Discussing his role as Director of the Low Carbon Agriculture Research Center at Shanghai Jiao Tong University, China, the excitement of discovery and the direction his field is taking on all corners of the globe, University of New Hampshire Research Professor Changsheng Li is helping to guide agricultural research for improved environmental and societal health.

Firstly, why did you move to the US?

I moved to the US to work at the headquarters of the Environment Protection Agency in the late 1980s. I was involved in the greenhouse gas emissions inventory from agricultural land in the US. I led a group that developed a model called DeNitrification-DeComposition (DNDC) to quantify greenhouse gas emissions from soils. However, I was not entirely satisfied in conducting government research so when the University of New Hampshire offered me a faculty position, I happily accepted it.

Could you offer a brief overview of the DNDC model?

DNDC is a computer simulation model of carbon and nitrogen cycling in agricultural systems. As all three greenhouse gases – carbon dioxide, nitrous oxide and methane – consist of two major elements, carbon and nitrogen, we can predict the behaviour, or cycling, of carbon and nitrogen and thus gain the ability to predict greenhouse gas emissions.

We spent five years developing the model framework and a further 15 years testing the model in other countries, including the UK. Actually, the UK has adopted this model already. The Rothamsted Research group uses our model and links it to a UK database, and they have named it the UK-DNDC. The EU, Canada, New Zealand, Japan and China have developed their own versions of the DNDC model as well. I recommend people use this model as a top priority for greenhouse gas mitigation.

Could you give insight into your role as Director of the Low Carbon Agriculture Research Center at Shanghai Jiao Tong University? What is your major focus at present?

As Director, I tend to advise my colleagues on how to deliver services from their research to sustain agriculture. In China it is happening a little slowly, but food remains a top priority. Some significant environmental issues arise from Chinese agriculture, such as air and water pollution. This position is an opportunity for me to transfer my experience from my time in the US to help people to start thinking not only about agricultural production but also global environmental issues, like greenhouse gas emissions; emitted locally but with global consequences. These are the types of issues I want to address.

The name of the Center emphasises low carbon solutions, with a new orientation of agricultural studies paying more attention to greenhouse gas emissions. I hope I can support and enhance this direction.

International cooperation and exchange in science and technology are currently important priorities for China and other nations. How can such cooperation be boosted?

This type of collaboration is especially important for Chinese agriculture. If we want to enhance such collaboration we have to pay attention to timescales. In the short term, if this type of collaboration is mutually beneficial then we can make fast progress. Meanwhile, we have to pay attention to our long-term goals. I think the best way of achieving long-term collaboration is to train and educate the younger generation to give them a broad view of agriculture across the planet – not only how it provides sustenance for survival, but how we can perform agriculture to sustain environmental safety.

Why are such collaborations specifically important to China?

Agriculture is a big issue in China because we need to supply food to so many people. However, people didn’t realise that agricultural production caused a lot of environmental problems at first. For example, local water contamination has caused increased rates of cancer in the countryside,
and combustion of crop residue causes air pollution which directly relates to the current issues with smog across the entire country. I think we should encourage Chinese people to realise that these issues have worldwide ramifications. If we cannot cease global warming, Chinese agricultural production will be interrupted and severely diminish.

You recently attended the Pujiang Innovation Forum (October, 2014). What was your key message to the delegates?

A 20 minute presentation is not a long time for me to talk about all these issues, but I discussed feedback between agricultural production and the global environment, especially climate change, asking: what is the influence of climate change on Chinese agriculture and how can Chinese agriculture affect or improve issues of international importance?

As a platform to promote exchange and interaction among various Chinese and international stakeholders, how important was the Pujiang Innovation Forum to your endeavours?

The Forum is important because you can spread your word to a broader audience than simply your research institution or government agency. It’s also important people understand the issues without using special terminology. This kind of presentation should be routine so we can inform and gradually change the behaviour of stakeholders in agriculture.

Finland and Sichuan were the designated Country and Province of Honor, respectively, at this year’s Forum. Why are these regions significant to your research?

I have been working with several research groups in both regions, focusing mainly on greenhouse gas emissions from their agricultural production. In Finland I spent quite a long time in a small place called Kuopio, where they turned the peatland into cropland, planting a lot of trees for biofuel in order to support the energy supply. However, when the soil is cultivated methane, nitrous oxide and carbon dioxide gases are emitted.

Sichuan is a very different place, with a warm climate and rich soil, but it shares the same problem. Sichuan farmers also release greenhouse gases into the atmosphere. I believe that in working together these two places can benefit the planet.

What first led you to develop an interest in the environment and ecology?

When I was young, in my hometown in Xian, China, a lot of farmers were suffering from strange diseases and heart failure. They were dying suddenly in the winter and almost half the population died in one night in the villages. It was a very severe medical issue. I asked my father what was happening and he told me it was due to the poor quality of the local water supply and soil, although he was unable to explain what the pollutant was. As a result, I majored in geochemistry in college, and learned that there exists a discipline known as biogeochemistry which focuses on chemical elements transferred through animals and plants that can cause strange diseases. When I had the chance for further training, I studied these kinds of diseases and found that the strange deaths in my region were caused by a deficiency in selenium. It is a nutrient in soil and water and is only present in trace amounts, but if a deficiency occurs it affects heart tissue. When farmers harvest crops, they disturb the soil. The nutrients in the top soil are leached into the river where they dissolve. This was a very big issue in China in the 1940s and up until the 1960s.

From our finding that the reason for heart failure was deficiency in selenium, medical doctors placed selenium in food – in biscuits and all food supplied to the affected areas – and the disease was effectively controlled.