



# Annual Report 2012

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UK-China  
Sustainable Agriculture  
Innovation Network

We are pleased to present  
the Annual Report (2012) of UK  
China Sustainable Agriculture  
Innovation Network (SAIN).  
This is the fourth year which  
SAIN has being in full operation.

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# 02.

## Preface

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SAIN is a unique mechanism established by the Chinese and UK Governments in 2008 to provide a coherent framework for carrying out sustainable agriculture cooperation activities. Its objectives are to stimulate innovative thinking and research on all aspects of sustainable agriculture; to communicate information on sustainable agriculture issues and disseminate best practice to key audiences; and to contribute to global sustainability through wider sharing of expertise between developed and emerging economies.

Both China and the UK are determined to move to a low carbon economy and to contribute to global sustainable development. In China, the Government committed to reduce carbon intensity per unit of GDP by 40 – 45 per cent from 2005 levels by 2020. In the UK, the Climate Change Act 2008 set a target of at least an 80% (below 1990 levels) reduction in all greenhouse gas (GHG) emissions by 2050. Agriculture can play an important role in achieving the low carbon goals of these two countries.

The world is facing an unprecedented challenge of feeding a growing population, which is likely to reach 9 billion by 2050. Agriculture needs to move to a more resilient and efficient system that can achieve high-production and with less impact on the environment. The challenge China is facing is even more intense. Chinese agriculture needs to feed over 1.5 billion by 2030. Chinese agriculture is also constrained by limitations of arable land, climate change

impacts such as more extreme weather events, water scarcity and biodiversity loss. China started its 12th five year plan in 2011 with ambitious targets to produce over 540 million tonnes of food per year, increase fertiliser and water use efficiency and to strengthen the resilience of China's agriculture to climate change impacts and other disasters. From the UK's perspective, SAIN offers an opportunity to build on the excellent research and development that already exists in the area of sustainable intensification, and to use this as a basis for economic growth against a background of severe financial pressures in Europe.

Through the innovative cooperation mechanism of SAIN, researchers and policy makers in China and the UK work hand-in-hand to tackle these challenges. The activities undertaken in 2012, as highlighted in this report, include implementation of six jointly funded research projects, publication of journal papers and policy report, communication of research findings to policy makers, and engagement with a wide range of stakeholders and international initiatives. Over forty universities, research institutes and industry sector organisations are now networked through SAIN. SAIN's achievements are encouraging and we look forward to achieving more in the years to come.



Niu Dun  
Vice Minister  
Ministry of Agriculture (MoA)



Ian Boyd  
Chief Scientific Adviser  
Department of Environment,  
Food and Rural Affairs (Defra)

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# 03. Highlights

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**2012 has been another productive year for the China-UK Sustainable Agriculture Innovation Network (SAIN). Key achievements during the year include:**

## **Completion of two projects**

- ADMIT - Harmonising Adaptation and Mitigation for agriculture and water in China
- Improved Nutrient Management in Agriculture – a Key Contribution to the Low Carbon Economy

## **MoA delegation visited UK**

- Policy delegation, led by Zhang Hongyu, Director General of Department of Sectoral Policy and Law, visited Defra, NFU, British Sugar, Scottish Government and Scottish Agricultural Organisation Society (SAOS), 15-20th May
  - International cooperation delegation, led by Wang Ying, Director General of Department of International Cooperation, visited Defra, 14th December
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## **Publications produced**

### **Policy Briefs**

- No5. Policies and technologies to overcome excessive and inefficient use of nitrogen fertilizer: delivering multiple benefits
- No6. Improving manure nutrient management towards sustainable intensification in China

### **Journal Papers**

- Di S, Xie L, Hao X (2012), Effect of Atmospheric CO<sub>2</sub> Enrichment on Chemical and Physiological Character in Leaf of Summer Soybean. *Acta Agriculturae Boreali-Sinica*, 27(2):165-169
- Ding, X., Li P, Bai Y., Zhou H. (2012). Aflatoxin B1 in post-harvest peanuts and dietary risk in China. *Food Control* 23(1): 143-148
- Gao J, Hao X, Ju H, Li Y, Lin E, (2012) Effect of Elevated CO<sub>2</sub> on Photosynthetic Pigment Contents and Photosynthesis of Summer Soybean, *Chinese Agricultural Science Bulletin*, 28(06):47-52
- Han X, Hao X, Wang H, Li Y, Lin E (2012), Effect of Free Air CO<sub>2</sub> Enrichment on Nitrogen Absorption in Leaf and Head of Winter Wheat. *Chinese Journal of Agrometeorology*, 33(02): 197-201
- Hao, X.Y., Han, X., Lam, S.K., Wheeler, T., Ju, H., Wang, H.R., Li, Y.C., Lin, E.D. (2012) Effects of fully open-air CO<sub>2</sub> elevation on leaf ultrastructure, photosynthesis and yield of two soybean cultivars. *Photosynthetica*, 50 (3). pp. 362-370
- Huang, J., C. Xiang, X. Jia, and R. Hu. 2012. Impacts of Training on Farmers' Nitrogen Use in Maize Production in Shandong, China. *Journal of soil and water conservation* 67(4):329-335
- Norse, D, 2012, Low carbon agriculture: Objectives and policy pathways, *Environmental Development*, 1(1):25-39
- Yang Y, Ji C, Ma W, Wang S, Wang S, Han W, Mohamma A, Robinson D and Smith P, Significant soil acidification across northern China's grasslands during 1980s–2000s, *Global Change Biology* (2012) 18, 2292–2300, doi: 10.1111/j.1365-2486.2012.02694.x
- Yang Y, Fang J, Ji C, Ma W, Mohammad A, Wang S, Wang Shaopeng, Datta A, Robinson D and Smith P, Widespread decreases in topsoil inorganic carbon stocks across China's grasslands during 1980s–2000s, *Global Change Biology* (2012) 18, 3672–3680, doi: 10.1111/gcb.12025
- Zhang W-F, Dou Z., He P, Ju X-T, Powlson D., Chadwick D. Norse D., Lu Y., Zhang Y., Wu L., Chen X-P, Cassman K.G. and Zhang F-S.

(2012). New technologies reduce greenhouse gas emissions from nitrogenous fertilizer in China. *Proceedings of the National Academy of Sciences* (in press)

- Zheng J, Li L, Pan P, Zhang X, Smith P & Hussain Q, Potential aerobic C mineralization of a red earth paddy soil and its temperature dependence under long-term fertilizer treatments, *Soil Use and Management*, June 2012, 28, 185–193

### **Reports**

- David Norse, Yuelai Lu, Huajun Tang, 2012, *The Future of Food and Farming - Foresight Report's Implications for China*, Government Office for Science, UK

### **SAIN and project findings presentations at international conferences**

- David Powlson, Overuse of Nitrogen: Insights from the Chinese Experience, *Planet under Pressure 2012: New Knowledge towards Solutions*, London, 27 March 2012
- David Norse, The Foresight Report, low carbon agriculture and climate change mitigation, *BRICS Workshop on Agriculture and Climate Change*, Beijing, 19-21 June 2012
- James Muir, The Future of Food and Farming: Challenges and choices for global sustainability, *BRICS Workshop on Agriculture and Climate Change*, Beijing, 19-21 June 2012
- Yuelai Lu, Dealing with climate change in an agricultural way- Implementation of UK China cooperation, *BRICS Workshop on Agriculture and Climate Change*, Beijing, 19-21 June 2012
- Yuelai Lu, Science of Food Security, *Global Food Security Conference*, 6 November 2012, Shanghai
- Yuelai Lu, Collaborating across borders and reaping the benefits, *CropWorld Global*, 7 November 2012, London

### **Significant networking and stakeholder engagement**

Over 40 leading universities, research institutes and industry sector organisations in China and the UK now formally networked through SAIN.

