Briefing

Climate change, Food and agriculture

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Reducing climate risk and poverty: why China needs ecosystem-based adaptation

As climate risks increase, China's government must help its people — particularly the poorest farmers — to adapt and thrive. One increasingly popular and tested strategy is to adopt ecosystem-based approaches to adaptation (EbA). Evidence from a recent initiative examining the use of EbA in 12 countries — including Yunnan and Guangxi provinces in Southwest China — suggests that EbA is a powerful tool that can both tackle climate change risks and alleviate poverty, while promoting transformed, sustainable and diversified agroecology systems. Based on existing EbA success stories, China has an opportunity to invest in and mainstream EbA into its policies for agriculture, poverty alleviation and others, harnessing EbA approaches such as participatory plant breeding to promote sustainable and inclusive agricultural production. This briefing describes current policy, institutional and political challenges to implementing EbA — while identifying opportunities and priorities for moving forward.

Policy pointers

Chinese policymakers must integrate climate change adaptation into poverty alleviation plans. The Ministry of Agriculture must integrate EbA into policies and strategies addressing climate change adaptation and agriculture. Policymakers, government stakeholders and institutions in China must also improve their EbA awareness and capacity levels.

Policies and strategies relating to biodiversity also need a greater emphasis on adaptation. Key are those addressing community-based farmer seeds and water management.

Policies and responses relating to climate change and agriculture must be based on local needs, culture and expertise. Local knowledge, participatory approaches and community-based adaptation must be prioritised.

China must invest in and mainstream EbA approaches such as participatory plant breeding to improve local seed variety resilience. Stronger collaboration between communities and scientists will improve the evidence base for EbA and inform policymaking and support.

Is ecosystem-based adaptation effective?

Ecosystem-based adaptation (EbA) is becoming a popular response to the linked challenges of climate change and poverty in developing countries. EbA approaches comprise the use of biodiversity and ecosystem services to help people adapt to climate change, forming part of a broader overall strategy.

Evidence from a recent initiative examining the effectiveness of EbA suggests that Chinese policymakers could harness EbA approaches to tackle climate risks and reduce poverty. The initiative — Ecosystem-Based Adaptation: Strengthening the Evidence and Informing Policy[1] — looked at 13 EbA sites around the world, examining the opportunities and challenges for EbA implementation and, in particular, how challenges can be overcome. One of the participating sites was a participatory plant breeding and community-supported agriculture project in Southwest China (see Box 1).

But how can we can judge the efficacy of EbA? There are a number of useful criteria:[2]

- **Adaptive capacity and vulnerability**: does the EbA initiative allow communities to maintain or improve their adaptive capacity or resilience? Does it reduce their vulnerability to climate change, while enhancing co-benefits that promote wellbeing?
- **Ecosystem resilience and services**: does the EbA initiative restore, maintain or enhance

Collaborative research platforms linking farmers and scientists must be a priority

the capacity of ecosystems to continue to produce services for local communities? Does it allow ecosystems to withstand climate change impacts and other stressors?

- **Economic viability**: is the EbA initiative economically sustainable?

Improved adaptive capacity and reducing vulnerability

In China, the participatory plant breeding project described in Box 1 helped people adapt to climate change impacts such as changes to rainfall, increased drought, more extreme weather events and increases in pests observed in the region over the past ten years. Diversification improved the resilience of the local agricultural system. Knowledge and capacity for conservation, sustainable use of biodiversity and hazard response and management improved. Traditional knowledge, practices and joint collective governance supported adaptation. Income and health improved. Seed conservation strengthened crop resistance to drought, insects and temperature increases. In particular, a harmony was achieved blending farmers' needs, adaptation and sustainable development. Women and the elderly, particularly those between the ages of 50 and 70 (the main agricultural labour force in remote mountain areas), experienced the most improvements in resilience and adaptive capacity.

As with many EbA projects, the social co-benefits from the project were extensive: sustainable water provision, improved biocultural heritage systems, raised environmental awareness, improved health, increased income, strengthened capacity, improved market access, strengthened social capital, improved governance, strengthened intellectual property rights and food self-sufficiency.

Robust ecosystem resilience and services

Climate change is a key factor threatening local ecosystem resilience and service provision in the project area. In terms of EbA effectiveness, it was clear the project enhanced ecosystem resilience and supported ecosystem services provision in the context of climate change and other threats. The project operated at the landscape level and included several different connected ecosystems. It considered ecosystem resilience at the watershed level, transcending 'climate smart agriculture' that often operates at the farm scale. Particular improvements under the project included:

- Crop breeding led to diversification and proliferation of local genetic resources
- New ecological farming and husbandry methods have increased species diversity and helped preserve the local environment, for example by reducing chemical inputs
- Improvements to the wetland ecosystem and biodiversity have been observed
- Improvements in water resource management and provision have been noted
- Forest resources are better managed.

