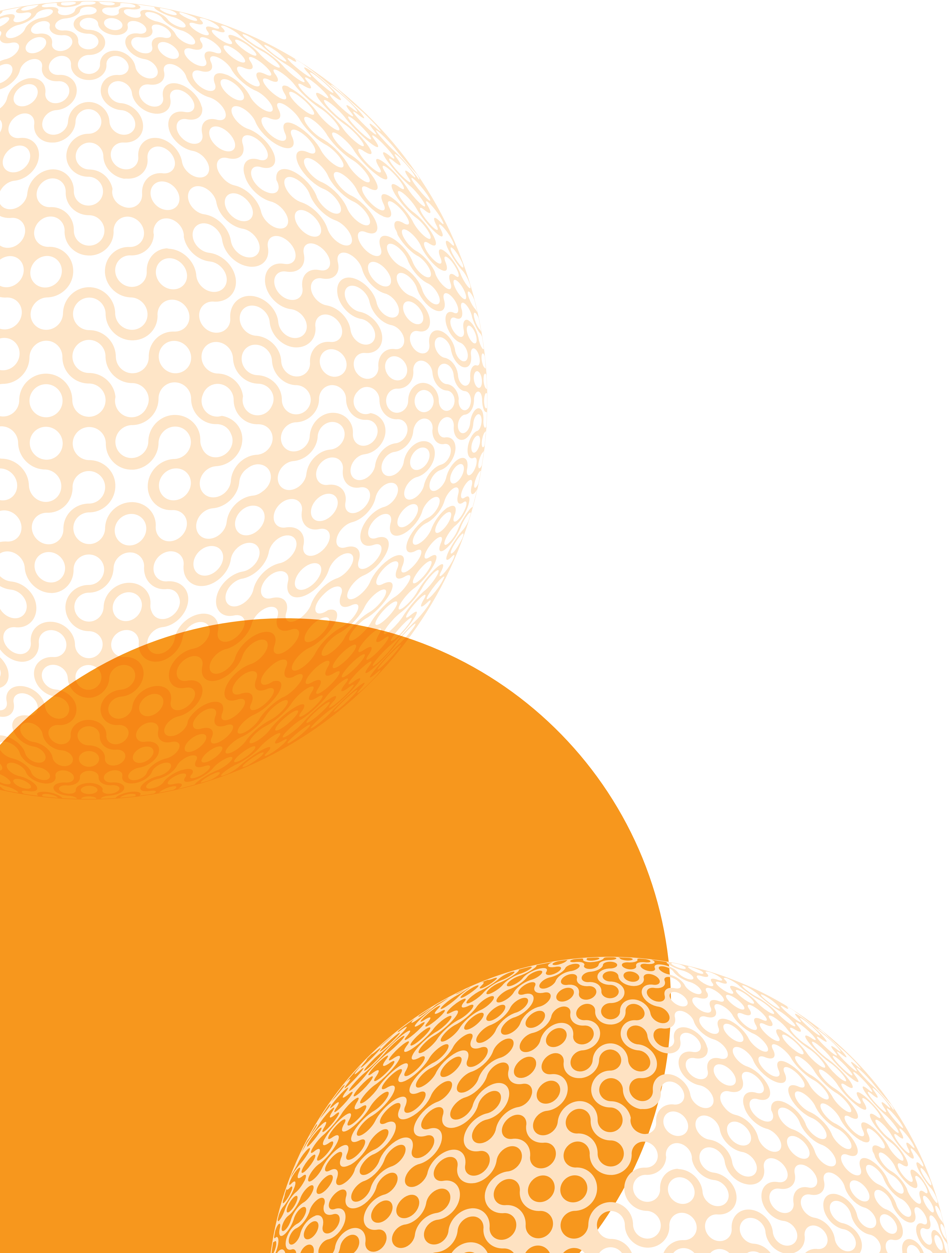
WORKSHOP REPORT

UK-China Workshop: Extreme weather and global food system resilience

Global Food Security

Sustainable, healthy food for all



Executive summary

In January 2016, the Global Food Security (GFS) programme collaborated with the Foreign and Commonwealth Office (FCO) in Beijing to hold the *UK-China Workshop on extreme weather and global food system resilience*. Its purpose was to build upon the work of the UK-US Taskforce on *Extreme Weather and Resilience of the Global Food System*, established by GFS in 2014, facilitating a shared understanding of the global issues surrounding extreme weather, while gaining insight from Chinese experts on the issue of both local and global food system resilience in the face of changing weather. This workshop, and a number of additional meetings with other stakeholders, also aimed to identify gaps in current knowledge and shared research priorities, while exploring how these might be addressed through developing new international research collaborations.

