UK-China
Sustainable Agriculture
Innovation Network

UK-China Seminar on Agriculture and Climate Change

8-10 November 2010, Beijing

Summary

1. Introduction

Supported by Chinese Ministry of Agriculture (MoA), UK Department for Environment, Food and Rural Affairs (Defra), and Department for International Development (Dfid), the UK China seminar on Agriculture and Climate Change was held in Beijing Asia Hotel on 8-10 November 2010.

The seminar comprised two days presentation and discussion, and a one-day field trip; over 60 participants attended the seminar (see annex 1 for seminar programme and annex 2 for participant list).

The Seminar was opened by Mme Yao Xiangjun, Deputy Director, Department of International Cooperation, MoA; Adrian Davies, Director, North and East Asia, DFID; Mme Huang Wenhang, Division Director, Department of Climate Change, National Development and Reform Commission (NDRC). In her opening remark, Mme Yao Xiangjun addressed that SAIN is priority area of China-UK cooperation in agriculture; MoA will continue to support SAIN's work. She urged Chinese and UK scientists to use SAIN as a platform, strengthen the communication and cooperation and strive progress in priority areas such as climate change mitigation and adaptation in agriculture. Adrian Davis highlighted that for many years, DFID, together with DEFRA, DECC (Department of Energy and Climate Change) and FCO (Foreign and Commonwealth Office), has been doing joint research with the Chinese government in climate change, including through SAIN – the Sustainable Agriculture Innovation Network. With SAIN as the platform, the Chinese and British scientists have been joining hands to undertake inspiring studies on climate change mitigation and adaptation. He hoped the research will not only contribute to policy making but also benefit the poor countries through knowledge sharing and technology transfer. In future, Dfid expects to continue to work in partnership with China on critical issues of international development, such as climate change, sustainable development and food security. Mme Huang Wenhang stated that NDRC is working on national climate change action plan, in which international cooperation is a major component. NDRC will continue to facilitate the dialogue on climate change, and share the information and experience, particularly through SAIN, on agricultural mitigation and adaptation.

2. Agriculture & Climate Change: The Policy Context

Global Greenhouse Gas Mitigation Potential in Agriculture

Prof Pete Smith presented global and regional estimates of agricultural GHG mitigation potential with different mitigation measures, under different emission scenarios at different carbon prices. He concluded that:

- Agriculture has a significant role to play in climate mitigation
- Agriculture is cost competitive with mitigation options in other sectors

- Bio-energy crops and improved energy efficiency in agriculture can contribute to further climate mitigation, but the savings are usually counted in other sectors
- Agricultural mitigation should be part of a portfolio of mitigation measures to reduce emissions / increase sinks whilst new, low carbon energy technologies are developed.

Prof Smith also outlined the challenges for IPCC AR5, which include:

- Agriculture and forestry considered together
- Better link between top-down and bottom- up models from the outset
- More in-depth analysis of economics needed
- Better assessment of fertiliser management options
- Balance with food security needs
- Examine contribution to mitigation potential embodied in the different "Representative Concentration Pathways" (new scenarios for IPCC AR5)

Mitigation Potential and Priorities on Climate Change and Agriculture in China

Prof Lin Erda reported mitigation potential and priorities for climate change and agriculture in China. A number of agricultural mitigation options have significant potential in GHG reduction in China. For example, reducing N fertilizer application by 30% can greatly decrease N_2O emission without significant decline of crop yield in intensive managed fields. It is important to increase yield at the same time as reducing GHG emissions. The suggested priority agricultural mitigation measures include:

- N fertilizer management
  - Reduce N fertilizer application rate
  - Increase use of organic fertilizer/manure
  - Use slow release fertilizer and nitrification inhibitors
  - Change the application methods, for example use deep placement
  - Integrate water and fertilizer management
- Crop straw management

  China produces about 600-700 Mt crop straws every year, of which about 70% can be return to the field in the future. Crop straw can also be used as biogas feedstock and livestock feed.
- Livestock waste management

  China's livestock waste production is about 2-4 Gt per year. Livestock waste can

be used as organic manure as well as biogas feedstock.