### **Extending SAIN through various communication and information sharing activities**

Including regular e-newsletters (SAIN Update), website, flyers, promoting SAIN at various events and more



# 04.

## SAIN in brief

### Who we are

SAIN provides a coherent framework for the development and implementation of China-UK collaboration on sustainable agriculture and food security. SAIN was set up by MoA, Defra and DfID in 2008.

### What we do

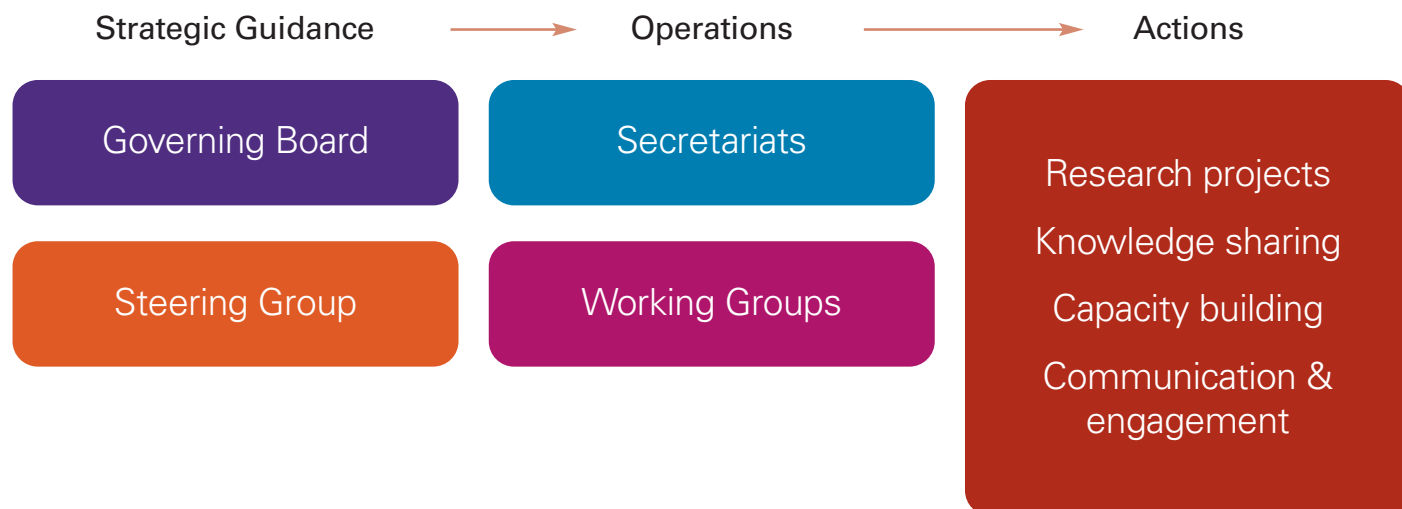
- Support UK-China cooperation in sustainable agriculture by fostering innovation in three areas:
  - policy approaches;
  - institutional mechanisms for collaborative research;
  - translating policy and science into practice
- Stimulate innovative thinking and research on all aspects of sustainable agriculture and its relation to the local, national and global economy
- Communicate information on sustainable agriculture issues and opportunities for change, and disseminate best practices to key audiences
- Contribute to global sustainability through south-south learning and similar initiatives



# 05.

## SAIN in brief

### How we work



### Governing Board

- Co-chaired by Prof Ian Boyd, Chief Scientific Adviser, DEFRA and Mr Niu Dun, Vice Minister, MoA
- 15 members representing Government departments, academic institutes and international organisations

#### Responsibilities:

- Direction setting
- Strategic oversight
- Communication and influencing

### Steering Group

- Co-chaired by Tim Mordan, Deputy Director of Farming and Food Chain Programme, DEFRA, and Liu Yingjie, Deputy Director of International Cooperation Department, MoA
- Eight members include MoA, DEFRA, DFID officials and heads of Secretariats

#### Responsibilities:

- Act and take decisions on behalf of the Governing Board when it is unable to meet

### Secretariats

- Two Secretariat Offices at the University of East Anglia in the UK, headed by Yuelai Lu, and at the Northwest A & F University in China, headed by Tong Yan'an

#### Responsibilities:

- Coordinate SAIN's day-to-day work
- Programme management
- Stakeholder engagement and communications
- Long-term development

### Working Groups

- Four Working Groups addressing issues of nutrient management; biomass and biofuel production; climate change mitigation and adaptation; and policies for circular agriculture
- Each Working Group is co-chaired by a Chinese and British scientist

#### Responsibilities:

- Reviewing issues in each focus area and identifying knowledge gaps
- Preparing proposals for programmes of work
- Developing proposals for external funding to address gaps
- Implementing funded proposals



# 06.

## Our journey to date

### 2005

- UK-China Partners in Science Conference, Appropriate Technologies for Sustainable Rural Development, held in Yangling, Shaanxi Province, China.
- Proposal was raised to establish a platform to coordinate and strengthen agricultural cooperation between the two countries
- UK China Sustainable Development Dialogue (SDD) launched

### 2006

- Research project, "Improving livelihoods for Shaanxi farmers by reducing non-point source pollution through improved nutrient management", funded by the UK Department for International Development (DFID) and Department for the Environment, Farming and Rural Affairs (DEFRA) under SDD

### 2007

- At project launch workshop in Sept 2007, the idea of setting up UK China cooperation mechanism was re-advocated
- David Norse and Yuelai Lu were appointed in October 2007 to lead the stakeholders consultation and to develop a Business Plan
- A Business Plan was produced through a DEFRA/DFID consultancy after wide consultations with Chinese stakeholders, bilateral agencies and international organisations

### 2008

- SAIN Business Plan was accepted by the Chinese Ministry of Agriculture (MoA), DFID and DEFRA in April 2008
- Governing Board, Working Groups and Secretariats established
- SAIN inaugural workshop "Circular Agriculture – Policy, Science and Technology" held in Yangling, China on 5-7 November
- SAIN launched in Beijing on 11th November by Hilary Benn, Secretary of State of DEFRA, UK and Sun Zhengcai, Minister of Agriculture, China

### 2009

- Launch of Low Carbon Agriculture project, under Working Group 1, funded by UK Foreign and Commonwealth Office (FCO) and Chinese MoA
- Working Group co-chairs meeting at UEA, March
- Governing Board meeting in Beijing, July
- UK-China Action Plan on Cooperation on Food Security, signed at Ministerial level in London by Gao Hongbin (MoA), Lord Davies of Oldham (Defra) and Mike Foster (DfID) includes SAIN as a key component, October

