UK-China Sustainable Agriculture Innovation Network

CWR China

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The importance of China's crop wild relatives for the future of food and farming[1]

Crop wild relatives (CWR), the focus of the SAIN project 'CWR China', are wild plant species genetically related to crops that contain adaptive traits which can be used for crop improvement through the development of new varieties; therefore the conservation of CWR genetic diversity is critical for food security and economic stability[i]. Professor Sir John Beddington's Foresight Report on Food and Farming commissioned by Defra[ii] raises global policy issues that highlight the value of CWR to food security and the need to address their future survival. But will current policy address these issues?

The CWR China project has produced an inventory of China's CWR which contains more than 24,000 species of potential/actual economic importance, including CWR related to food, fodder, forage, industrial, medicinal and ornamental crops. To what extent is the survival of these species threatened by the pressures to ensure world food security and what are the key issues raised in the Beddington report that pertain to China's CWR?

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[1] This briefing note is based on the findings of the China-UK Project "Conservation for enhanced utilization of crop wild relative diversity for sustainable development and climate change mitigation (CWR China)". The project is funded by Defra and China's Ministry of Agriculture. It is led by Dr Dingming Kang, China Agricultural University, Prof Keping Ma and Dr Wei Wei, Institute of Botany, Chinese Academy of Sciences, China and Prof Brian Ford-Lloyd and Dr Nigel Maxted, University of Birmingham, UK. The project forms part of the China-UK Sustainable Agriculture Innovation Network – SAIN (see www.sainoline.org).

Threats to CWR from China's agricultural production

The Foresight Report identified a number of threats that are likely to impact on CWR, including:

- China's forest and agricultural land expanded by 35% between 1990 and 2007 (to 70 million hectares), so depleting natural ecosystems and threatening CWR populations.
- Land tenure reform in China has given farmers much greater rights to freely manage their land, and this has played a major role in the country's substantial increase in agricultural production. This could reduce the effectiveness of any government policy designed to conserve and protect CWR.
- China has seen expansion in its agricultural research base in contrast to many other countries. Spend increased by about 10% per year between 2001 and 2007 (to RMB12.3 billion in 2007), and seven people are taken out of poverty for every RMB10,000 spent. Investment in agricultural R&D in less favoured areas where smaller farms are more concentrated has a greater effect on growth and poverty reduction than investment in other areas. While being highly significant in terms of directly addressing food security issues, this expansion could in the longer term contribute indirectly to food insecurity by threatening the future survival and availability for use of CWR. This is because growth is associated with intensification of land management which in turn leads to a loss of suitable habitats for CWR, a reduction in population size and consequently a loss of genetic diversity.

Policy options highlighted by the Foresight Report

- Beddington argues rightly that 'sustainable intensification' of global agriculture is a necessity. Indiscriminate expansion of intensively managed agricultural land would destroy natural and traditionally managed habitats where biodiversity (which includes CWR) is to be found, and hence is not a desirable policy option. It is "critical to produce enough food from [existing] cultivated land to allow land to be spared for wildlife [including CWR], and for the ecosystem services [including the genes from CWR] these habitats provide".
- Will changes in land tenure in China described in the Foresight Report make sustainable intensification more or less likely with a greater or lesser threat to natural populations of CWR? In order for the policy option most beneficial to CWR survival to be taken, it can be argued that more research is needed, but nevertheless it is known that unsustainable intensification does cause CWR diversity erosion and extinction.
- Beddington argues that in China, investment in agricultural R&D in less favoured areas where smaller farms are more concentrated has a greater effect on growth and poverty reduction; but what effect continuing this policy will have on biodiversity and CWR is unknown. More information is needed which could influence future conservation planning.

- In a global context should farming be made more biodiversity/CWR friendly at the expense of some productivity (de-intensification) or should the focus be on sustainable intensification with land set aside (natural reserves) for conservation as Beddington suggests?
- FAO has only recently warned that two thirds of China's wheat crop (75 million tonnes out of the total 112 million tonnes) may be at risk because of very low rainfall. Will the immediate solution to meet this shortfall be to increase sustainable intensification, or more indiscriminate expansion of agricultural land? What policy option is taken will either protect or threaten the future of CWR in China.

Policy to be informed by the CWR China project

Without baseline data on numbers and distribution of CWR in China, threats to their future survival and opportunities for their enhanced use in crop improvement cannot be assessed. The CWR China project is now providing the baseline data to inform future CWR conservation and use policy in China. We now know which species of economic importance currently exist in China and preliminary results indicate which of these are of highest priority in terms of their potential contribution to food and economic security (Table 1, Figure 1). Information on the extent to which these species are currently under active conservation will also soon be revealed by gap analysis so that policy can be established which will ensure their future survival under climate change – establishment of new genetic reserves can be planned for CWR conservation, and threats to existing reserves imposed by agricultural intensification can be assessed.