While we have some significant skill in understanding how the average climate is changing, our appreciation of volatile weather extremes and their potential impacts on the food system is far from sufficient. For example, extreme weather events of recent years have been markedly more frequent and more severe[1], adversely impacting agricultural production in many regions of the world. Should such extreme weather-related production shocks occur in major global 'breadbasket' areas, then the associated drop in food production would have the capability to trigger rapid spikes in global food prices, seriously compromising food security both locally to the production shock and globally as repercussions move through the global food market[2].

As a major global breadbasket region, being one of the world's largest producers and traders, China has great bearing on global food supply and commodity prices. Therefore, understanding how extreme weather-related shocks might impact Chinese food production, as well as how Chinese food policy and trade may be used to respond to either local or global scale shocks, is of key importance to help build global food system resilience in the face of growing risks.

Key discussions

In depth discussions took place on the findings of the UK-US Taskforce on *Extreme Weather and Resilience of the Global Food System*, and their relevance to China and its food security.

Following decades of productivity growth in China, more recently growth rates have been falling. While local pollution is currently thought to be a major driver in this yield stagnation, another rapidly growing contributory factor is climate change and the associated changing patterns of weather across China. Of course, due to its large size and diversity of environments, climate and weather risks across China are unequal. This provides a degree of national resilience against extreme weather events and some opportunity to adapt to average changes in climate via improvement of resource use efficiency or movement of cropping areas. However, it was acknowledged that risks associated with climate change are greater than merely trends in climate, and there is significant need to better understand the likelihood and potential impacts of extreme weather across China. Furthermore, China's reliance on imports is growing significantly, putting the Chinese food system at risk from fluctuations in global prices. As poverty in the Chinese rural population is significant, the government has historically acted to protect them from food price spikes. This leads to likelihood of price-protection through export bans, release of stockholdings in a food-price crisis and direct price interventions in the domestic market; however, such policy responses may amplify price rises in the global market.

Future research priorities

Discussions between UK and Chinese experts identified a number of shared research priorities and knowledge gaps. These key research priorities were as follows:

- Extreme weather events are a priority research area for both the UK and China, especially in a global context, but there is a great deal still unknown about the likelihood of and possible impacts resulting from extreme weather, requiring significant improvement to climate models and forecasting. Better characterisation of extreme weather is also necessary, defining the relationship between variability in the weather across space and time.
- There is appetite to better understand the global impacts of different policy responses to production shocks and identify more favourable trade solutions. This is especially important as the global food system becomes more integrated, facilitating the transmission of risk through food markets to have a variety of repercussions at multiple scales.
- There is a need to better understand food system risks at both temporal and spatial levels, creating better links between biophysical predictions and associated repercussions on socio-economic systems.
- There is scope to stimulate greater collaboration with the private sector and between international Governments to enhance food system management and resilience.
- There remains a significant need to align research in sustainability, resilience and "climate-smartness" in order to stimulate effective and sustainable adaptation of agriculture to climate change and associated weather events.
- In order to address many of the knowledge gaps in this space there is need to improve existing global modelling approaches, for example, creating a fully integrated model incorporating all aspects of the food system.

Given our highly aligned priorities and complementary research strengths, there is a great deal of scope for the UK and China to work together further on the issues surrounding extreme weather and global food system resilience.

Introduction

Trends in demand for food are growing faster than yields are - by 2050, the UN's Food and Agriculture Organisation estimates that 60% more food per year will be needed to support the growing global population[3]. This substantial increase, if realised, would have the potential to put significant strain on the global food system and its sustainability. At the same time the climate is changing, creating further need for agriculture to adapt while posing many additional challenges on multiple fronts.

Climate is an aggregate description of the weather, and whilst we have some significant skill in understanding what a changing climate may mean, we have perhaps insufficiently considered the issue of changing weather and how this may impact on food systems. Already, we are recognisably experiencing more frequent, more extreme and more impactful weather than ever before[1]. In recent years, such extreme weather events have impacted on agricultural production in a number of areas of the world. These events have the potential to create local food security issues in some regions, as seen from current impacts of the 2015-16 El Niño. In addition, if a major 'breadbasket' area is affected, the associated drop in food production can trigger rapid increases in global food prices. Such price spikes have serious consequences for global food security - increasing household food expenditure, reducing access to sufficient good quality food in poor communities, and even triggering civil unrest in areas with fragile governance. Finding ways to rise to the challenge of producing food for over 9 billion people by 2050 in an increasingly unpredictable climate is therefore a key global priority.

