



OARDC

FALL 2009

Newsletter



# Students Abroad: Samy Sekar, India

After 12 visits to India, one might think that I would have seen it all; I'd seen the Taj Mahal, Bangalore – the IT center of India, and some of the oldest temples in the world, but this summer I experienced the “real” India for the first time. I stayed in a hostel (dorm) at the Tamil Nadu Agricultural University where I met students who were sons and daughters of farmers or grew up in village communities or small towns. They were much different from westernized, sophisticated youth I see in the cities. And of course, because the trip was for business as well as pleasure, I learned about the research and community outreach being performed in the Soil Science and Environmental Science departments as well as the Water Technology Center.

The professors I visited were doing research and outreach ranging from creating mathematical models to determine the most efficient fertilizer and manure applications for a specific crop in a specific type of soil to extension work involving system rice intensification, precision farming and fertigation. It seems that most of the focus was on soil fertility and efficiency, because those are the major challenges facing the Tamil Nadu farmers whose land is quickly degrading due to unsustainable farming techniques.

I chose to focus on heavy metal contamination of soils and ultimately the ecosystem of Vellore, Tamil Nadu. Vellore district is a center for leather tanneries, and has become notoriously famous for its chromium contamination. The relatively insoluble trivalent chromium released by the tanneries is being oxidized to the soluble and hazardous hexavalent chromium in and spreading to the groundwater and ultimately to the members of the ecosystem, including humans. This toxic

chromium has already led to agricultural problems, because many of the crop varieties being grown in the area are intolerant of such high chromium concentrations, but additionally, I am interested in seeing how this heavy metal is affecting human and wildlife health.

Along with my wonderful educational experiences, I was able to meet with many of extended family, enjoy some leisure time, and attend my second Indian Wedding. The trip was overall a great success!

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C-MASC

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## Students Abroad: Melissa Herman, Africa

During the summer of 2009, I had the opportunity to lead a 5-person team to an agriculture community in Western Kenya for a 10-day trip. One of my objectives was to tour many of the farms (or *shambas*) throughout the area to better understand the community's farming resources and limitations. Many of the farmers we visited are incredibly innovative. They understand their soil and crops, and have carefully planned where each crop and tree should be planted. They are wise stewards of their resources, as they are maximizing productivity on their small parcels of land and successfully providing for their families. However, there are also farmers who, unfortunately, lack both the capital and education to make such decisions, and consequently are struggling.



I also had several opportunities to speak to small groups of farmers about their agricultural practices. I discussed with them what I have learned about Kenya's agriculture from my previous research project, as well as what I was learning from touring their farms. The mismanaged land in Western Kenya has the potential to be very rich. I was able to continually share with the farmers about two key issues I was seeing: (i) problems of erosion, (ii) your soil is like a bank account; you can't take out more nutrients than you put in. I was able to explain the importance of each, and then give them suggestions to improve their farming, such as practicing crop rotation and leaving crop residue on the soil to act as a mulch cover and to replenish nutrients.

## Visiting Scholars



**HEBA** arrived at OSU in August 2009 and will be here until August 2010. She is working on quality of soils of Egypt.

### **HEBA YAHIA ELBASIOUNY: Egypt**

- B Sc. in Environmental and Biological Sciences (2000); Master in Agricultural Sciences (2005) both from Al-Azhar University - May 2000
- PhD student in kafr Elsheikh University (Egypt).
- I worked as administrator at department of (Environmental and Biological Sciences) in Al Azhar University (Egypt) (2001-2005) and assistant lecturer at the same department (2005-present). Hobbies are computer and traveling.

### • **Researches and conferences**

Mahmoud A. Medany, Heba Y. El-Basiony and Nabil N. EL-Hefnawy (2007). The impact of Climate Change on Sea Level Rise at North of Nile Delta. International Conference on Climatic Changes and their Impacts on Coastal Zones and River Deltas. Alexandria , Egypt from 21- 25 April 2007.