### 2010

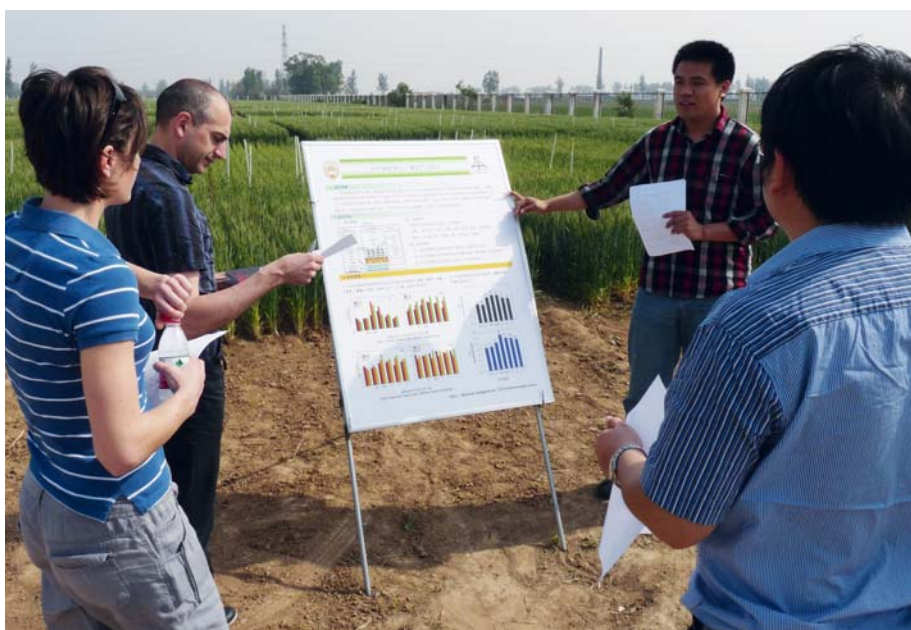
- Launch of six projects
- Production of two Policy Briefs
- UK China Seminar on Agriculture and Climate Change held

### 2011

- Second Governing Board meeting held in London, May
- Completion of three projects
- Publication of five journal papers, two book chapters and two Policy Briefs
- MoA delegation, led by Vice Minister Niu Dun, visited British Sugar's factory in Wissington, UK
- At the Fourth UK China Economic and Financial Dialogue, SAIN was recognised as primary implementer for UK China cooperation on sustainable agriculture and global food security

### 2012

- Completion of two projects
- Publication of 11 journal papers, one Policy Report and two Policy Briefs
- MoA policy delegation visited Defra, NFU and AFRC of the Scottish Government
- Two project completion workshops held
- Launch of Dfid-funded bio-char project



# 07.

## SAIN in Action - Key Events in the Year 2012

### ADMIT: Harmonising Adaptation and Mitigation for agriculture and water in China

SAIN project 'ADMIT: harmonising adaptation and mitigation for agriculture and water in China' ended in March 2012.

It was 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 has been undertaken. The project organised workshops both in the UK and China, inviting stakeholders and experts to discuss 'Energy use in the water sector' and 'Policy scenarios for harmonising water and energy use for irrigation in China'. The project made great steps 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 this

important 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.

#### Key outputs

##### Journals papers

- Greenhouse-gas emissions from energy use in the water sector, Nature Climate Change 1 (2011), 210–219
- China's water-energy nexus: greenhouse-gas emissions from groundwater use for agriculture, Environ. Res. Lett. 7 (2012) 014035:1-10

##### SAIN Policy Brief

- Greenhouse-gas emissions from energy use in the water sector (No.3)

##### Project Partners

- University of East Anglia, Declan Conway (project leader), Sabrina Rothausen
- Cranfield University, Ian Holman
- Chinese Academy of Agricultural Sciences (CAAS), Lin Erda (project leader)
- Centre for Chinese Agricultural Policy (CCAP), Wang Jinxia





# 08. SAIN in Action - Key Events in the Year 2012

## Improved Nutrient Management in Agriculture - a Key Contribution to the Low Carbon Economy

Analyses by 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. 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. Policies in the agricultural sector will only be effective if they take account of the current fact that many farmers are "part time", deriving a substantial fraction of household income from off-farm work. Policies and financial structures that encourage the development of a contractor sector able 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. 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.

- More effective delivery of information to farmers
- Policies and incentives to promote the development of a contractor sector for fertilizer application
- Use of modified forms of N fertilizer, especially inclusion of inhibitors to slow the release of N into crop-available forms and decrease gaseous losses
- Policies to further promote production of organic fertilizers from animal manure. But this needs to be combined with improved labelling the crop-available nutrient content – not only total content), training of advisors and farmers, and measures to reduce N losses during production of organic fertilizers
- Promotion of integrated water and nutrient management including "fertigation" in situations where irrigation is practiced – especially in the greenhouse horticulture sector but in some cases for field grown crops

### Key outputs

#### Journals papers

- Low carbon agriculture: Objectives and policy pathways, Environmental Development, 1(1):25-39
- New technologies reduce greenhouse gas emissions from nitrogenous fertilizer in China, PNAS (in press)

#### SAIN Policy Brief

Improved Nutrient Management in Agriculture – A Neglected Opportunity for China's Low Carbon Growth Path (No.1)

- Greater food security and a better environment through improved nitrogen fertilizer management (No.2)
- Policies and technologies to overcome excessive and inefficient use of nitrogen fertilizer: delivering multiple benefits (No.5)

#### Partners

- **China Agricultural University:** Fusuo Zhang (project leader), Weifeng Zhang, Xiaotang Ju
- **Centre for Chinese Agricultural Policy, Chinese Academy of Sciences:** Jikun Huang, Xiangping Jia
- **Rothamsted Research:** David Powlson (project leader), David Chadwick
- **University College London:** David Norse
- **University of East Anglia:** Yuelai Lu



# 09.

## SAIN in Action - Key Events in the Year 2012

### Project Workshops

#### **“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 Edwards, Energy and Climate Change Counsellor of British Embassy opened the workshop and delivered welcome speech.

#### **SAIN outreach workshop Climate Change and Agriculture in China held in Beijing on 21-22 November.**

SAIN outreach workshop Climate Change and Agriculture in China was held on 21-22 November in Chinese Academy of Agricultural Sciences (CAAS), Beijing.

This was a joint workshop of two SAIN projects Addressing Vulnerabilities and Building Capacity for Adaptation of Agriculture to Climate Change in China and Estimates of

Future Agricultural Greenhouse Gas Emissions and Mitigation in China. These two projects were funded by Defra and Chinese Ministry of Agriculture, led by Prof Tim Wheeler of University of Reading, Prof Lin Erda of Chinese Academy of Agricultural Sciences, Prof Pete Smith of University of Aberdeen, Prof and Pan Genxing of Nanjing Agricultural University respectively.

The workshop was attended by more than 80 participants from 30 organizations. Participants presented and discussed greenhouse gas (GHG) emissions in agriculture, GHG mitigation technologies, potential adaptive capacity and climate scenarios and projections. There was unanimous agreement from delegates that SAIN was an excellent platform for bilateral or multilateral cooperation and that it should progress to wider areas.