In order to address this issue, a UK-US Taskforce on *Extreme Weather and Resilience of the Global Food System* was established in 2014 by the Global Food Security programme (GFS) in collaboration with the Foreign and Commonwealth Office (FCO) and Science and Innovation Network (SIN). The Taskforce presented evidence in 2015 that the global food system is vulnerable to production shocks caused by extreme weather, and that this risk is growing[2]. Preliminary analysis of our limited existing data suggested that the risk of a 1-in-100 year global production shock could increase to 1-in-30 or more by mid-Century. The Taskforce also developed a plausible scenario of extreme weather events affecting multiple breadbasket areas, and, using this, analysed policy actions needed to avoid amplifying shocks and impacting upon people. Their analysis of historical records suggested price spikes are more likely to occur if global production is 95% or less of demand, especially if more than one crop is affected, and if global stocks are less than about 20% of demand. How markets respond to such shocks often depends crucially on governmental responses. For example, implementation of export bans to protect local food security tends to amplify price signals. Likewise, although it is improving, a lack of transparency of national stock holdings can lead to market uncertainty and volatility.

However, the work of the Taskforce, as published in the reports in the summer of 2015, further highlighted the numerous areas of uncertainty within this field, and the need for further study on a global level to fully understand the potential impacts of extreme weather events on the global food system.

Credit: Flickr, Global Environment Facility

UK-China Collaboration

In January 2016, the Global Food Security (GFS) Programme collaborated with the Foreign and Commonwealth Office (FCO) in Beijing to hold the *UK-China Workshop on extreme weather and global food system resilience* to build upon the work of the UK-US Taskforce. This aimed to establish a shared understanding of the global issues surrounding extreme weather, while gaining insight from local experts as to China's stance on the issue of food system resilience in the face of changing weather. It was anticipated that this workshop, and a number of additional meetings with other stakeholders, would identify gaps in current knowledge and shared research priorities, while exploring how these might be addressed through developing new international research collaborations.

Background

China is the world's most populous country and is the second largest economy after the US (or third, after the EU and the US), representing about 13 % of global GDP. China is becoming more integrated into the global economy and is increasingly reliant on international trade to meet its needs - currently China is a major importer of Oilseeds, including soy, and processed food. Since 2003 China has become a net food importer, with this import need likely to increase as China's demand continues to grow, partly due to its economic growth.

As a major global breadbasket region, being one of the world's largest producers and traders, China is a significant player in global food system dynamics. It is therefore of key importance to understand how possible weather-related shocks might impact Chinese food production, and how their subsequent trade response might have knock-on effects for the global food market - any changes to Chinese food supply or demand brought about by extreme weather events having the potential to significantly affect global commodity prices. Equally, given China's need to feed 20 % of the global population on only 7 % of global arable land[4], it is also important to understand possible impacts of extreme weather-related production shocks on Chinese national food security.

Credit: Sian Williams

Current state of knowledge

China's agriculture remains in transition. Undoubtedly China is a very large country, with a range of different climatic, cultural, agricultural suitability and income levels. Recent decades of agricultural productivity growth have significantly depended on three technologies, but unequally –analysis presented at the workshop indicated that irrigation and synthetic fertilisers between them accounted for 47% of yield improvement, with improved plant genetics accounting for a further 18% (Chaoqing Yu, Tsinghua University). However, a number of challenges are impeding China's productivity growth, including: the increasing demand for irrigation water when its supply is limited; the eutrophication of ground water by fertilisers; the widespread degradation of soils; and increasing land and labour costs. As a result, levels of rural poverty remain higher than urban poverty, with some 46% of rural populations subsisting on low incomes compared to 20% in urban environments.

In addition to these challenges, of course, is climate change. Presentations at the workshop indicated **changing patterns of weather across China**, including: decreasing cold days and nights; increasing warm and hot days and nights; increasing 1- and 5-day rainfall intensities; and increasing drought risk in the agricultural north (Guoyu Ren, National Climate Centre). Further to this, climate change is already seen to be impacting on yields. Partial factor productivity shows -1.2% yield suppression due to changing temperatures, countered by 3.3% increase in production volume this century as a result of technological efficiency and increasing the area sown. Thus, despite productivity growth, climate change is leading to yield stagnation (Erda Lin, CAAS).