### • **Research Interest**

- Environment, environmental sensitivity and environmental degradation
- Land degradation and it's relation to environmental degradation
- Climate Change

### **DR. ARINDAM DATTA: India**

Center on Global Change  
Radio & Atmospheric Science Division  
National Physical Laboratory

**Doctor of Philosophy in Environmental Science, 2008**

University of Kalyani, West Bengal, India

### **RESEARCH INTEREST**

- Global climate change
- C and N dynamics; Biosphere-atmosphere trace gas exchange in ecosystems especially in agricultural ecosystems. N loss from agricultural ecosystems.
- Study of carbon sequestration in agricultural system.
- Development of emission factor from biomass fuel burning in rural areas.
- Process based Biogeochemical modeling combined with classical field ecology.
- Development of strategies for adaptation and mitigation to climate change.



**ARINDAM** arrived at OSU in August 2009 and will be here for 9 months. He is conducting research on gaseous emissions from soils.

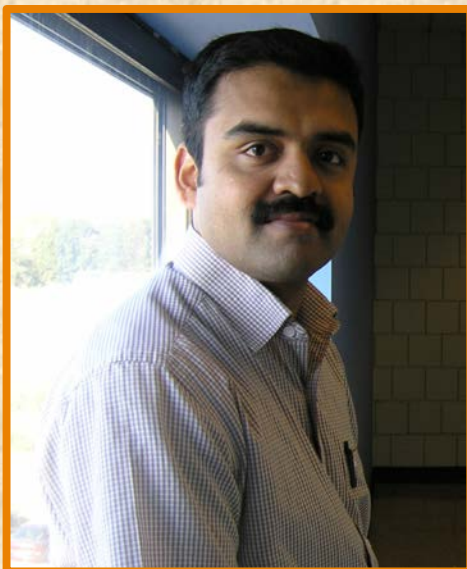
## Visiting Scholars Continued...

### Dr. A.H.M. Mustafizur Rahman: Bangladesh

- M Sc. University of Dhaka 1975 Honors in Soil Science
- Ph. D. From the University of Nancy, France, 1986
- Former Scientific Officer, 1977 Soil Resource Dev. Institute, Under the Ministry of Agriculture, Govt. of Bangladesh
- Joined as Research fellow at CNRS –France 1982
- Joined as Assistant Professor, Department Soil Science, University of Dhaka-1987
  - Associate Professor, 1990 Professor 1994
- ~50 journal publication, editor of 3 books.
- Chairman, Association of Environmental Scientists of SE Asia
- Chief Coordinator of DU-CNRS collaborative research program
- PI for Biological N Fixation in rice production
- President of MEGHDOOT
- Executive Member of Alliance Francaise de Dacca
- Executive Member of Dhaka University Alumni Association
- Founder Curzon Hall Club, University of Dhaka



**Dr. Rahman** visited OSU for 3 weeks in September 2009. He helped edit the book based on the Dhaka Symposium.



**Rajith** spent the summer of 2009 with C-MASC as a postdoctoral researcher.

### Dr. Rajith Mukundan: India

A native of Kerala, India.

M Sc. Tamil Nadu Agricultural University, 2003

Ph.D., University of Georgia, Athens, GA, 2009

#### RESEARCH INTEREST:

- Water quality
- Sediment transport
- Environmental pollution
- GIS



While at the Carbon Management and Sequestration Center, Dr. Mukundan mapped regional soil C pool and predicted changes occurring due to agricultural management practices to gain a better understanding on the importance of terrestrial carbon sequestration in mitigating the build up of atmospheric CO<sub>2</sub>, and the resulting global climate change.