#### **Addressing Vulnerabilities and Building Capacity for Adaptation of Agriculture to Climate Change - key achievement**

- Development of an aflatoxin (a toxin produced by fungi) contamination index model (GLAM-AFLA) that takes account of key weather conditions affecting aflatoxin accumulation post-harvest
- Development of the new version of the regional climate model for downscaling CMIP5 over China was finished
- Development of a weather-based regression model to investigate fusarium ear blight (FEB) in wheat using up to 10 years’ disease, anthesis date and weather data from 10 locations. We found that the incidence of FEB is related to the number of days of rainfall in a 30-day period after anthesis; high temperatures before anthesis increase the incidence of disease. The model projection suggests that wheat anthesis dates will generally be earlier and FEB incidence will increase substantially for most locations in central China under climate change
- Launch of a project of participatory integrated watershed management in rural areas, in 30 provinces, municipalities and autonomous regions, covering more than 10,000 small watersheds with a drainage area of nearly 600,000 square kilometres. Through integrated agricultural adaptation techniques the watershed has been partially adapted to cope with future water shortages caused by 1oC warming
- Production of papers describing the 2006-2012 surveys of phoma stem canker on oilseed rape crops in China and the risk of *Leptosphaeria maculans* spreading across oilseed rape growing regions in China
- The FACE study of the interactive effects of CO<sub>2</sub> and soil moisture on wheat crops showed that elevated CO<sub>2</sub> concentration may alleviate some drought stress in winter wheat

#### **Estimates of Future Agricultural greenhouse gas emissions, but also on productivity Greenhouse Gas Emissions and Mitigation in China – key findings**

- Based on the technical mitigation potentials assessed, biochar application has a great potential to decrease GHG emissions from rice and upland agriculture, with maximum mitigation potential, though the SOC sequestration potential is based on short term experiments and further data are necessary before policy recommendations can be made
- The other management options with great mitigation potential for rice agriculture are tailoring cropping rotation, no tillage, controlled irrigation, and integrated rice - fish - duck farming
- Combined application of chemical and organic fertilizer, conservation tillage, reduced N application are the possible measures that can reduce overall GHG emission from upland crops
- One of the important mitigation measures for agricultural grasslands could be reclamation of low yielding cropland, particularly on slopes, to shrub land or grassland and could be a promising option to decrease soil erosion
- Apart from restoration of degraded grassland, grazing exclusion and reduced grazing intensity can increase SOC sequestration and decrease overall GHG emission
- Chinese livestock are often fed on low quality forage, high in fibre and low in nutrients. Improving diet quality can therefore have positive benefits not only on greenhouse gas emissions, but also on productivity
- Supplementation with tea saponins is the most promising for Chinese production systems as these compounds are readily available as industry by-products with a proven effectiveness



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# 10.

## SAIN in Action - Key Events in the Year 2012

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### Launch of new project

#### Biochar: Socio-Economic and Biophysical "Fit"

Funded by Dfid and Chinese Ministry of Agriculture, a new project "Suitability of Bio-char in China and Sub-Saharan Africa: Biophysical and Socio-economic 'Fit'" was launched in April.

This project aims to (i) develop and test an integrated framework for assessing the suitability and feasibility of different forms of biochar and application method to specific biophysical and socio-economic situations; and (ii) to strengthen a number of important biochar-related research activities into a coherent programme of work that will move forward our understanding of the potential of biochar to improve livelihoods in sub-Saharan Africa, south Asia and China.

Led by Dr John McDonagh of University of East Anglia, Prof Zhao Lixin of Chinese Academy of Agricultural Engineering, this 30-month project is jointly implemented by SAIN and Dfid-funded programme of Policy Innovation Systems for Clean Energy Security (PISCES).

More details about this project can be found on page 18.





# 11.

## SAIN in Action - Key Events in the Year 2012

### SAIN Operation

#### SAIN – Defra meeting with Private Sector organisations, 16 July 2012

The meeting was held in Defra. Participants from CBBC, AB Sugar, Mylnefield Research Services Ltd, British Pig Association, SAIN Secretariat, and Defra policy makers discussed further involvement of private sector in SAIN.

It was agreed that there was scope for, and potential mutual benefit from, collaboration between current SAIN participants (UK-China Governments and research organisations) and the private sector. Whilst the original focus of SAIN was to produce research to inform policy development, collaboration with the private sector might more usefully focus on research to support policy implementation (e.g. Feed / Nutrient Management planning and best practice) and market development. To this end, there was merit in establishing an additional, more flexible mechanism, with business input, to identify projects relating in particular to technologies and products which would enhance the economic and environmental sustainability of agriculture and the wider food chain. The value of regular (quarterly/bi-annually) stock take meetings on UK-China sustainable agriculture issues with key players was agreed.

#### SAIN – MoA annual meeting, 12-13 October 2012

The meeting was held in Nanning, Guangxi Zhuang Autonomous Region. Director Wang Jinbiao, Sun Guifeng, from Department of International Cooperation, Ministry of Agriculture (MOA), Director Sun Yonghua from Centre of International Cooperation Service, MOA, Director Liu Dianzheng from Administration Centre of Agricultural Foreign-funded Projects addressed the meeting. The meeting proposed activities for 2013 which included summarizing achievements since SAIN setup; producing new proposals for future research; developing long-term cooperation mechanism; and disseminating SAIN achievements widely through public media such as news papers and television.

#### MOA-Defra meeting on SAIN future work plan, 14th December 2012

Led by Mr Wang Ying, Director General of the Department of International Cooperation, Mme Sun Guifeng and other four senior officials from Chinese Ministry of Agriculture visited Defra on 14th December. The purpose of this visit was to discuss the preparation of SAIN governing Board meeting and SAIN work plan for 2013 and beyond. Tim Mordan, Robert Bradburne and Yuelai Lu met the MoA delegation.

Both sides agreed to strengthen and deepen UK-China cooperation through SAIN and establish a high level cooperation mechanism. It was agreed to hold the third Governing Board meeting in April in China. A major multidisciplinary project on integrated nutrient and catchment management, jointly implemented by Working Group1 and 4, will be launched in April 2013 with a total budget of £760,756 and three years duration.



# 12.

## SAIN Research Portfolios

The common objectives of SAIN projects are to address the issues of increased resource use efficiency, particularly nitrogen fertilizers and manures; reduce pollution from agricultural production to air and water, including GHG emissions reduction and to increase carbon sequestration; and communicate information on agricultural climate change mitigation, adaptation and options to policy makers as well as to farmers.

### Projects under SAIN banner

Project title	Duration	Funding
Improved Nutrient Management in Agriculture - a Key to the Low Carbon Economy	April 2009 – March 2012	£426,600 by UK FCO
A review of Manure Use in China (MUC)	March 2010 – September 2011	£130,195 by Defra, MOA
ADMIT: Harmonising Adaptation and MITigation for agriculture and water in China	April 2010 – March 2012	£294,935 by Defra, MOA
Estimates of future agricultural greenhouse gas emissions and mitigation in China	April 2010 – March 2013	£519,569 by Defra, MOA
Conservation for enhanced utilization of crop wild relative diversity for sustainable development and climate change mitigation	April 2010 – March 2013	£360,145 by Defra, MOA
Addressing vulnerabilities and building capacity for adaptation of agriculture to climate change in China	April 2010 – March 2013	£569,658 by Defra, MOA
Developing a catchment management template to mitigate non-point source pollution in China	January 2011 – March 2011	£87,865 by Defra, MOA
The future of food and farming - Foresight Report's implications for China	September 2011 – December 2011	£27,200 by BIS
Suitability of bio-char in China and sub-Saharan Africa: biophysical and socio-economic "fit"	April 2012 – September 2014	£321,551 by Dfid, MoA
Knowledge, policy and practice for sustainable nutrient management and water resources protection in UK and Chinese agro-ecosystems	April 2013 – March 2016	£760,756 by Defra, MoA