However, while some ecosystem services were rapidly restored under the project, others took longer to recover. In addition, future droughts and changes in temperature could mean that a threshold in water availability is crossed, leading to irrecoverable ecosystem damage.

Neighbouring areas also experienced a range of improvements in ecosystem resilience and service provision as a result of the project. For example, networks for knowledge and resource sharing between communities can lead to improvements in ecosystem service delivery in other areas, through seed exchange and so on.

Economic viability

Although no formal cost-benefit analysis was conducted, there was evidence related to the costs and benefits of the participatory plant breeding project. This came from interviews, studying the village's books and assessing the improvements in income generated by the community from food production and the sale of 'green' products. Community-supported agriculture tripled farm incomes among some participating households, reversing the downward trend of the previous five years.[3] Comparisons with conventional plant breeding suggest participatory plant breeding is more cost-effective.

Project financial and economic benefits and costs changed over time. In the short term, human resource inputs were higher and 'eco-planting' (circular farming including for example crops, livestock and biogas) resulted in short-term productivity drops, meaning investments outweighed earnings. However, this situation reversed once income from agriculture and eco-tourism businesses grew.

Implementing EbA: lessons, enablers and challenges

The outcomes of the participatory plant breeding project demonstrate that EbA can effectively and economically address climate change impacts. But beyond meeting the criteria for success described above, this project generated lessons about a

Box 1. Participatory plant breeding and community-supported agriculture in China

Rich in biodiversity and culture, Yunnan and Guangxi provinces in Southwest China are home to most of China's rural poor ethnic minority communities. From 2000 to 2016, this EbA project worked with local farmers who developed a number of innovations and strategies to tackle climate change and other challenges.[4]

- Communities are conserving and continually improving drought-tolerant landraces of maize, wheat, rice and soybean through field and post-harvest selection.
- Farmers are reviving traditional farming techniques for pest control, such as combining organic rice with duck and fish production or planting Chinese mugwort, the smoke from which repels pests. They grow *Pelargonium citrosa* (a cash crop used in perfumes, medicine and incense) beside rice and wheat fields, so that its potent citronella-like smell deters pests.
- Villages have reintroduced traditional farming techniques and crops for soil management. In Guangxi, for example, project villages have reinstated abandoned traditional intercropping and composting approaches, and using fish waste as fertiliser.
- With support from scientists, farmers are using participatory plant breeding to conserve, improve and develop new maize varieties with satisfactory yields, agronomic traits and palatability, which are better adapted to drought and pests than modern hybrids. Participatory plant breeding combines local landraces and traditional knowledge with external varieties and knowledge through a joint innovation process.
- New institutional innovations link farmers and scientists, providing mutual support, equal benefits and collaboration. These have led to pilot access and benefit-sharing agreements between ten farmer villages and two public agricultural research institutes. These agreements ensure equal rights for farmer communities in terms of access to genetic resources and the economic and non-economic benefits emerging from participatory plant breeding.
- Community seeds registration, a community seed bank and seed fairs support collective action and enable farmer-to-farmer seed and knowledge exchange. They also link to formal gene banks at provincial and national levels.
- Farmers are finding new markets for their value-added green products and goods. Working with urban farm-direct organic restaurants and farmers' markets also enhances rural-urban linkages.

range of policy, institutional and capacity-related issues that influence EbA implementation in China.

A number of local and provincial-level social, institutional and political barriers made implementing EbA challenging. The most important was a lack of government support in terms of recognition, policies or subsidies for farmer seed systems and related traditional knowledge.

Farmers' participation and voices are limited in policymaking processes. For example, meaningful exchange between local or provincial government and local communities is minimal. Government-driven urban development or dam construction reduces farmland and damages ecosystems. Meanwhile, tourism policies are designed to benefit big tourism companies, not local communities.

China has a number of strategies and policies addressing climate change, but EbA and community-based or livelihood-oriented approaches do not feature strongly. Conventional modern agriculture and technically driven national policies, laws and development strategies are a key barrier to implementing EbA. Government agricultural subsidies favour modern crop varieties. Policies do not sufficiently recognise or protect traditional knowledge and the rights of smallholder farmers over the landraces they have domesticated, improved and conserved. Yet it is vital to support ongoing biocultural innovation and adaptation (blending traditional knowledge and science). Collaborative research platforms linking farmers and scientists must be a priority.