## Visiting Scholars Continued...



**Christian** of Shell, U.K., spent a week in August 2009 with C-MASC researchers.

### **CHRISTIAN DAVIES: England**

Christian has a BSc in Biology with Professional Experience from the University of Salford (1999). He conducted a year in industry at the Centre for Ecology and Hydrology in Lancaster working with Nisha Parekh and Phil Ineson on methane oxidation in soils, developing a  $^{13}\text{C}$  Stable Isotope Probing (SIP) technique to identify methane oxidising bacteria in soil. Christian did his PhD at the University of Edinburgh, School of Geosciences (2005), working on the effects of land use change on nitric and nitrous oxide emissions from soil. Christian conducted postdoctoral research at Queen Mary University of London applying  $^{15}\text{N}$  stable isotope techniques to identify microbial processes responsible for the production of nitrous oxide in the Indian Ocean, in addition he worked on the novel N cycle process anammox in marine ecosystems. He was recruited to the Odum School of Ecology at the University of Georgia in the US as a postdoc, where he was researching the effects of global climate change on soil microbial processes and soil C cycle dynamics. Christian joined Shell Global Solutions as an Environmental Biotechnologist in 2008 to evaluate soil C and N budgets for various biofuel production systems.

### **VISITORS SCHOLARS TO ATTEND THE FALL SWAMI WORKSHOP at OSU (21-26 Sept. 2009):**

- **DR. MANJIT S. KANG** is currently the Vice Chancellor of Punjab Agricultural University at Ludhiana. He previously served as Professor of Quantitative Genetics in the School of Plant, Environmental, and Soil Sciences, Louisiana State University Agricultural Center and LSU A&M campuses in Baton Rouge, for 21 years. He received his Ph.D. degree in 1977 in Crop Science (Genetics and Plant Breeding) from the University of Missouri-Columbia. He earned M.S. and M.A. degrees in Plant Genetics and Botany from Southern Illinois University; and a B.Sc. (Agri. & Animal Husbandry) degree from Punjab Agricultural University.
- **Dr. S. C. SHARMA**, Regional Research Station Punjab Agricultural University  
BALLOWAL -SAUNKHRI
- **Dr. KRISHAN LAL KHERA**, Senior Soil Physicist Dept. of Soils, Punjab Agricultural University  
Ludhiana, India

## STUDENTS IN TRANSITION

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### C-MASC Graduates 2009

- Josh Beniston, M.Sc., Soil Science, Pursuing a PhD. from OSU, C-MASC
- Paula Chacon, M.Sc., Natural Resources, Pursuing soil science in Ecuador
- Anjail Dubey, M.Sc., Soil Science, Pursuing a PhD. from OSU, C-MASC
- Melissa Herman, B.S., Environmental Science, Pursuing a M.Sc. from OSU
- Sindu Jagadamma, PhD., Research Scientist, OSU, Wooster campus
- Umakant Mishra, PhD., Research Scientist, U of CA, Berkeley campus

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### Inorganic Fertilizer vs. Cattle Manure as Nitrogen Sources for Maize (*Zea Mays* L.) in Kakamega, Kenya

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**Melissa Herman**, Advisor: Rattan Lal

Despite worldwide efforts, Sub-Saharan Africa's (SSA) food security has not improved since 2000 when the United Nations published its Millennium Development Goals. There are many reasons for this, but inconsistent and inefficient soil management by farmers is a major contributing factor. Maize (*Zea Mays* L.) is one of the major staple foods in Kakamega, Kenya, a large agriculture community located in Kenya's Western Providence. The objective of this study was to assess effects of organic and inorganic sources of N, an important but limiting nutrient, on maize yields and soil quality in this community. The data on soil, plant analyses, and crop yields show that inorganic fertilizer produced grain yields 68% higher than that from manure. However, yields are low, concluding that the recommended N rate of 50 kg/ha is not enough to either sustain crop yields or restore the degraded soil systems.

