UK-China Sustainable Agriculture Innovation Network (SAIN)

Update

January - March 2012

Work in Progress

"Low Carbon Agriculture" project final workshop held in Beijing

Beijing, 19th March 2012, Chinese Ministry of Agriculture (MoA) and British Embassy Beijing co-hosted the workshop "China's low Carbon Agriculture Technology and Policy". This is the final workshop of SAIN project "*Improved Nutrient Management in Agriculture – a Key Contribution to the Low Carbon Economy*".


The workshop was attended by more than 70 policy makers, academics and business sector representatives from Ministry of Agriculture (MoA), National Development and Reform Commission (NDRC), Ministry of Industry and Information Technology, China Nitrogen Fertiliser Association, National Agricultural Technology Extension Centre, Chinese Academy of Sciences, Shanghai Jiaotong University, China Agricultural University, representatives of Jilin, Shandong, Jiangsu, Shaanxi, Guangdong, Hebei provinces and Chongqing Municipal. Mr Liu Yingjie, Deputy Director General of International Cooperation Department, MoA, John Ewards, Energy and Climate Change Counsellor of British Embassy opened the workshop and delivered welcome speech.

Led by Prof David Powlson of Rothamsted Research and Prof Zhang Fusuo of China Agricultural University, this FCO and MoA funded three-year project was implemented by China Agricultural University (Zhang Fusuo, Zhang Weifeng), Centre for Chinese Agricultural Policy (Huang Jikun, Jia Xiangping), Rothamsted Research (David Powlson and Dave Chadwick), University College London (David Norse) and University of East Anglia (Yuelai Lu).

The project so far produced three Policy Briefs. Policy Brief No1, "*Improved Nutrient Management in Agriculture – A Neglected Opportunity for China's Low Carbon Growth Path*" quantified greenhouse gases emission associated to nitrogen fertilisers in China; Policy Brief No2, "*Greater food security and a better environmentthrough improved nitrogen fertilizer management*" demonstrated overcome overuse of nitrogen fertilisers in China will not damage food security, but deliver multiple benefit of reduced greenhouse gases emission, reduce non-point pollution, increase rural income and reduce national energy waste; Policy Brief No5, "*Policies and technologies to overcome excessive and inefficient use of nitrogen fertilizer: delivering multiple benefits*" identified 9 technologies and support policies to increase nitrogen fertilizer use efficiency and reduce the overuse and misuse of nitrogen fertilisers.

Analyses in the project showed that there is substantial scope for reducing national greenhouse gas emissions in China by reducing unnecessarily large nitrogen fertilizer applications to crops. Savings come from emissions of carbon dioxide during fertilizer manufacture and nitrous oxide after it is applied to soil, including direct and indirect emissions. The project team developed a series of scenarios to quantify the potential savings from a range of changes in practice, affecting both the industrial processes of nitrogen fertilizer manufacture and the use of fertilizer by farmers. A key conclusion is that the technical innovations and changes in management practices needed to achieve the environmental and economic gains will only be adopted if there are changes in policies. And policies in the agricultural sector will only be effective if they take account of the current situation in which many farmers are "part time", deriving a substantial fraction of household income from off-farm work. Policies and financial structure to encourage the development of a contractor sector to take on the task of fertilizer management would be highly beneficial. In addition to policies directly applicable to fertilizer, the team drew attention to opportunities to utilise nutrients from manures far more efficiently and thus reduce pollution of air and water and further decrease the need for synthetic fertilizers (See Manure Use project profile). But, again, to achieve this desirable result policies and financial incentives are required that take account of the numerous pressures and time constraints of part-time farmers

Completion of ADMIT project

SAIN project '*ADMIT: harmonising adaptation and mitigation for agriculture and water* in China' comes to a close with the end of March 2012. It was a collaboration between University of East Anglia, Cranfield University, Centre for Chinese Agricultural Policy and Chinese Academy of Agricultural Sciences led by Prof Lin Erda and Prof Declan Conway. During the past 2 years a large range of activities have been undertaken and the project has organised workshops both in the UK and China, inviting stakeholders and experts in a discussion of 'Energy use in the water sector' and 'Policy scenarios for harmonising water and energy use for irrigation in China'. The project has made a great step in closing the knowledge gap on the water-energy-environment nexus. One of the most significant outputs is a review paper published in Nature Climate Change that explores more than 100 studies on energy use and greenhouse gas emissions in the water sector and maps the tools for estimation. This paper highlights the lack of focus on as well as the importance of this topic. In another paper, a first estimate of energy use and associated greenhouse gas emissions from groundwater pumping for irrigation in China is presented. The results show that groundwater pumping for irrigation alone is substantial, accounting for over half a percent of China's total emissions. Further reports include a policy brief evaluating water-saving technologies and a detailed review of reporting standards and estimation tools for energy and greenhouse gas emissions in water management. Integrated resource management and planning is crucial to identify trade-offs and potential co-benefits between water, energy and environment – especially when adapting to climate change. The research of the ADMIT project aids the understanding of energy embedded in water and supports the development of policy strategies for harmonising adaptation and mitigation.