- Improve the tillage management

Mitigation Potential and Priorities on Climate Change and Agriculture in the UK

Dr Mike Segal presented mitigation potential and priorities on climate change and agriculture in the UK. UK has a very ambitious mitigation target - 80% (below 1990 levels) reduction in all GHG emissions by 2050. UK also adopted very similar mitigation measures, include:

- Nutrient (fertiliser and manure) management
  - Amount
  - application method
  - timing
- Manure storage
  - Cover slurry stores or use manure in AD to reduce emissions
- Livestock management
  - Match nutrition to needs; healthy animals; improved breeding
- Carbon Sequestration
  - Improve crop and grazing land management to improve soil carbon
  - Protect peat soils
  - Woodland creation to store carbon in soils and trees

Dr Segal also addressed the need of UK agricultural sector to increase production and deliver whole range of ecosystem services.

Prospects for Agriculture in the Post-Copenhagen Discussions

David Howlett reported on the prospects for agriculture in the post-Copenhagen UNFCCC (UN Framework Convention on Climate Change) discussions. David summarised what had happened in Copenhagen, what is about to happen in Cancun and what to look forward to in South Africa (the next venue for climate change negotiations). He said that agriculture needs to be included in future agreements both in terms of adaptation and mitigation, and that we should looking for triple wins: agriculture adapted to climate change, that reduces emissions and sequesters carbon, and delivers livelihood and food security benefits. These could be included as actions on financing and technologies under the National Adaptation Programmes of Action (NAPAs) and National Appropriate Mitigation Actions (NAMAs) that are being discussed in the negotiations. Another important aspect is to join up thinking on agricultural and

climate change policies which currently are rather separated, and to bring agriculture and forestry together.

3. Best Practice in Mitigating Greenhouse Gases in Agriculture

Nutrient Management

Prof. David Norse gave a presentation on *improved nutrient management to mitigate GHGs from crop production*. The presentation focused on the issue of over use of nitrogen fertilizer in China and multiple wins by reducing mis- and over-use of N fertilizer. Suggested approaches for improving N fertilizer management and GHG mitigations include:

- Estimation of nutrient budgets to ensure that all sources of N are taken into account in determining synthetic N rates
- Soil testing
- Sub-surface placement and fertigation
- Timing
- Slow release fertilizers & inhibitors
- More effective communication with farmers and extension workers

David Norse concluded that: (i) it is a true win-win-win intervention with benefits beyond substantial GHG reduction: income gains for poor farmers, raised food security, and reduced non-point pollution (ii) The environmental gains are local, national, regional and global; and (iii) the abatement costs are low or negative because of the high economic as well as the environmental benefits.

Manure Management

Dr Xiuping Tao reported *Mitigation Effects of Typical Waste Management Practices in Intensive Swine Farm.* China has a large animal industry and intensive enterprises produce large amount of waste - manure: 243 million tons; urine 163 million tons. In 2008, pork production in China totalled to 46.20 million tons. There is significant potential for mitigation in animal waste management, including biogas and composting. Dr Tao introduced a promising system in which pig farm waste water is used to produce biogas and biogas slurry applied to field; manure is composed to produce organic fertilizer.

Soil-Carbon Sequestration

Prof Genxing Pan reported *Soil Organic Matter-C Stock and Sequestration of China's Croplands.* Prof Pan pointed out that soil C in China's croplands have increased but still significant potential for more. There is a wide range of practices available to increase soil C stock, but needs policies to incentivise the good practice.

