble Approach to Predicting Future Sorghum Cropping System Effects at the Field Level,” and Dr. Lal spoke about “Climate Change Impacts on Soil Quality and Soil Degradation.”

US Awasthi IFFCO Award

New Dehli, India

December 2

The recipients of the 2019 U.S. Awasthi IFFCO Award are Dr. Sachchida Nand, Engineer with FAI, and Prof. Rattan Lal. These awards were presented at the 55th Annual Seminar of the Fertiliser Association of India (FAI). Professor Lal received the award for Lifetime Achievement Research and Development in New Dehli, India on December 2, 2019. About 1200 colleagues attended the event.

Dr. Sachchida Nand holds a PhD in Chemical Engineering from University of Ottawa, Canada, and also M.Tech as well as a PhD from IIT Delhi. He has several years of research experience in India, Canada & USA in the areas of hydrocarbon reforming, coal gasification and coal desulfurization.

Dr. Udai Shankar Awasthi is currently the Managing Director



From left to right: Professor Rattan Lal, Dr. Udai Shankar Awasthi, and Dr. Sachchida Nand

(MD) and CEO of Indian Farmers Fertilisers Cooperative (IFFCO). Founded in 1967, IFFCO today is the largest fertiliser cooperative empowering more than 4 crore farmer and cooperative members. A domain expert in Chemical fertiliser, Urea, Cooperative, Leadership, and Project Management, US Awasthi is an authority in food security.

Announcing the Awards DG of FAI Satish Chandra, highlighted the achievements of the

awardees Dr. Lal and Dr. Nand, saying, “They have made extraordinary contributions in their chosen fields of work in fertilisers and agriculture.” The winners of the Awards were decided by a jury of eminent persons, he added.

The awards were given away by Union Minister of State for Chemicals and Fertilizers Mansukh Mandaviya and Chhabilendra Roul, Secretary of Chemicals & Fertilizers.



Minister of Agriculture of Chile Antonio Walker Prieto (right) with Dr. Rattan Lal at COP25 in Madrid



Dr. Rattan Lal speaking at COP25

COP 25

Madrid, Spain

The Ministers of Chile invited Dr. Lal to speak at COP25 took place in Madrid, Spain. There, Dr. Lal met with dozens of Environmental and Agricultural Ministers from Europe and Latin America to present his talk about the “Relevance of Science to Agriculture and Climate

December 3-5

Change in the LAC Region.” At the conclusion of the meeting, the Ministers each signed an agreement to implement the techniques that Dr. Lal proposed to mitigate climate change through best agricultural practices and proper soil maintenance. This initiative is entitled the “Platform

on Climate Action in Agriculture” or PLACA.

PLACA is a regional voluntary collaboration, “which seeks to generate a regional space for exchange of practices and collaboration relative to the implementation of measures on climate change for agriculture, in order to effectively adapt and mitigate in the agricultural sector.” Many have suggested that COP25, the last COP before the world must reduce carbon emissions, is one of the most important meetings of our time. PLACA reflects this sense of urgency.



Dr. Rattan Lal, Vice Minister Ana Christina Quiros Soto of Costa Rica, President of the COP25 Minister Carolina Schmidt Zaldivar, Minister Antonio Walker Prieto



Ministers of Agriculture from Latin America and the Caribbean signing the PLACA agreement

Quarterly Publications

Upcoming Important Meetings and Conferences

1. Indian Academy of Sciences, 1-6 January, 2020
2. Pullman, Washington, USA 23-24 January, 2020
3. Korea World Peace Summit, Seoul, Korea, 2-6 February, 2020
4. Melbourne, Australia, 15-19 February 2020
5. Morocco, 26-28 2020
6. National Academy of Sciences, Washington, D.C., USA, 4-6 March 2020
7. Montreal, Canada, 18-21 March 2020

Referred Journal Articles

- Das, A., J. Layek, G.I. Ramkrushna et al. 2019. Effects of tillage and rice residue management practices on lentil root architecture, productivity and soil properties in India's Lower Himalayas. *Soil & Tillage Research* 194: 104313
- Feng, X., G. Hongjun, R. Lal, et al. 2019. Nitrous oxide emission, global warming potential, and denitrifier abundances as affected by long-term fertilization on Mollisols of Northeastern China.
- Lal, R. 2019. Carbon Cycling in Global Drylands. *Current Climate Change Reports* 5(3): 221-232.
- Lal, R. 2019. Managing soils for resolving the conflict between agriculture and nature: The hard talk. *European Journal of Soil Science*.
- Serafim, M.E., Zeviani, W.M., Ono, F.B., Neves, L.G., Silva, B.M., Lal, R. 2019. Reference values and soil quality in areas of high soybean yield in Cerrado region, Brazil. *Soil & Tillage Research*. 195. <https://doi.org/10.1016/j.still.2019.104362>.
- Zhao, X, Liu, B-Y, Liu, S-L, Qi, J-Y, Wang, X., Pu, C. Li, S-S, Zhang, X-Z, Yang, X-G, Lal, R. Chen, F., Zhang, H-L. Sustaining crop production in China's cropland by crop residue retention: A meta-analysis. *Land Degrad Dev*. 2019; 1– 16. <https://doi.org/10.1002/ldr.3492>

Invited Keynote Speeches

- Lal, R. 2019. A Soil-Centric Green Revolution for the 21st Century, 14-15 October 2019, Carthage, Tennessee, USA.
- Lal, R. 2019. The Wholistic and Nexus Thinking to Address Complex Issues. Food, Energy, Water Systems Transdisciplinary Environmental Research Network, 26-28 October 2019, Seattle, Washington, USA.
- Lal, R. 2019. Adaptation and Mitigation of Climate Change in India by Soil Conservation and Restoration. Soil and Water Resources Management for Climate Smart Agriculture and Global Food and Livelihood Security. 5-9 November 2019, New Delhi, India.
- Lal, R. 2019. Climate Postive Panel. World Food Prize Conference. 14-16 October, 2019. Des Moines, Iowa, USA.
- Lal, R. 2019. Preparing Graduates to Be Leaders in Solving Global Environmental Challenges. Transforming Higher Education: GCHERA Conference. 28-29 October 2019, Nanjing, China.
- Lal, R. 2019. Greening Africa. 2nd Adapation of African Agriculture Meeting. 4-5 November, 2019. Marrakesh, Morocco.
- Lal, R. Climate Change Impacts on Soil Quality and Soil Degradation. SSSA Special Symposium on Soil Chemistry and Climate Change. Embracing the Digital Environment, ASA-SSA-CSA International Annual Meeting. 11-14 November 2019. San Antonio, Texas, USA.
- Lal, R. 2019. Relevance of Science to Agriculture and Climate Change in the LAC Region. COP25. 3-5 December 2019. Madrid, Spain.
- Lal, R. Managing Forests and Agriculture in Indonesia for Food and Climate. 11-12 December 2019. Jakarta, Indonesia.

A Ph.D Student conducting his thesis research at the Ohio State University



Photos courtesy of Mr. Robert Klingensmith

CONTACT INFORMATION

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

Carbon Management and Sequestration Center (C-MASC)
210 Kottman Hall, 2021 Coffey Rd.
Columbus, OH 43210

Email: lal.1@osu.edu

Please see Dr. Lal's TV
interview with the *Ohio
State Alumni Magazine*
here (cut and paste):

[https://www.youtube.com/
watch?v=53z-97IKkul#ac-
tion=share](https://www.youtube.com/watch?v=53z-97IKkul#action=share)



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