# 13.

## SAIN Research Portfolios



### Improved Nutrient Management in Agriculture - a Key to the Low Carbon Economy

#### Problems to be addressed

- Fertilizer production accounts for >70% of fossil energy inputs to agriculture in China, a reduction is essential for progress to a low carbon agricultural economy
- Fertilizer production in China releases about 235 Mt CO<sub>2</sub> plus 39 Mt CO<sub>2</sub>-equivalent as nitrous oxide
- Additional nitrous oxide, at least 150 Mt CO<sub>2</sub>-equivalent, is emitted from the use of fertilizers and manures in agriculture
- These emissions represent over 20% of total CO<sub>2</sub> emissions from China and about 25% of global N<sub>2</sub>O emissions from agriculture
- Large reductions in N use are achievable: it is estimated that cuts of at least 25% of grain crops, and probably considerably more for intensive vegetables, are possible through application of current knowledge
- Savings will involve greater recycling and waste minimisation - key objectives in China's plans to establish a circular economy

#### Project objectives

- Estimating GHG emissions associated with the manufacture and use of N fertilizer in China
- Reviewing current and emerging technologies for increasing efficiency of use of N fertilizer, N from manure and manufactured organic fertilizers, building on results from the Chinese Ministry of Agriculture's national programme "Fertilizer Recommendations and Soil Testing"
- Assessing improved means of communicating information on rational use of N fertilizers and manures to farmers and extension staff
- Providing information to policy makers on the GHG savings possible from improved management of N in agriculture and the ways of achieving this

#### Project team

**Rothamsted Research:** David Powlson (project leader), David Chadwick  
**University College London:** David Norse  
**University of East Anglia:** Yuelai Lu  
**China Agricultural University:** Fusuo Zhang (project leader), Weifeng Zhang, Xiaotang Ju  
**Centre for Chinese Agricultural Policy, Chinese Academy of Sciences:** Jikun Huang, Xiangping Jia

#### Key milestones in 2012

##### March

Project completion workshop held in Beijing.



# 14.

## SAIN Research Portfolios



### Estimates of future agricultural greenhouse gas emissions and mitigation in China

#### Problems to be addressed

- The challenge of reducing agricultural GHG emissions and increasing soil carbon sinks in China, whilst maintaining food security for its very large population
- The need for an evidence base, policy advice and decision support tools to allow policy implementation and knowledge exchange among scientists, policy makers and farmers

#### Project objectives

- Provide the evidence base, policy advice and decision support tools to reduce agricultural GHG emissions and increase soil carbon sinks in China, whilst maintaining food security
- Develop a national and regional picture of economic abatement potential from Chinese agriculture

- Explore behavioural or incentive barriers associated with obvious high potential in mitigation (and low cost) measures that are not being adopted
- Assess applicability of mitigation strategies to decrease livestock and manure emissions for different farm types
- Create a whole China model of mitigation potential for livestock and manure emissions, also considering pollution swapping
- Provide policy advice on cost effective mitigation options for soil C sequestration, and for reducing GHG emissions from croplands (dry and paddy), grasslands and livestock
- Produce database, journal publications, decision support tools and policy briefings on GHG emissions and GHG mitigation options in China's agriculture

#### Project Team

**University of Aberdeen:** Pete Smith (UK Co-Leader), Dali Rani Nayak

**Nanjing Agricultural University:** Genxing Pan (China Co-Leader), Weiyun Zhu, Feng Shuyi

**University of Aberystwyth:** Jamie Newbold

**Lanzhou University:** Ruijun Long, Fujiang Hou, Zhibiao Nan

**Rothamsted Research – North Wyke:** Laura Cardenas

**Zhejiang University:** Jianxin Liu

**Scottish Agricultural College:** Dominic Moran

**Peking University:** Jintao Xu

**ISSAS, CAS:** Xiaoyuan Yan

**Shenyang Agricultural University:** Liyong Xie

**Fudan University:** Changming Fang

### Key milestones in 2012

#### June - August

Meta-analysis of data collated in Cropland, Grassland and Livestock database to identify region specific and ecosystem specific GHG mitigation options completed.

#### October

Policy brief document on technical options to reduce greenhouse gas emissions from croplands and grasslands in China submitted.

#### November

Policy brief document on technical options for reducing enteric methane emissions from livestock production completed.

Workshop to discuss/finalise policy briefing document was held on 18th and 19th of November, 2012 in Nanjing Agriculture University, Nanjing.

Key findings of the project were presented in the outreach conference of the UK-China Sustainable Agriculture Innovation Network (SAIN) held in Beijing during 21-22nd of November.

# 15.

## SAIN Research Portfolios



### Conservation for enhanced utilization of crop wild relative diversity for sustainable development and climate change mitigation

#### Problems to be addressed

CWR are plant species closely related to crops, including their wild ancestors. CWR are recognized as critical resources for mitigating the impact of climate change because they are likely to provide the genetic diversity and adaptation needed to breed crops with greater resistance to the environmental changes brought about by the changing climate. CWR diversity is threatened directly by climate change, as well as indirectly by increasing food insecurity resulting from climate change and other socioeconomic factors that could push agriculture into increasingly marginal land resulting in an erosion of diversity. The challenges facing us are to ensure effective conservation of important resources on the one hand, and to enhance food security on the other through rational and sustainable use of plant genetic resources.

#### Project objectives

- Production of a full inventory of CWR of China using a systematic approach previously developed and applied in Europe
- Identification of priority CWR species based on food security, economic importance, use potential for climate change mitigation, and threat status
- 'Gap' and climate change analysis to identify conservation needs for selected high priority crop gene pools (including rice, soybean, foxtail millet, grape, Kiwi fruit, poplar and citrus fruits)
- Publication of crop gene pool conservation strategies, including briefing papers for policy-makers
- Evaluation of CWR using novel genomic approaches to provide improved access to CWR genetic diversity for use in crop improvement, with a focus on genes likely to confer adaptation to climate change
- Development of an online information system to provide access to the CWR inventory and associated conservation and evaluation data

#### Project Team

**University of Birmingham:** Brian Ford-Lloyd (UK Co-Leader), Shelagh Kell, Nigel Maxted

**China Agricultural University:** Kang Dingming (China Co-leader)

**Institute of Botany, Chinese Academy of Sciences:** Ma Keping, Wei Wei

**Fudan University:** Lu Baorong

### Key milestones in 2011

#### March

List of candidate genes for brown planthopper resistance and salt tolerance in rice produced.

#### June

Red List status of China's CWR species identified.

#### October

Team meeting in Beijing.

#### December

National CWR conservation strategy developed and associated paper in preparation.

# 16.

## SAIN Research Portfolios



### Addressing vulnerabilities and building capacity for adaptation of agriculture to climate change in China

#### Problems to be addressed

Climate change is a key driver of change in agricultural systems in China and is closely linked with the causes and alleviation of poverty. However, because of the complexity of agricultural systems, many key knowledge gaps remain, such as: crop responses to elevated CO<sub>2</sub> conditions; farmer perception of climate change and their communication and adaptation strategies; and crop disease threats. Through a structured programme of knowledge exchange using research training and established networks developed through previous research, this project will address the skills needs of two major stakeholder groups – adaptation researchers in China and Chinese farming communities vulnerable to climate change – in order to enhance UK-China collaboration targeted to improve the adaptation of Chinese agriculture to climate change.