Livestock Management

The title of Professor Jamie Newbold report was *Decreasing Methane Production in the Rumen: Saving the World One Belch at a Time*. He outlined a number of options for mitigation of GHG emissions from livestock. Significant gain in GHG emission reduction can be gained through improving productivity and health. There are other options, some are now in or close to use (within 2-5 years), some are further away from implementation:

- Gut biota manipulation – reduce gut protozoa
- Plant breeding – high sugar grasses (for grazing)
- Plant breeding – high fat cereals (for feed)
- Garlic and other plant extracts to reduce gut methane
- Early development manipulation of the rumen
- Effects are not necessarily transferable across species

4. Impacts of Climate Change on Agriculture

Prof Tim Wheeler delivered a presentation on *Adapting to the Challenges of Climate Change whilst Increasing Food Production.* He stated that the local context is crucial even at small spatial scales, no adaptation action works for a whole country in UK or in China, local circumstance must be considered; climate sensitivity can be used to identify priorities for action; investment / infrastructure / policies & market mechanisms need to be identified to satisfy this. Extreme events and thresholds are very important. The cost of adaption needs to be justified in the context of costs of development needs.

Prof Yinlong Xu introduced the China-UK-Swiss project on *Adapting to Climate Change in China* (ACCC). The project will target a wide range of geographical regions with various natural and socioeconomic situations. The comprehensive risk assessment will include impact on water and agriculture, as well as links between climate and health. The project will also address the issues of adaptation planning, capacity building and knowledge sharing.

5. SAIN Project Progress & Expected Outcomes

In this session, each of the on-going SAIN projects reported on progress, as follows:

- *A review of manure nutrient use in China*, reported by Dr. Yu Guanghui, Nanjing Agricultural University
- *Improved Nutrient Management in Agriculture: A Key to China's Low Carbon Growth Path*, reported by Dr. Yuelai Lu, University of East Anglia

- *Estimates of future agricultural GHG emissions and mitigation in China*, reported by Professor Pete Smith, University of Aberdeen
- *Addressing vulnerabilities and building capacity for adaptation of agriculture to climate change in China*, reported by Professor Tim Wheeler, University of Reading
- *Conservation for enhanced utilization of crop wild relative diversity*, reported by Prof Brian Ford-Lloyd, University of Birmingham
- *Harmonising adaptation and mitigation for agriculture and water,* reported by Prof Declan Conway, University of East Anglia.

Priorities and considerations for future collaboration

Through discussions, the following points were recognised as future research needs and priorities for future collaboration.

- More information is needed on monitoring and evaluation, including emissions factors for specific agricultural activities based on international standard;
- Development of enabling framework to address the issues of policies, incentives and drivers;
- Need larger database of mitigation factors;
- Better assessment of mitigation costs;
- Better understating of macro level policy changes, such as water prices change, land tenure reform and the impact on agriculture and mitigation options , particularly when looking forward to what farms in China might look like in 2020;
- How to deal with uncertainty – in knowledge, of future – when trying to provide recommendations to influence policy (one of the aims of the ACCC project, for example). What does the anticipated increase in frequency and intensity of extreme weather systems mean for livelihoods and communities?
- 12^{th} 5-year plan in China (starting in 2011) will propose establishment of carbon market in China. Hope UK and China collaboration can contribute to this initiative.
- Carbon measurement method for various mitigation measures, which should include not only direct emission reduction but also other benefits such as energy saving from reduced fertilizer manufacturing;
- Comprehensive demonstration programmes needed to show activities which can adapt to climate change as well as reduce GHG emission. Research already started in China but needs to be on much larger scale and in different regions;
- Agriculture must include forestry and fisheries as well;
- What are effects of climate change on gender likely to be?

- Partnership with other international work in China to strengthen the synergies, such as CGAIR;
- Timeframes (e.g. China's 5-year plans) will affect priorities and what can be done?
- Protection of not only CWR, but also landraces. Few of China's flora are on the 'red list';
- More research on China's indoor livestock production systems. Move to intensive farming leads to loss of species and diversity;
- Better understand the impact of high frequency of climate and weather extremes on livelihoods, production systems, community coping capacity, as well as how to design the systems which are able to dealing with uncertainties, particularly extremes;

Potential funding sources

John Warburton of DFID China clarified that future work funded by DFID in China must be not just relevant to China, but also of relevance to other developing countries. He also introduced some other possible funding sources to address some of the priority issues above. One is the ESPA (Environmental Services for Poverty Alleviation) programme, funded by DFID and the two of the UK Research Councils. China is one of the four focus regions of ESPA. The call for bids for proposals still open. Another opportunity is a recent joint call from DFID and AusAID for systematic reviews to be undertaken, to check the evidence around various development issues, including agriculture, food security and environment, in low and middle-income countries,– see the AusAid website for further details.