Links to publications:

Rothausen, S.G.S.A. and Conway, D. (2011) Greenhouse-gas emissions from energy use in the water sector. Nature Climate Change 1, 210–219

J. Wang, S.G.S.A Rothausen, D. Conway, L. Zhang, W. Xiong, I.P. Holman and Y. Li (2012) China's water-energy nexus: greenhouse-gas emissions from groundwater use for agriculture. Environmental Research Letters 7 (014035).

SAIN project findings presented at *Planet under Pressure 2012* conference

On behalf of project team, David Powlson spoke at major global conference *Planet under Pressure 2012: New Knowledge towards Solutions* in London on 27th Match. The title of his presentation is "*Overuse of Nitrogen: Insights from the Chinese Experience".*

Abstract - China plays a significant role in the global nitrogen (N) cycle and agriculture's contribution to climate change. This is partly the consequence of the overuse and mismanagement of synthetic N fertilizer and manure. China now produces >35% of the world's synthetic N fertilizer (largely from coal); its livestock sector generates about 20 million tonnes of N; its methane (CH_4) and nitrous oxide (N_2O) emissions account for ~12 and > 30% respectively of total global agricultural emissions of these GHGs .

China's impact on the global N cycle role is primarily the consequence of the high priority given by the Government of China to ensure food security by maintaining 95% self-sufficiency in basic foods (notably grains) and keeping food prices low. This has been achieved by direct and indirect subsidies and extension messages that emphasise increasing production rather than raising N use efficiency (NUE) and productivity. NUE has declined from >40 to <23 kg grain per kg N applied over the last 30 years whilst application rates increased ~400%. The result has been widespread overuse and mismanagement of synthetic N fertilizers and manure (though pockets of underuse also occur) and a range of economic and environmental problems. .

During the past 10 years and in the current 5 year plan, China has been introducing a wide range of reforms, policies and technological measures to produce and use fertilizer N more efficiently, thus contributing to a shift of the Chinese economy on to a low carbon (C) growth path, and reducing the negative externalities of the current production systems. These actions are pro-poor; pro-climate change mitigation and pro-ecosystem health. This paper considers these actions in more depth and discusses how the Chinese experience could help other developing countries to avoid or correct the N rate 'overshoot' problem and achieve sustainable intensification.

Click here for details

Publications

David Norse, Low carbon agriculture: Objectives and policy pathways, *Environmental Development* 1 (2012) 25–39

Abstract - The threat of long-term climate change has driven a number of international and national bodies to call for a re-direction of development pathways so that they are more resource efficient and use less carbon (C) in the form of fossil fuel per unit of economic growth and cause lower greenhouse gas emissions (GHGs). Agriculture is one of the largest anthropogenic sources of GHG emissions yet few authorities take account of this fact in their proposals and programmes for low C development. Hence this policy review examines the case for promoting strategies and policies for low C agricultural growth. Most of the policy and technological options that it considers have already been put forward by the Intergovernmental Panel on Climate Change (IPCC) and others in the context of climate change mitigation, but constraints to their implementation have often been underestimated. This review reassesses their potential contribution in the light of known bio-physical, socio-economic and institutional limitations. It concludes that there is a very strong case for greatly increasing the priority given to policies for low C growth which can be true win–win–win responses. Many of them are more cost-effective than the responses available to other sectors. They can be pro-poor and have other socio-economic benefits. They not only limit GHG emissions but also provide a range of other environmental

and ecosystem benefits. However there can be significant barriers to implementation that must be overcome by national policies shaped to meet the needs of different farmer groups and agricultural systems.

Click here to read the full paper.