The climate risks across China are unequal, but as Chinese regions are integrating more, this builds some degree of national resilience. However, as was pointed out in discussion, food insecurity and famine is often driven by the policy environment rather than by changing weather alone. Nonetheless, there was significant discussion about the need to better understand how weather patterns will change and the potential for variability and extremes to increase. Multi-decadal droughts for China exist in the historical record, and it is far from clear how China might cope if the risk of such events occurring in future increases.

Given China's increasing integration in the global market, there are positives in terms of the ability for trade to make up for production shortfalls; however, such integration also results in increased exposure of China's agricultural sector to variability in input and output prices. Due to the extent of national rural poverty, protecting the poorest people is an important determinant of how China may respond in the event of a production shock. Jikun Huang (CCAP) presented insight into how China might respond to a major production shock and associated price spike from analysis of the 2007/8 price spike, where the government's response - across multiple departments - was to buffer the domestic market. This included:

- Release of grain stocks (Late 2007) (involving NDRC+SGA)
- Forward contracts with foreign suppliers
- Increasing domestic production (COFCO)
- Change in biofuel policy to reduce competition with food
- Disincentivising cereal exports (Jan 2008) and subsequent export ban (involving NDRC+MOC+MOA)
- Increasing subsidy on fertilisers
- Food subsidies given to rural poor and students

Credit: Flickr, Bethan Phillips

Chinese policy responses after global production shocks have therefore historically acted to stabilise national food prices via mobilisation of food reserves, incentivising production, creating disincentives for export and changing biofuel demands. These actions, alongside wider integration of all the resources available within the Chinese food system, have brought about a decrease in the frequency of national food crises in recent history. However, given the great purchasing power of China, this kind of response can have major knock-on effects for the global market, further increasing commodity prices. In brief, if there was a significant perturbation, there would likely be a big and fast policy response to stabilise prices in China which would inevitably have implications for international trade and prices. Therefore, there is a need to identify solutions other than creating export restrictions on international trade to buffer against the impacts of both local and global production shocks.

One way of building global food system resilience is to ensure that **agricultural production globally is resilient in the face of growing risks**. The northern developed countries invest significantly in their farming sectors, but there is an increasing need for richer nations to help poorer nations, especially in the global south, improve their sectors. Several experts mentioned investing in the south, for example via China's investments in the South-South Cooperation on Climate Change[5], as an example of 'enlightened self-interest'. With respect to global food system resilience, this approach is prudent for two reasons; firstly, investing in the south spreads risk to ensure a wider range of productive agricultures around the world, which in turn may help maintain trade-flows when necessary; secondly, price-signals based on harvest forecasts in the north can drive rapid (within-year) changes in planting in the south, creating the potential to buffer across hemispheres.

Credit: Flickr, Walmart

One strand of adaptation to manage the impact of increasing risk is the use of insurance. The state owned People's Insurance Company of China (PICC) has significant and rapidly growing interest in agriculture, currently covering around 65% of the Chinese market. Agricultural insurance in China is now second only to the USA - in 2015 the size of the sector was 77bn RMB (approximately 12.5bn USD) - with more than 150 farm products covered and 280 000 offices ('service points', employing more than 330 000 people) throughout China (Jun Wang, PICC). Insurance plays a role in three ways:

- Agricultural risk is related to yield and through that to disaster insurance (for food security) and agricultural insurance for farmers
- Agricultural risk is also related to price risk – this requires price protection for the poor and futures contracts to manage volatility
- Insurance, as well as managing risks, can drive technology transfer and promote credit-support

Clearly, as with other aspects of the private sector (e.g. COFCO, the integrated agri-food supply chain company), PICC has a significant interest in understanding the changing risks associated with changing weather.

Key discussions and unknowns

- **Characterising the evolution of extreme weather.** This was a core thread throughout much of our discussion. Firstly, there is the issue of understanding inter-annual variability, vs decadal and multi-decadal variability, and then understanding how changing climates may create trends or step-changes in the likelihood of events happening. In addition, as Kirsty Lewis (Met Office Hadley Centre) highlighted, understanding the meteorology of what creates an extreme impact is different from understanding the meteorology of extreme events. For example, a succession of 1-in-10 year droughts may be more impactful than a single 1-in-100 year drought. Similarly, a relatively minor shock in one place, if it happens the same year as a shock in another place, may combine to create a market shock. Thus, there is a need to understand high-impact shocks at multiple scales in both space and time, and in particular their teleconnections – how shocks may be spatially correlated in a given year.