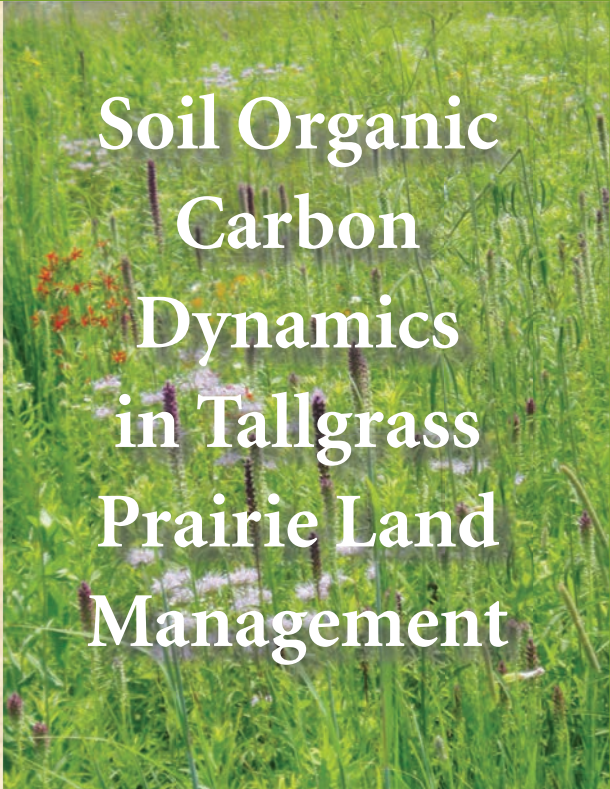
## GRADUATE EXIT SEMINAR

**Presenter:**  
Josh Beniston

**Date:**  
Monday, Sept. 14, 2009

**Time:**  
10:00 a.m.

**Location:**  
460 Kottman Hall



### Soil Organic Carbon Dynamics in Tallgrass Prairie Land Management

This study was composed of two research components that examined the effects of tallgrass prairie land use changes on soil organic C (SOC). The central objective of the first study was to examine changes in SOC and a suite of soil quality parameters in former agricultural soils now under restored tallgrass prairie. This research was conducted at the Prairie Nature Center, on the OSU Marion campus in northwest Ohio. Soils from 31 year, 13 year, and 8 year-old prairies, and adjacent agricultural and lawn soils were analyzed. These soils demonstrated significant increases in SOC concentration, particulate organic matter (POM), water stable aggregation (%WSA), aggregate mean weight diameter (MWD), total porosity (f<sub>t</sub>), and available water capacity (AWC), and significant decreases in soil bulk density associated with time under tallgrass prairie. The second research component observed long and short-term effects of the conversion of remnant tallgrass prairies to wheat production, in north central Kansas. Total C, microbial biomass C (MBC), and a particle size fractionation of SOC were used as indices of change. Long-term sites showed changes in all fractions analyzed, while only MBC showed significant change in the short-term study. This study provides further evidence that perennial plant communities store and cycle C, and maintain ecosystem processes at far greater levels than annual plant communities.



School of Environment and Natural Resources  
College of Food, Agricultural, and Environmental Sciences

## GRADUATE EXIT SEMINAR

**Date:** Friday, Sept. 11, 2009    **Time:** 1:00 p.m.    **Location:** 333C Kottman Hall

**Presenter:** Paula Chacon



### Land Use, Climatic and Structural Controls of Soil Organic Carbon in Costa Rican Ecoregions

Abrupt climate change (ACC) is an unprecedented global threat. Cost effective strategies to mitigate ACC include offsetting anthropogenic emissions through terrestrial carbon (C) sequestration. A field study was conducted to understand mechanisms of C sequestration in soils of Costa Rica and to assess their C sink capacity to offset anthropogenic emissions by different management scenarios. This study focused on characterizing the SOC pool up to 1 – m depth in 12 land uses, distributed in 3 contrasting ecoregions of Costa Rica. Specific objectives were to: (i) determine the effects of land use on SOC pool; (ii) evaluate the role of climatic controls on SOC pool; and, (iii) establish the role of primary and secondary soil particles on the physical protection of SOC. The hypothesis tested was that SOC pool is significantly influenced by climate and land use, and its stability is strongly dependent on the physical protection provided by soil aggregates and primary particles.