Table 1. The CWR China inventory: summary statistics[iii]

Category	**No. of species**
Total plant species in China	35,342
Crop wild relatives	24,538
Wild relatives of food crops	1,229
Wild relatives of crops of high economic importance	629
Wild relatives of food crops endemic to only one province	485

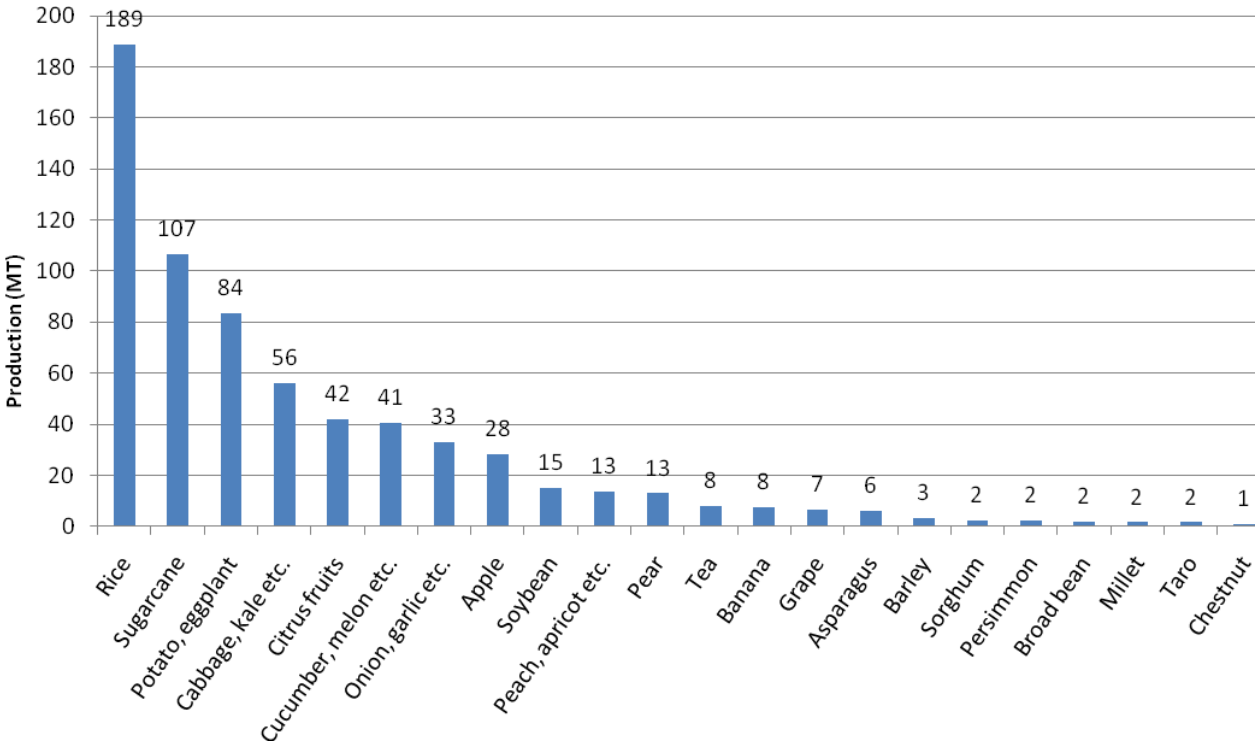

Figure 1. Crops of which China produced an average of >1MT in five years from 2005–2009 that have CWR native to China which may be important for crop improvement[iv].

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[i] Maxted, N. and Kell, S. (2009) Establishment of a Global Network for the *In Situ* Conservation of Crop Wild Relatives: Status and Needs. Commission on Genetic Resources for Food and Agriculture, FAO, Rome, Italy. 212 pp. http://typo3.fao.org/fileadmin/templates/agphome/documents/PGR/SoW2/CropWildRelatives_2011_final.pdf

[ii] Foresight. The Future of Food and Farming (2011) Final Project Report. The Government Office for Science, London. http://www.bis.gov.uk/assets/bispartners/foresight/docs/food-and-farming/11-546-future-of-food-and-farming-report.pdf

[iii] Data source: Qin, H. *et al*. (eds.) (2009) *China Checklist of Higher Plants.* In: the Biodiversity Committee of Chinese Academy of Sciences (ed.), *Catalogue of Life China: 2009 Annual Checklist China*. CD-ROM. Species 2000 China Node, Beijing, China.

[iv] Data source: FAO (2010) FAOSTAT. Food and Agriculture Organization of the United Nations, Rome, Italy. http://faostat.fao.org/