- **The risks associated with climate change are more than simple trends in climate.** We are particularly interested in understanding the relationship between variability in the weather – across space and time – and how it impacts on the food system, both locally and globally. In many discussions, this nuance became lost due to two assumptions that hold force with some strength. Firstly, that the challenge of climate change is in the changing mean climate (e.g. the gradual change in yields and how to adapt to it by changing crops, management and agricultural area). Secondly, that the future weather will simply be the same as today's, but on average a few degrees warmer. There is potential for the mean climate and its variability to become uncoupled – so rainfall totals can increase on average, but at the same time if their variability increases, so can drought risk. And, of course, as the distribution of weather changes, increasingly unprecedented events are likely.

- **A country's food security no longer depends on its agriculture alone.** In many discussions there was a temptation to equate domestic food production and food security. This is increasingly not the case for China. As China integrates more closely with the global trade economy it becomes more dependent on agriculture elsewhere. In addition, as a responsible player in global trade, China is increasingly concerned with the impacts of food system shocks, especially relating to how China's response may affect these impacts in other countries. This is driving some investment in agricultural development in the Global South as a means of creating both global and local resilience. However, as was discussed, China's historical response is to protect its rural poor to the extent of imposing export bans and thus potentially contributing to driving up prices across the world. This strategy may increasingly impose a political cost.

- **It is important to better understand the transmission of risks through the market at multiple scales.** A key discussion thread was how best to link biophysical models to socio-economic ones. By definition, extreme events are often 'out of sample' in terms of socio-economic models, where the mechanistic basis of responses to an event can be a highly complex mix of individual consumers and citizens reactions as well as institutional responses to actions of market and policy actors. This has typically forced the modelling community to focus on models with well-established theory and only a few parameters which we know well (or believe we know well). These are potentially inadequate approaches to understand how multiple bread-basket failures may propagate into local food prices and availability.

Credit: Grigorev Vladimir, Thinkstock

- **Responses to shocks domestically or overseas are complex.** For example, meteorological, hydrological and agricultural droughts are different; the latter can increase in likelihood even if the former are stationary, simply if demand from other sectors is increasing. The impact of a drought in China depends on where it is, and responses have the potential to exacerbate the problem as well as to mitigate it. For example, if there is a shortfall in production, signals to intensify agriculture elsewhere can undermine soil, water or other natural resources in a significant way. Stockholdings are a major determinant of price transmission, yet as transparency of where stocks are held globally is poor, and stocks are expensive, it is difficult to estimate the necessary stocks to hold if the risks are poorly known.

Credit: Flickr, CheshireCat@TO

- **Adaptation and mitigation.** There is a clear and strong interest by China in mitigating, as well as adapting to, climate change[6]. This interest has bought about greater recognition of the need to better manage natural capital, especially soil and water resources. However, there is great debate on how best to do this, some discussions highlighting adaptation potential in terms of:
    - Improving water-use efficiency and irrigation
    - Improving resource management, including large scale water transfers
    - Moving and increasing cropping areas, and switching to double cropping in the south
    - Developing 'circular agriculture' to maximise resource use efficiency and re-establish nutrient cycling

However, some of these options could still come at a potential yield cost, implying the need for either more reliance on imports or improved demand-side management, and all proposed options need to be explored further in terms of resilience to shocks as well as the expectation of yields.

- The challenges around food security need to be framed in two ways. The first is to take **a food systems' view**, acknowledging the challenge of the interdisciplinary thinking and learning this requires. The second is to think about variability in the weather changing rather than the average climate. A challenge is therefore to move away from disciplinary perspectives on climate change, and to think about the systemic responses to shocks, wherever they may occur. As Jikun Huang (CCAP) said in his closing remarks to the workshop: "*There is good acknowledgement that the climate is changing and that we all see this from different perspectives; but the more we see, the more we see we need to know. This is a good starting point*."

- **There is a great deal of scope for the UK and China to work together on this issue**, given our highly aligned priorities and complementary research strengths. Considering the high level of interconnectivity within the global food system, more could be done on an international level to address global food security.