#### Project objectives

The overall objective of the project is to foster joint research and knowledge exchange between Chinese and UK researchers concerned with adaptation of agricultural systems to climate change and the promotion of sustainable food systems. The specific objectives are:

- Communicating issues of sustainability of farming systems to key stakeholders: farming communities, researchers and policy-makers
- Exploring information flows within farming communities concerned with the perception of climate change and possible adaptation options, and linking these with research
- Building capacity of researchers and farming communities to adapt to climate change

#### Project team

Walker Institute for Climate System Research, University of Reading:  
Tim Wheeler (UK Co-Leader),  
Chris Garforth

University of Leeds: Andy Challinor

Rothamsted Research: Bruce Fitter

Met Office Hadley Centre: Richard Jones

CABI: Qiaoqiao Zhang

Chinese Academy of Agricultural Sciences: Lin Erda (China Co-Leader),  
Ju Hui

Anhui Academy of Agricultural Sciences:  
Binjie Gan

Inner Mongolia Academy of Agricultural Sciences: Ziqin Li

### Key milestones in 2012

#### March

Project staff have led a number of workshops on low carbon agriculture in Beijing and diagnosis of oilseed rape disease in Sichuan, Anhui and Jiangsu provinces.

#### May

The University of Reading hosted a visit by academic staff from the Institute of Rice Sciences, the Institute of Animal and Husbandry Sciences, the Institute of Crop Sciences and management from Anhui Academy of Agricultural Sciences.

#### December

A video was produced showing field surveys carried out in Fengtai county, Anhui province, to find out farmers' needs to adapt to climate change.

#### November

A successful outreach conference on climate change and agriculture in China was held in Beijing, attended by more than 80 participants from 30 organisations.



# 17.

## SAIN Research Portfolios



### ADMIT: Harmonising ADaptation and MITigation for agriculture and water in China

#### Problems to be addressed

Recent research on climate change in China suggests that the interactive effects of climate change and other socio-economic drivers could lead to significant decreases in total production by the 2040s. Water availability plays a particularly significant role in limiting potential crop production, due to the combined effects of higher crop water requirements and increasing demand for non-agricultural use of water. Successful adaptation policies based on sustained improvements in agricultural technology and crop yields will be essential for China to produce enough to keep pace with population growth and the effects of other drivers such as land use change. Such production-oriented policy goals should not ignore wider issues of sustainability, such as the intensity of fossil fuel and water use in the sector.

#### Project objectives

The overall objective of the project is to estimate the 'carbon cost' of adaptation to future climate change in terms of water use in agriculture. Specifically, the project will address the following objectives:

- Assessing and describing the main impacts of climate change on agriculture in China and deriving adaptation policy scenarios to sustain agricultural production in China
- Developing preliminary estimates of energy consumption in agricultural water use, using case study data
- Linking adaptation policies with energy use. The project will focus on a time horizon out to the 2030s, and use China's current national planning to provide the framework for the definition of socio-economic and policy scenarios.

#### Project team

**University of East Anglia:** Declan Conway (UK co-leader), Sabrina Rothausen

**Cranfield University:** Ian Holman

**Chinese Academy of Agricultural Sciences:** Lin Erda (China co-leader)

**Centre for Chinese Agricultural Policy, Chinese Academy of Sciences:**  
Wang Jinxia

#### Key milestones in 2012

##### March

Project completed in March

# 18.

## SAIN Research Portfolios



### Biochar: Socio-Economic and Biophysical 'Fit'

#### Problems to be addressed

This project addresses the current weak understanding of the socio-economic context of biochar in developing countries and in China. Despite the claims of widespread relevance of biochar to livelihoods and food security, there is currently little understanding of the farming systems, economic and livelihoods related constraints that limit its usefulness in many areas.

This work builds on existing knowledge of the biophysical characteristics of biochar, attempting to integrate this with a deeper understanding of the socio-economic context relevant for biochar deployment. It takes a comparative approach, examining a number of contrasting environments to deliver a comprehensive assessment of where biochar-related applications have potential and where they do not.

#### Project objectives

- To investigate, from both biophysical and socio-economic perspectives, the applicability of different biochar technologies in rural, peri-urban and other locations in sub-Saharan Africa, south Asia and China
- To investigate the likelihood of unequal socio-economic impacts, positive and negative, at different scales (within households, between households, between socio-economic groups, communities, between rural and urban areas, between countries and regions) arising from biochar production and use
- To test and refine "purposeful selection" tool(s) that help the user match the biochar technology to the site-specific biophysical and socio-economic environment
- To investigate sustainable use of biochar for improved food security and energy access

#### Project team

Chinese Academy of Agricultural Engineering (CAAE): Lixin Zhao (project leader), Haibo Meng, Ren Yawei

China Agricultural University (CAU): Mingsheng Fan

Council for Scientific and Industrial Research (CSIR), Ghana: Edward Yeboah, Beatrice Barko Obiri

University of East Anglia (UEA): John McDonagh (project leader)

University of Edinburgh: Saran Sohi

### Key milestones in 2012

#### April

Launch of the project

#### July

Baseline socio-economic survey work has taken place

#### August

A group from CAAE has visited the UK as part of this project

#### September-November

Survey carried in Heilongjiang, Jiangsu, Henan and Yunnan provinces

# 19.

# Information and Communication

## Websites

**SAIN main bilingual website**  
[www.sainonline.org](http://www.sainonline.org)  
[www.sainonline.org/English.html](http://www.sainonline.org/English.html)

**SAIN project bilingual websites**  
[www.sainclimatechange.org](http://www.sainclimatechange.org)  
[www.sainclimatechange.org/indexch.asp](http://www.sainclimatechange.org/indexch.asp)  
[www.cwrchina.ibcas.ac.cn](http://www.cwrchina.ibcas.ac.cn)

## SAIN Update

- Published quarterly
- Reports on SAIN progress
- Communication with stakeholders
- Share information within and beyond the SAIN network

## Publications

### SAIN Policy Briefs

Bilingual policy briefs are produced by each project team to communicate SAIN project findings and policy implications to non-academic audiences and policy makers.



## Publications in 2012

### Policy Brief No 5:

To realise the policy and technological options that could overcome multiple challenges posed by the excessive and inefficient use of N fertilizers, it is recognised that a whole enabling and incentive environment needs to be addressed, including:

- More effective delivery of information to farmers
- Policies and incentives to promote the development of a contractor sector for fertilizer application
- Use of modified forms of N fertilizer, especially inclusion of inhibitors to slow the release of N into crop-available forms and decrease gaseous losses
- Policies to further promote production of organic fertilizers from animal manure. Clear policies are required to ensure that manure management is taken fully into account at the planning stage for the rapidly growing number of large animal units
- Promotion of integrated water and nutrient management including “fertigation” in situations where irrigation is practiced – especially in the greenhouse horticulture sector but in some cases for field grown crops

### Policy Brief No 6:

- 3060 million tonnes (fresh weight) of livestock manure was generated in China in 2010. The N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O content of these manures is estimated to represent ca. 14 million, 10.2 million and 12.0 million tonnes respectively, which worth ca. 201,300M RMB
- Manure is commonly over-applied to horticultural crops, particularly greenhouse vegetables and fruit, which causes negative environmental impacts
- The barriers for effective management of manure, compost and digestate include lack of labour to transport and apply to the field; lack of knowledge of the nutrient content and availability; and inadequate labelling of e.g. composted manure products
- The pathways for improved manure nutrient management include:
  - Retaining nutrients through the manure management continuum
  - Using an integrated nutrient recommendation system
  - Generating knowledge of the nutrient content and nutrient availability of manure, compost and digestate
  - Ensuring CAFOs have manure nutrient management plans for utilisation in the local area (planning regulations)
  - Encouraging and incentivising improvements in other infrastructure, e.g. to facilitate mechanised transportation and spreading of manures