Jinxia Wang, Sabrina G S A Rothausen, Declan Conway, Lijuan Zhang, Wei Xiong, Ian P Holman and Yumin Li, China's water–energy nexus: greenhouse-gas emissions from groundwater use for agriculture, Environ. *Res. Lett.* 7 (2012) 014035 (10pp)

Abstract - China is the world's largest emitter of greenhouse gases (GHGs) and the agricultural sector in China is responsible for 17–20% of annual emissions and 62% of total freshwater use. Groundwater abstraction in China has increased rapidly from 10 $km^3\ yr^{-1}$ in the 1950s to more than 100 $km^3\ yr^{-1}$ in the 2000s, such that roughly 70% of the irrigated area in northern China is now groundwater-fed. Pumping of water for irrigation is one of the most energy consuming on-farm processes; however, to date this source of GHG emissions in China and elsewhere has been relatively neglected. We derive the first detailed estimate of GHG emissions from groundwater pumping for irrigation in China, using extensive village survey data from 11 provinces, broadly representative of the situation during the mid-2000s. The 11 provinces cover roughly half of China's irrigated cropland and we upscale to the national level using government statistics for the remaining 20 provinces. Our results show emissions of 33.1 $MtCO_2e$, just over half a per cent of the national total. Groundwater abstraction represents an important source of GHG emissions that has been rapidly increasing and which at present is largely unregulated. Water scarcity in China is already driving policies to improve water conservation. These results suggest that significant potential exists to promote the co-benefits of water and energy saving in order to meet national planning targets.

Click here to read the full paper.

Other News

Knighthood for SAIN Co-chair, Prof Bob Watson

Congratulations to Sir Bob Watson, Co-chair of SAIN Governing Board, Defra's chief scientific adviser, who has been honoured with a knighthood in the New Year's list for his contribution to science**.**
On receiving the news Bob said: "I am delighted and humbled by this honour, which implicitly recognises the value of scientific knowledge in national and international environmental policy formulation. Of all the honours I have received this is very special, not only to me but also to my family and friends."

Bob was also elected as Fellow of Royal Society in May 2011.

What Next for Agriculture After Durban?

Beddington J R, Asaduzzaman M, Clark M E, Fernández Bremauntz A, Guillou M D, Howlett D J B, Jahn M M, Lin E, Mamo T, Negra C, Nobre C A, Scholes R J, van Bo N and Wakhungu J (2012). What Next for Agriculture After Durban? Science, 335 289-290

Global agriculture must produce more food to feed a growing population. Yet scientific assessments point to climate change as a growing threat to agricultural yields and food security. Recent droughts and floods in the Horn of Africa, Russia, Pakistan, and Australia affected food production and prices. The Intergovernmental Panel on Climate Change predicts that the frequency of such extreme weather events will increase, which, when combined with poverty, weak governance, conflict, and poor market access, can result in hunger and famine. At the same time, agriculture exacerbates climate change when greenhouse gases (GHGs) are released by land clearing, inappropriate fertilizer use, and other practices.

The full paper is accessible by subscribes *here*

Pollution costing China dear, says green report

Feb 4 (China Daily): BEIJING China is paying an increasing price for pollution brought about by economic development, says a report by the country's environmental protection academy. The cost of environmental and ecological damage to the country soared to almost 1.4 trillion yuan ($222 billion) in 2009, an increase of 9.2 percent on the previous year. China spent 3.8 percent of that year's GDP to clean up the environment, according to the statistics in the recently released China Green National Accounting Study Report 2009.

Click *here* for full article

China 2030: Building a modern, harmonious, and creative high-income society

27th February 2012, Beijing. The World Bank and Development Research Center of the State Council, the People's Republic of China released a 468-page, "*China 2030: Building a Modern, Harmonious, and Creative High-Income Society"*. The Report recommended steps to deal with the risks facing China over the next 20 years, including the risk of a hard landing in the short term, as well as challenges posed by an ageing and shrinking workforce, rising inequality, environmental stresses, and external imbalances.

The report laid out six strategic directions for China's future:

- Completing the transition to a market economy;
- Accelerating the pace of open innovation;
- Going "green" to transform environmental stresses into green growth as a driver for development;
- Expanding opportunities and services such as health, education and access to jobs for all people;
- Modernizing and strengthening its domestic fiscal system;
- Seeking mutually beneficial relations with the world by connecting China's structural reforms to the changing international economy.

Click *here* for full report.