Future research priorities

Discussions between UK and Chinese experts identified a number of shared research priorities and knowledge gaps. The key research priorities were as follows:

- **Extreme weather events are a priority research area for both the UK and China, especially in a global context, but there is a great deal still unknown about the likelihood of and possible impacts resulting from extreme weather.** It was agreed that there is a need to improve our climate models and ability to forecast, exploring the use of wider global modelling and new sensing technologies. A clearer definition of extreme weather should also be developed, taking into account both one-off and compound events, the nature of direct and indirect impacts and the time periods over which impacts are considered.

- **There is a need to better understand food system risks**, including long term agricultural risk and short term dynamic assessment on both local and global levels. This requires developing more sophisticated ways to link biophysical model predictions with their potential impacts on socio-economic systems. In particular, the extent to which shocks may propagate through the market and the factors that may amplify or mitigate them.

- **There is appetite to better understand the global impacts of different policy responses to production shocks and identify more favourable trade solutions.** In our highly connected global food system it is vital to consider how activity of individual members, especially those such as China with large influence, can impact both individual countries and the global market as a whole. Potential negative impacts on developing countries are especially vital to understand and protect against.

- **Greater collaboration with the private sector has the potential to enhance food system resilience**, via transparency in private food stocks to allow improved management efficiency of public stocks, and support of agricultural risk management by insurance firms.

- Given that agriculture necessarily needs to adapt to climate change, and given China's recognition of the importance of carbon reduction and sustainability in the agricultural sector, there remains a significant need to **align research in sustainability, resilience and 'climate-smartness'**. Key areas of interest are soil and water management, 'sustainable intensification' and the potential for circular farming systems to address some of the challenges in rural development.

- **In order to address many of the knowledge gaps in this space there is need to improve existing global modelling approaches.** There is scope to create a fully integrated food system model; taking into account climatology, hydrology, production data, and socio-economic factors. This would require not just an update to empirical data sources, but also new modelling methodologies to couple biophysical and socio-economic factors. The scale of this research would need to be established, bringing in relevant players in the global food system for effective modelling on a global scale.

Conclusion

This work has provided an improved understanding of the risks of climate change on food system resilience in China, while also recognising China's role within the global food system as a whole. Key shared research priorities have been identified, highlighting the opportunity for new UK-China collaborations that the Global Food Security Programme will look to facilitate in the near future.

Appendix 1: Workshop Participant List

Richard Baker, British Embassy Beijing

Tim Benton, Global Food Security Programme

Jianmin Cao, Jinlin Agriculture University

Steve Chen, Commodity Research Department, COFCO

Ding Ding, Department of Climate Change, NDRC

Yazhen Gong, China Renmin University

Xue Han, Chinese Academy of Agriculture Sciences

Tim Hess, Cranfield University

Lingling Hou, Center for Chinese Agricultural Policy, Peking University

Zeying Hu, Research Councils UK

Clement Hua Wei Lang Dai, IBM Energy & Utilities Industry/Green Horizon

Jikun Huang, Peking University & Center for Chinese Agricultural Policy, Chinese Academy of Sciences

Tong Jiang, China Meteorological Administration, National Climate Center

Sanlin Jin, Rural Economic Research Department, State Council

Aled Jones, Anglia Ruskin University

Hui Ju, Institute of Environment and Sustainable Development, Chinese Academy of Agriculture Sciences

Richard King, Chatham House

Kirsty Lewis, Met Office Hadley Centre

Erda Lin, General Agro-Environment and Sustainable Development Institute, Chinese Academy of Agricultural Sciences

Jing Liu, Agriculture Insurance Department, PICC

Suxia Liu, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences

Yu Liu, Center for Chinese Agricultural Policy, Chinese Academy of Sciences

Ruifeng Liu, Henan Agriculture University

Yuelai Lu, UK-China Sustainable Agriculture Innovation Network (SAIN)

Xingguo Mo, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences

Huanguang Qiu, China Renmin University

Guoyu Ren, China Meteorological Administration, National Climate Center

Jiyuan Shi, Market Intelligence Department & Commodity Research Department, COFCO

Chunxiao Song, Henan Agriculture University

Laixiang Sun, Department of Geographical Sciences, University of Maryland

Richard Tiffin, University of Reading

Andy VanLoocke, Iowa State University

Jinxia Wang, Center for Chinese Agricultural Policy, Chinese Academy of Sciences & Peking University