# 20.

## Information and Communication

### Journal Papers

- Di S, Xie L, Hao X (2012), Effect of Atmospheric CO<sub>2</sub> Enrichment on Chemical and Physiological Character in Leaf of Summer Soybean. *Acta Agriculturae Boreali-Sinica*, 27(2): 165-169
- Ding, X., Li P, Bai Y., Zhou H. (2012). Aflatoxin B1 in post-harvest peanuts and dietary risk in China. *Food Control* 23(1): 143-148
- Gao J, Hao X, Ju H, Li Y, Lin E, (2012) Effect of Elevated CO<sub>2</sub> on Photosynthetic Pigment Contents and Photosynthesis of Summer Soybean, *Chinese Agricultural Science Bulletin*, 28(06):47-52
- Han X, Hao X, Wang H, Li Y, Lin E (2012), Effect of Free Air CO<sub>2</sub> Enrichment on Nitrogen Absorption in Leaf and Head of Winter Wheat. *Chinese Journal of Agrometeorology*, 33(02): 197-201
- Hao, X.Y., Han, X., Lam, S.K., Wheeler, T., Ju, H., Wang, H.R., Li, Y.C., Lin, E.D. (2012) Effects of fully open-air CO<sub>2</sub> elevation on leaf ultrastructure, photosynthesis and yield of two soybean cultivars. *Photosynthetica*, 50 (3). pp. 362-370
- Huang, J., C. Xiang, X. Jia, and R. Hu. 2012. Impacts of Training on Farmers' Nitrogen Use in Maize Production in Shandong, China. *Journal of soil and water conservation* 67(4):329-335
- Norse, D, 2012, Low carbon agriculture: Objectives and policy pathways, *Environmental Development*, 1(1):25-39
- Yang Y, Ji C, Ma W, Wang S, Wang S, Han W, Mohammad A, Robinson D and Smith P, Significant soil acidification across northern China's grasslands during 1980s–2000s, *Global Change Biology* (2012) 18, 2292–2300, doi: 10.1111/j.1365-2486.2012.02694.x
- Yang Y, Fang J, Ji C, Ma W, Mohammad A, Wang S, Wang Shaopeng, Datta A, Robinson D and Smith P. Widespread decreases in topsoil inorganic carbon stocks across China's grasslands during 1980s–2000s, *Global Change Biology* (2012) 18, 3672–3680, doi: 10.1111/gcb.12025

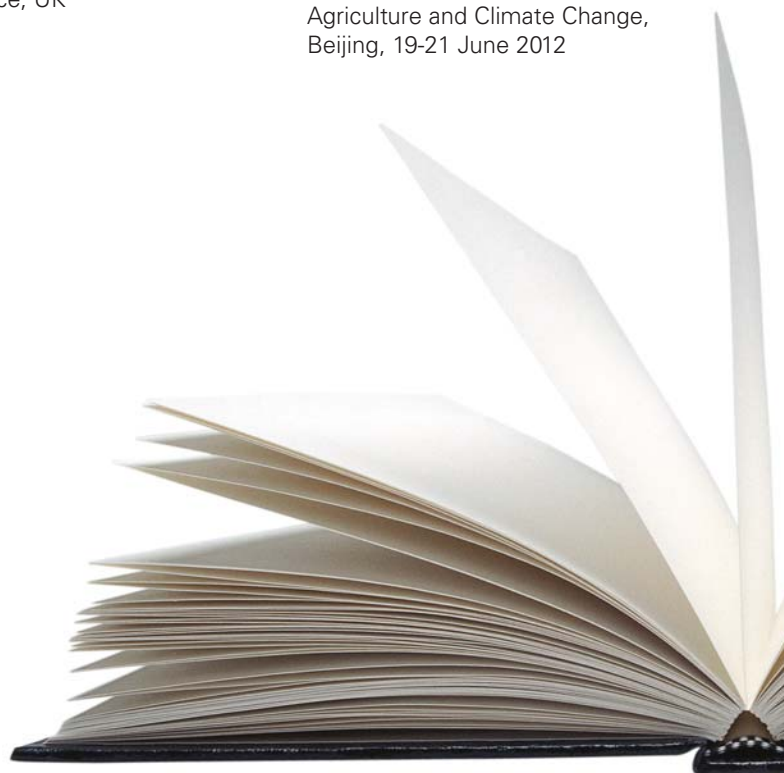
- Zhang W-F, Dou Z., He P., Ju X-T, Powlson D., Chadwick D. Norse D., Lu Y., Zhang Y., Wu L., Chen X-P, Cassman K.G. and Zhang F-S. (2012). New technologies reduce greenhouse gas emissions from nitrogenous fertilizer in China. *Proceedings of the National Academy of Sciences* (in press)
- Zhang W-F, Dou Z., He P., Ju X-T, Powlson D., Chadwick D. Norse D., Lu Y., Zhang Y., Wu L., Chen X-P, Cassman K.G. and Zhang F-S. (2012). New technologies reduce greenhouse gas emissions from nitrogenous fertilizer in China. *Proceedings of the National Academy of Sciences* (in press)
- Tong Yanan, Gao Pengcheng, Low Carbon Agricultural Technology, Popular Science series of books, (60,000 words), Publishing House of China's Labor and Social Security, (in Press)
- Tong Yanan, Gao Pengcheng, Climate Change and adaptation strategies of Agricultural Technology, (30 pages), Publishing House of Shaanxi Science and Technology, (in Press)

### Report

- David Norse, Yuelai Lu, Huajun Tang, 2012, The Future of Food and Farming - Foresight Report's Implications for China, Government Office for Science, UK

### Presentations at international conferences

- David Powlson, Overuse of Nitrogen: Insights from the Chinese Experience, Planet under Pressure 2012: New Knowledge towards Solutions, London, 27 March 2012
- David Norse, The Foresight Report, low carbon agriculture and climate change mitigation, BRICS Workshop on Agriculture and Climate Change, Beijing, 19-21 June 2012
- James Muir, The Future of Food and Farming: Challenges and choices for global sustainability, BRICS Workshop on Agriculture and Climate Change, Beijing, 19-21 June 2012
- Yuelai Lu, Dealing with climate change in an agricultural way-Implementation of UK China cooperation, BRICS Workshop on Agriculture and Climate Change, Beijing, 19-21 June 2012
- Yuelai Lu, Science of Food Security, Global Food Security Conference, 6 November 2012, Shanghai
- Yuelai Lu, Collaborating across borders and reaping the benefits, CropWorld Global, 7 November 2012, London
- Yanan Tong, Climate change and impact on phenology of winter wheat in Shaanxi, China, BRICS Workshop on Agriculture and Climate Change, Beijing, 19-21 June 2012



# 21.

## Networking & Stakeholder Engagement

### Academic and policy exchanges

A number of academic and policies exchanges have been carried out this year, including:

- May 2012, led by Zhang Hongyu, Director General, Department of Policy & Regulation, Ministry of Agriculture, the delegation visited Defra, NFU, British Sugar, Scottish Government and Scottish Agricultural Organisation Society (SAOS), 15-20 May. During the visit, the delegation held a number of in-depth discussions on UK policies of agricultural subsidies, agricultural insurance and farmers' cooperatives. It was felt that the agricultural sectors in the two countries face similar challenges, though at different development stages. There is great scope for the two countries to strengthen communications on policy making and implementation. It was suggested SAIN could facilitate policy communications through joint research, and workshops. The other delegation members included Wang Hui, Zhang Hiyang, Li Hongtao and Tian Xiao
- May 2012, the University of Reading hosted a visit by academic staff from the Institute of Rice Sciences, the Institute of Animal and Husbandry Sciences, the Institute of Crop Sciences from Anhui Academy of Agricultural Sciences. The visit was part of the project "Addressing vulnerabilities and building capacity for adaptation of agriculture to climate change in China"
- June 2012, Prof James Muir of Stirling University and Dr Yuelai Lu visited Chinese Academy of Fishery Sciences
- July the 8th, 2012, Mr. Liu Zhongwei, a project officer of FAO, who had been the director of the Division for European Affairs of the International Cooperation of MOA, China visited SAIN secretariat of China and communicated with the international cooperation division and executive deans from colleges of Northwest A and F University about the present situation on international cooperation in the field of Agriculture of China. He reported the present situation and development trend of FAO and MOA about China-Africa cooperation and about China-British-Africa cooperation
- August 2012, Chinese team members of Bio-char project visited UK Biochar Research Center at University of Edinburgh
- December 2012, led by Mr Wang Ying, Director General of the Department of International Cooperation, Mme Sun Guifeng and other four senior officials from Chinese Ministry of Agriculture visited Defra on 14th December. The purpose of this visit was to discuss the preparation of SAIN governing Board meeting and SAIN work plan for 2013 and beyond. Tim Mordan, Robert Bradburne and Yuelai Lu met the MoA delegation
- December 2012 WG4 members visited China to develop new research. Laurence Smith (SOAS), Ben Surridge (Lancaster University) and Sean Burke (British Geological Survey) visited Agri-Environment Protection Institute (AEPI) in Tianjin, where they held meetings with Prof Ren Tianzhi, Director of AEPI and other colleagues





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# 22.

## Networking & Stakeholder Engagement

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### Working with International Initiatives

SAIN has been actively engaging in international initiatives to contribute to global sustainable development.

SAIN is a partner to Global Partnership on Nutrient Management (GPNM) which is a global platform to steer dialogues and actions to promote effective nutrient management. Based on the partnership, SAIN and GPNM will share the knowledge and tools in sustainable nutrient management to reduce greenhouse gas emission and water pollution.

SAIN is in partnership with PISCES (Policy Innovation Systems for Clean Energy Security) implementing a research project to assess the suitability of biochar in China and sub-Saharan Africa, to explore biophysical and livelihood fit of biochar as an alternative energy as well as soil conditioner. The project, funded by Dfid and MoA, will last 30 months from April 2012. The project is working in China, Ghana and other PISCES focus countries, including India, Kenya, Sri Lanka and Tanzania.

Working with Foreign Economic Cooperation Centre of Chinese Ministry of Agriculture, SAIN disseminated the findings of Foresight Report on Future Food and Farming at BRICS (Brazil, Russia, India, China, South Africa) Workshop on Agriculture and Climate Change in Beijing on 19-23 June. Prof James Muir of Stirling University and Prof David Norse of University College London presented the key findings and follow up of The Future of Food and Farming: Challenges and choices for global sustainability, and The Foresight Report, low carbon agriculture and climate change mitigation. Dr Yuelai Lu of SAIN Secretariat presented SAIN's research on climate change titled Dealing with Climate Change in an Agricultural Way – Implementation of UK China Cooperation and Prof. Yanan Tong of SAIN Secretariat presented a titled Climate change and impact on phenology of winter wheat in Shaanxi, China.





# 23.

## The Ways SAIN Makes a Difference

SAIN contributes to sustainable agriculture and food security through putting research into practice. This includes technology development and implementation, as well as policy making.

### Support tools and evidence for policy makers and practitioners

SAIN projects emphasise the development of support tools and provision of evidence for policy making and guided implementation of good practices. Some examples of the tools already provided or to be developed include:

- Inventory of technologies for improving the management of N (from chemical fertilizers and manures) to increase efficiency of use and decrease losses
- GHG emissions inventory for various cropping systems
- Economic assessment of the marginal abatement cost of agricultural GHG mitigation in China

Outputs such as these are explicitly designed to assist or guide either agricultural practitioners (both farmers and their advisers) or policy makers in changing policies and practices in such ways that favour a more low carbon development path. This is one element of an overall strategy that comprises both mitigation and adaptation.

### Knowledge sharing and mutual learning

One of the important aspects of SAIN projects is knowledge sharing and mutual learning. This includes comparison studies between UK and China, as well as modification and application of technologies developed in the UK and Europe to the Chinese context. Examples include:

- Nutrients and manure management technologies and policies in both China and UK
- Models for inventory and systematic in situ and ex situ conservation of important crop wild relative diversity
- Building on UK and European database experience to examine how GHG emissions vary with different cropping and livestock systems in different regions

### Capacity building

Research capacity of Chinese and UK scientists is increased by implementing joint projects. For example:

- Chinese and UK scientists have learned to apply in botanically-rich China the crucial methodologies and principles of inventory, conservation and management of CWR resources developed and applied in UK
- SAIN Climate Science training workshop, organized by the UK Met Office Hadley Centre and Chinese

Academy of Agricultural Sciences, gives scientific and technical training necessary to use regional climate modeling system-PRECIS products and address many issues involved in its applications. The training includes an introduction to the PRECIS system, constructing climate scenarios for impact studies, uncertainties in climate modeling, PRECIS system related data analysis

### Communication

Various communications approaches are used in SAIN projects, including:

- Policy briefs
- Dialogue with policy makers
- Public lectures
- Academic publication



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# 24.

## Look into 2013

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### In 2013-14 SAIN will continue to work toward its overall objectives:

- Stimulate innovative thinking, research and policy approaches on all aspects of sustainable agriculture
- Communicate information on sustainable agriculture and disseminate best practices to key audiences
- Contribute to global sustainability through wider sharing of expertise between developed and emerging and developing economies

The specific objectives for 2013-14 were identified as following:

- Launch of a major multidisciplinary project on integrated nutrient and catchment management, jointly funded by Defra and MoA with total budget of £760,756 over three years
- Synthesis and translate SAIN research findings into practice
- Diversify funding sources
- Engage wider stakeholders
- Explore the possibilities for a long-term strategic plan and other funding sources



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### News from SAIN Members

#### Sir Prof Bob Watson

Sir Prof Bob Watson has left Defra in September 2012. In his letter to SAIN, Bob said "I have very much appreciated the cooperative approach we have fostered in relation to sustainable agriculture research, the results of which we are now beginning to see as the initial projects conclude and reports are published.

My successor as Chief Scientific Adviser to Defra, Ian Boyd, is looking forward to continuing the fruitful collaboration we have established over the last 3-4 years through the mechanism of SAIN, and to building on this with the participation of agriculture and food companies in both our countries."

Thanks to Sir Bob for his enthusiasm support and strategic guidance to SAIN in the past four years. We wish him all the best in his new position.

#### Prof Ian Boyed

We welcome Prof Ian Boyd becoming co-chair of SAIN Governance Board.

Professor Ian Boyd's career has evolved from Physiological ecologist with the Natural Environment Research Council Institute of Terrestrial Ecology, to a Science Programme Director with the British Antarctic Survey, Director at the Natural Environment Research Council's Sea Mammal Research Unit, Chief Scientist to the Behavioural Response Study for the US-Navy, Director for the Scottish Oceans Institute and acting Director and Chairman with the Marine Alliance for Science and Technology for Scotland. He has also been the Chief Executive or board member of several companies for the University of St Andrews. He is currently Professor in Biology at the University of St Andrews and Chief Scientific Adviser to the UK Department of Environment, Food and Rural Affairs.



# 25. Acknowledgement

## Project Partners



## Funders





For more information please visit:  
**<http://www.sainonline.org>**

or contact

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