At the grassroots and provincial levels, there are a number of examples of good practices and case studies that showcase opportunities for implementing EbA in China. In Ningxia and Yunnan provinces, for example, there is already some support and cooperation from relevant government departments, including policies and programmes supporting ethnic groups and traditional knowledge and heritage.

At the national level, the Chinese government already has a number of climate change and poverty alleviation strategies and policies. If amended to include EbA, these could provide opportunities for future implementation. A number of institutional bodies are involved with developing and implementing these strategies and policies. These include the State Council (China's cabinet), which provides a general framework for climate change work at the highest level. A number of other policies, laws and strategies support EbA, related to disaster risk reduction, green development (including the Green Agriculture Policy, which promotes traditional and organic crops), and farmers' rights over seeds and biodiversity. There are also national programmes that support farming organisations.

Overcoming challenges

The Chinese participatory plant breeding project demonstrates that EbA can be an effective, financially viable and inclusive way of addressing climate change. But experience also shows that a range of implementation challenges remain. To establish EbA as a powerful tool in China, we recommend the following:

- **Climate change policymakers need to better integrate EbA into government strategies and policies addressing climate change adaptation and poverty alleviation**. Given the top-down nature of governance in China, relevant national or provincial-level policies and legislation that support EbA are needed to support implementation at lower levels. The participatory plant breeding project provides an example of effective EbA and should inform such policymaking.
- **The Ministry of Agriculture needs to further mainstream EbA into agricultural policies** and increase policy support for smallholder farmers, traditional farming, local seed and innovation processes, farmers' interests and biocultural heritage. A national adaptation plan for agriculture is needed.
- **Climate change needs strengthening in policies and strategies** relating to the Convention on Biodiversity. Climate change policies themselves also need greater emphasis on adaptation as well as mitigation.
- **The awareness and capacity levels relating to EbA amongst policymakers and leading government stakeholders and institutions need to improve, along with stronger collaboration between ministries on the issue**. The role of agriculture in adaptation needs greater appreciation, as well as the importance of ecosystem services in supporting agriculture.
- **The evidence base needs improving**. This involves investing in research to improve local seed varieties, encouraging public scientific research institutes to work at the community level, strengthening collaborative research platforms linking farmers and scientists, and investing in translating relevant scientific research findings to benefit the environment and build farmer capacity. A stronger evidence base for EbA would help inform policymaking. This includes evidence from monitoring and evaluating ecosystem processes and dynamics.
- **To scale up and mainstream project activities, project partners need to work with international organisations** such as UN Environment (which collaborates closely with the Chinese government and has a strong influence over domestic policies), and projects such as the Adapting to Climate Change in China project, which worked with provincial and municipal stakeholders to introduce risk-based planning approaches into adaptation policy planning.
- **Public presentations, and farmer networking and dialogue with policymakers and scientists** can support further replication, for example through the new multi-stakeholder platform Farmer Seed Network.[3,4] The advocacy that is already underway on EbA should be sustained.
- **Market incentives are needed** to sustain farmers' active involvement in participatory plant breeding and community-supported agriculture. For instance, value is added to local green products by linking rural communities to urban consumer groups through, for example, farmers' markets and online retailers.
- **Local knowledge must be prioritised and participatory approaches adopted when implementing EbA**. These were key to ensuring success of the participatory plant breeding project. Participation of farmers and women was particularly important. Community participation in seed conservation and improvement, seed bank-related activities and community-supported agriculture were key. Farmers' engagement in a Participatory Guarantee System allowed community members to regain control over the seed certification process and ensure quality and equal benefit sharing in the participatory activities. Experience shows that project success is maximised when policies and institutional responses are suited to local conditions and based on local culture and expertise.

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Notes

[1] IIED, Ecosystem-based approaches to climate change adaptation. www.iied.org/ecosystem-based-approaches-climate-change-adaptation / [2] Reid, H, Seddon, N, Barrow, E, Hicks, C, Hou-Jones, X, Rizvi, AR, Roe, D and Wicander, S (2017) Ecosystem-based adaptation: question-based guidance for assessing effectiveness. IIED, London. http://pubs.iied.org/17606IIED / [3] Song, Y, Zhang, Y, Song, X and Swiderska, K (2016) Smallholder farming systems in Southwest China: exploring key trends and innovations for resilience. IIED, London. http://pubs.iied.org/14664IIED / [4] Song, Y, Zhang, Y, Song, X and Buckley, L (2015) Emerging biocultural innovations for climate resilience in Southwest China. SIFOR qualitative baseline study. IIED, London. http://pubs.iied.org/G03916

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