Jun Wang, Agriculture Insurance Department, PICC

Sian Williams, Global Food Security Programme

Jianjun Wu, Drought Mitigation Center, Beijing Normal University

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Ying Xu, National Climate Centre

Song Yanling, China Meteorological Administration & Beijing Climate Center

Chaoqing Yu, Center for Earth System Science, Tsinghua University

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Su Zhang, UK Department for International Development

Tianyi Zhang, Institute of Atmospheric Physics, Chinese Academy of Sciences

Yumin Zhao, International Market Department, Ministry of Commerce

Qi Zheng, British Embassy Beijing

Hongjian Zhou, National Disaster Reduction Center of China

Appendix 2: Workshop and meeting agenda

UK-China Workshop on Extreme Weather and Global Food System Resilience

AGENDA

Monday 11th January, 9am – 5.30pm

Venue: Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences

Co-Chairs – Professor Huang Jikun and Professor Tim Benton

9:00 – 9.15 **1. Welcome** by Co-Chairs, Professor Huang Jikun and Professor Tim Benton

9.15 – 10.55 **2. Overview of the GFS Report**

- Summary by Professor Tim Benton
- Specific findings from Climate Team, Kirsty Lewis, Met Office Hadley Centre
- Specific findings from Response Team, Aled Jones, Anglia Ruskin University
- Specific findings from Impacts Team, Richard Tiffin, University of Reading
- Specific findings from Lloyds of London report, Aled Jones, Anglia Ruskin University
- Key discussions (Chaoqing Yu, Tsinghua University; Hengyun Ma, He Nan Agriculture University)
- Open discussion of GFS report

10.55 – 11.15 **Break**

11.15 – 12.45 **3. Presentations on how impacts of extreme weather might affect China**

- Extreme weather and climate change, Guoyu Ren, National Climate Center
- Extreme weather and Chinese food security, Erda Lin, Chinese Academy of Agricultural Sciences
- Extreme weather, trade and the global market, Jikun Huang, Center for Chinese Agricultural Policy, Chinese Academy of Sciences
- Key discussions (Tim Hess, Cranfield Water Science Institute; Richard King, Chatham House; Andy VanLooke, Iowa State University)
- Open discussion

12.45 – 13.45 **Lunch**

13.45 – 15.15 **4. Roundtable discussion for perspectives from participants**
Co-Chairs – Professor Huang Jikun and Professor Tim Benton.

- Key discussions

Panel: Jinxia Wang, CCAP/CAS; Jianjun Wu, Beijing Formal University; Sun Laixiang, SOAS; representative from IBM; Kirsty Lewis, The MET Office; Yuelai Lu, UK-China Sustainable Agriculture Innovation Network)

- Open discussion

The discussion will begin with a presentation from Kirsty Lewis, illustrating a possible extreme weather scenario and its potential repercussions for China. This scenario will provide starting material for group discussion.

Discussion Objectives:

- Consider the repercussions of such a scenario on food security in China, in terms of both Chinese domestic production and impacts on the global market. Where would shocks be felt most strongly?
- Consider how China might respond to such a scenario, especially in terms of Policy and Industry responses. What actions might be needed to avoid amplifying shocks and impacting upon people?
- Consider the uncertainty surrounding the possibility and outcomes of such a scenario and identify gaps in current knowledge.
- Explore how these knowledge gaps might best be addressed through research and international research collaborations.

15.15 – 15.45 **Break**

15.45 – 16.45 **5. Presentations from representatives of UK and Chinese funding bodies to outline possible funding and collaboration opportunities**

- Presentation from National Disaster Reduction Center, Hongjian Zhou
- Introduction of UK Research Council in China, Maggie Lu, RCUK China
- Presentation from People's Insurance Company of China (PICC), Jun Wang
- Presentation from China National Cereals, Oils and Foodstuffs Corporation, Shi Jiyuan
- China South-South Fund on Climate Change ,Ding Ding, China National Development and Reform Commission
- Group discussion

16.46 – 17.30 **6. Summary and closing remarks** by Co-Chairs, Professor Huang Jikun and Professor Tim Benton

This time could also be used to cover any follow up discussion required.

UK-China workshop on extreme weather and global food system resilience

Monday 11th January 2016, Beijing, China

Prepared by Sian Williams on behalf of the Global Food Security programme

References

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