Tim Wheeler, DFID Deputy Chief Scientist stated that DFID currently commission £200 million of research annually, including agriculture and climate change themes, to support DFID's objective to reduce poverty. It is worth looking at CGIAR and CCAFS (Climate Change, Agriculture and Food Security) activities.

Mike Segal, Deputy Chief Scientist of Defra, stated that Defra has been supporting SAIN to date, and both Chinese and British scientific communities have benefited enormously from the collaboration. With current financial situation in the UK, it is not able to confirm if Defra can continue to support SAIN initiative, although it is expected to be able to.

Mr Wang Jinbiao, Chinese MoA, food security is the top priority in China; the GHG emission reduction should contribute to this priority goal. Giving limited funding, need to prioritise the work and give support to the priority areas. MoA will continue to support collaboration in this field but need to know next year's government plans.

6. SAIN Project co-ordination

Dr Yuelai Lu of SAIN Secretariat reported current situation of SAIN projects coordination. There are 6 fully funded projects currently implemented under SAIN, these projects have different start dates and durations, and therefore variable delivery milestones. Currently SAIN dissemination mainly through website (SAIN main website and capacity building project website are operational, CWR China website under construction), SAIN Update newsletter, and project flyers. SAIN's news and events are also reported by SDD newsletter and RCUK website. Most of the projects also have planned to produce policy briefs at various project stages.

To maximise the synergies between the projects, the following actions are suggested for SAIN Secretariat and projects teams to take.

Publicity and dissemination

- Currently the main SAIN website and that for capacity building project are operational, whilst CWR China's is in progress. For It may be necessary for individual websites to be put on institutional websites in order to adhere to Defra guidelines; this needs to be confirmed with Defra;
- The SAIN Update newsletter should be produced more often & include project updates;
- 5 of the projects have publications planned. Could each project have a list of topics with their expected publication date?
- A standard format for policy brief would be needed, with a common image;
- Can policy briefs be co-authored if they cut across 2 areas?
- Could a SAIN joint publication be established, perhaps a special issue of a journal or book? 15 papers would be needed for a special issue. A proposal would have to be put forward to editors, including an abstract (of work yet to be done!) This would need to be developed further as the projects are at different stages;
- Project partners should be asked to assist with English/Chinese translations for the policy brief and other publications;

Joint activities and resource sharing

- Similar surveys are being carried out by different projects. Can the information requested be co-ordinated and shared? Tim Wheeler is happy to share the methodologies used in his previous ESPA project;
- WG1 works on nitrogen fertilizer and manure management, therefore WG3 groups won't have to repeat the same work;

- Project participants would be welcome to attend other project workshops. Longer workshops are needed with more time in the field. Let others know locations & dates once agreed;
- Need to share latest news/information e.g. Govt policies/changes/future scenarios

Student/staff exchange within SAIN projects

- Training for PhD students in the UK & China would be beneficial. There are difficulties with UK/China funding & scholarships. There is no UK commitment to fund overseas students. There is funding for UK/China staff exchanges from the BBSRC (enough for living expenses only) & the Royal Society.
- Who else could support SAIN as well as/instead of the MoA in China? There may be co-funding opportunities but it is up to Chinese collaborators to identify the possible funding sources and take the initiatives.

7. Conclusion

Following two day's presentations and discussion, it is clear that the UK and China have very different production systems, soils, climates, policy contexts and economies. However, many similar mitigation options are being considered and the countries are facing the same challenges.