The C sink capacity of the soils in this study was of 18 - 37 Mg ha<sup>-1</sup> in the Atlantic Moist ecoregion, 14 - 89 Mg ha<sup>-1</sup> in the Pacific Dry ecoregion and 9 - 81 Mg ha<sup>-1</sup> in the Montane ecoregion. The total soil C pool for the country is estimated at 672 - 938 Tg of C, from which 473 ± 43 Tg C are from forest soils, 346 ± 91 Tg C in agricultural soils and 336 ± 61 Tg C in pasture soils.



## STUDENTS IN TRANSITION

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### New Students to OSU

- **Nick Stanich, M.Sc. Student**

**Interest:** Soil organic matter's contribution to soil resiliency. More specifically, determining critical limits of soil organic matter and how various soil components are affected by crossing critical SOM thresholds into irreversible degradation. Its bound to develop into something less inchoate as the quarter progresses.

- **Ryan Hottle, M.Sc. Student**

**Interest:** Generally, researching large-scale "fast-action" climate change mitigation strategies with focus on terrestrial carbon sequestration strategies involving ecological restoration and agroecology systems. Specifically, research focuses on biochar as a large-scale carbon sequestration pathway with ancillary benefits for renewable energy generation and soil restoration. Experimental design includes long-term field trial of biochar applied to maize-soy rotation in temperate Midwestern United States with investigations into costs and benefits, lifecycle analysis, and comparative impacts with no-till and conventional tillage systems.

- **Christopher Eastman, M.Sc. Student**

**Interest:** Measuring the changes in physical properties of Central Ohio agricultural soil (Typic Hapludalf) after biochar amendment in the context of 3 tillage regimes and 2 fertilizer regimes. The 10 year experiment will be conducted at Waterman Farm on a plot of corn/soybean. I'm expecting improved soil physical properties such as, infiltration and shear strength, and to sustain crop yield a reduced dependence on fertilizer with increasing biochar concentrations.

## President Gee Visits Two Agricultural Universities In India



Dr. Gee visited IARI, New Delhi on 12<sup>th</sup> August 2009. Photo (L to R) includes M.S. Swaminathan, Dr. G. Gee, Dr. Rattan Lal, Dr. M.S. Dhu Walia and Dr. R.S. Paroda.

NEW DELHI, India – Dr. Gee and members of his entourage visited the India Agricultural Research Institute (IARI) on 12<sup>th</sup> August 2009. President Gee presented a seminar at the Indian Academy of Agricultural Sciences, and discussed possibilities of collaboration with leaders in agricultural sciences in India. President Gee met with M.S. Swaminathan, Dr. R.S. Paroda, Dr. Mangle Raj, and Dr. M.S. Ahluwalia. In addition, Dr. Rattan Lal, Professor of Soil Science at OSU was presented with the M.S. Swaminathan Award.

The award recognizes those who have made great impacts in the field of agriculture on a global basis, and in food security and sustainability of agriculture in India. “For nearly 20 years, it has been my good fortune to know Dr. Rattan Lal,” Gee told the standing room only crowd at the awards ceremony. “As one of the world’s preeminent soil scientists, he is on the front lines in fighting hunger and finding solutions to global warming. At The Ohio State University, he is essential - just like the soil that he studies.” Continued on Page 10....

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Lal, a professor in the School of Environment and Natural Resources in the College of FAES, is director of the Carbon Management and Sequestration Center. He also serves the Ohio Agricultural Research and Development Center.

President Gee and his entourage also visited the N.G.R.R. Agricultural University in Hyderabad. The delegation later called upon Her Excellency the President of India, Smt. Pratibha Patil. She emphasized the need for improving agricultural production and conserving water on farm land. President Gee signed a MOA with the Ministry of Science and Technology, and called upon Hon'ble Ministers P.R. Chavan and K. Sibal. Earlier, President Gee also met with Mr. Ratan Tata. Mr. Tata received the Honorary Degree from OSU in 2005.



From left to right: Rebeka Gee, Gordon Gee, William Brustein, Rattan Lal