Food security is the priority; mitigation must not adversely affect yields but rather increase them in order to feed a growing population. Some GHG emissions from agriculture are inevitable but what is the optimum lowest level?

Some agricultural practices have a track record in China & some in the UK, such as reduction of nitrogen fertilizer use in the UK and small-scale biogas system in China. We need to think about how transferable these practices between countries are.

There are common economic and social science needs in both countries which need to be met in order to assess the economic mitigation potential and social barriers to adoption and implementation of good mitigation measures. Clearly some mitigation measures are cheaper with short leading time, such as improvement in N fertilizer management; some need longer time to be effective, such as conservation tillage.

There is already a great deal of international activity which now needs to be harnessed and SAIN work should feed into this international context as well.

Need to consider not only GHG emission directly attributed to agriculture, but also embedded carbon of some products, for which full life-cycle analysis is required.

There are excellent scientists, data & science in China & the UK which will provide a good basis for progress.

The projects within SAIN can make a significant contribution to our common aims and goals in agriculture. It is also expected UK China collaboration through SAIN can benefit other developing countries.

(Compiled by Yuelai Lu, with contribution of Pete Smith, Lin Erda and Felipa House)

END

Annex 1

UK-China Seminar on Agriculture and Climate Change

8-10 November, 2010
Beijing Asia Hotel
8 Xinzhong Xijie, Gongti Beilu, Beijing

This seminar aims to:

- Consider the role of agriculture in tackling climate change, including the prospects for emission reduction and carbon sequestration, while ensuring food security
- Examine best practice for enhancing agriculture's role in climate change mitigation
- Share information on policy and research priorities
- Exchange ideas on UK-China contributions to wider international initiatives
- Agree on priorities for UK-China collaboration in this field under the auspices of the joint work programme on sustainable agriculture

8 November

08:30	***Arrival, registration & coffee***
09:00	**Welcome**
	Chair: Wang Jinbiao, Division Director, Department of International Cooperation, Ministry of Agriculture
	Yao Xiangjun, Deputy Director General, Department of International Co-operation, Ministry of Agriculture Adrian Davis, Director, North and East Asia, UK Department for International Development Huang Wenhang, Division Director, National Development and Reform Commission
09:20	**Session 1: Agriculture & Climate Change: The Policy Context**
	Chair: Zhao Lixin, Director of Institute of Energy and Environment Protection, Chinese Academy of Agricultural Engineering
This session will provide the overall context for the meeting. It will outline the global challenge of climate change, and provide an overview of agriculture's role in climate change and how the sector can contribute to mitigation. It will summarise the policy responses being developed in both the UK and China, which will include looking at approaches to technology, research and communications, and how climate change is being addressed alongside the other environmental challenges that agriculture faces. It will also summarise the broader policy context, including the work UNFCCC is doing post Copenhagen.	
	• **Global mitigation potential in agriculture** Professor Pete Smith, University of Aberdeen [20 mins]
	• **Mitigation potential and priorities on climate change and agriculture in China** Professor Lin Erda, Chinese Academy of Agricultural Sciences [20 mins]
	• **Mitigation potential and priorities on climate change and agriculture in the UK** Dr Mike Segal, UK Department for Environment, Food and Rural Affairs [20 mins]
	• **Prospects for agriculture in the post Copenhagen discussions** David Howlett, University of Leeds [15 mins]
	• **Discussion & Summary** [30 mins]
11.10	***Tea / coffee***

11:30	**Session 2 (a): Best Practice in Mitigating Greenhouse Gases in Agriculture**
	Chair: Dr Mike Segal, Director, Strategy & Evidence Group, UK Department for Environment, Food and Rural Affairs
This session will consider various methods to reduce greenhouse gases from agriculture through best practice examples. It will identify appropriate policy instruments that were used to make progress.	
	• **Case study 1: Nutrient management** Professor David Norse, University College London [20 mins]
	• **Case study 2: Anaerobic Digestion** Professor Tao Xiuping, Chinese Academy of Agricultural Sciences [20 mins]
12:30	***Lunch***
14.00	**Session 2 (b): Best Practice in Mitigating Greenhouse Gases in Agriculture**
	Chair: Dr Mike Segal, Director, Strategy & Evidence Group, UK Department for Environment, Food and Rural Affairs
	• **Case study 3: Soil-carbon sequestration** Professor Pan Genxing, Nanjing Agricultural University [20 mins]
	• **Case study 4: Livestock management** Professor Jamie Newbold, Aberystwyth University [20 mins]
	• **Discussion** [40 mins]
15:30	***Coffee / tea***
16.00	**Session 3: Impacts of Climate Change on Agriculture**
	Chair: Professor Tong Yan'an, North West Agriculture and Forestry University, China
This session will examine synergies/ trade-offs between practices that provide mitigation, those that provide resilience to future climate change and those needed to maintain and enhance food production. Practices that provide "win-win" benefits will be discussed and potential trade-offs will be identified. Interactions between mitigation and adaptation research under the UK-China Sustainable Agriculture Innovation Network and Adapting to Climate Change in China project will be highlighted.	
	• **Challenge of reducing GHG emissions from agriculture while increasing food production** Professor Tim Wheeler, University of Reading [20 mins]

	• **Report from China-UK-Swiss Collaborative Project: Adapting to Climate Change in China (ACCC)** Professor Xu Yinlong, Chinese Academy of Agricultural Sciences [20 mins]
	• **Discussion & Summary** [20 mins]
17:00	**Summary of the workshop** Professor Lin Erda, Chinese Academy of Agricultural Sciences Professor Pete Smith, University of Aberdeen
18.30	**Banquet**

9 November

09:00	**Session 4: SAIN Project Progress & Expected Outcomes**
	Chair: John Warburton, Senior Environment Adviser, UK Department for International Development
This session will provide an overview of the six ongoing SAIN projects, with leads of ongoing SAIN projects reporting on progress made to date, future work and expected achievements.	
	• **Project 1: A review of manure nutrient use in China** Dr. Yu Guanghui, Nanjing Agricultural University [10 mins] Discussion [5 mins]
	• **Project 2: Low carbon agriculture project** Dr. Lu Yuelai, University of East Anglia [10 mins] Discussion [5 mins]
	• **Project 3: Estimates of future agricultural GHG emissions and mitigation in China** Professor Pete Smith, University of Aberdeen [10 mins] Discussion [5 mins]
	• **Project 4: Addressing vulnerabilities and building capacity for adaptation of agriculture to climate change in China** Professor Tim Wheeler, University of Reading [10 mins] Discussion [5 mins]
10.00	***Tea / coffee***
10.30	• **Project 5: Conservation for enhanced utilization of crop wild relative diversity** Dr Brian Ford-Lloyd, University of Birmingham [10 mins]

	Discussion [5 mins]
	• **Project 6: Harmonising adaptation and mitigation for agriculture and water** Dr Declan Conway, University of East Anglia [10 mins] Discussion [5 mins]
11:00	**Discussion & Summary: Future priorities for collaboration on climate change and agriculture**
12.00	***Lunch***
13.30	**SAIN Internal Meeting**
	Chair: Dr Yuelai Lu and Prof Tong Yan'an, SAIN Secretariat
SAIN members will discuss how to coordinate between projects, and identify activities which can be delivered jointly to achieve synergies of objectives. Project teams will discuss how to make sure project results can be achieved and promoted.	
	▪ Project coordination, results and publicity [30 minutes]
	▪ Breakout groups to deal with internal project planning and to explore inter-project collaboration
	▪ Summary of the discussion and action points
17.00	**End of final day**

10 November

9:00	**Field Visit**
	• Visit to FACE project in the suburbs of Beijing

Annex 2

中英农业与气候变化研讨会参会人员名单
Participants List of UK-China Seminar on Agriculture and Climate Change

	姓名 Name	职务/职称 **Title**	单位 **Affiliation**	联系方式 **Contact**
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