

With support from



Federal Ministry
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German Bundestag



中德农业中心
Deutsch-Chinesisches
AGRARZENTRUM

The conservation and sustainable use of agrobiodiversity in China and Germany

Advancing the policy agenda

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September 2024

DCZ Policy Brief

Disclaimer

This study is published under the responsibility of the Sino-German Agricultural Centre (DCZ), which is funded by the German Federal Ministry of Food and Agriculture (BMEL). The views, results, conclusions, and/or proposals stated therein do not necessarily reflect the opinion of the BMEL.

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Background

In November 2023, the Sino-German Agrobiodiversity Network was established with the aim to exchange knowledge and experiences on the conservation and sustainable use of agrobiodiversity as a contribution to the transformation to climate-resilient food systems and more innovative development of rural regions (e.g., through the production, sales, and promotion of novel products). The initiative received support from the German Federal Ministry of Food and Agriculture. The Sino-German Agricultural Centre in Beijing, China (Deutsch-Chinesisches Agrarzentrum, DCZ) assumed coordination of the Network. One of the areas of work of the Sino-German Agrobiodiversity Network is agrobiodiversity policy development, in particular in support of the efforts of farmers, farming communities, and related organizations to conserve and sustainably use agrobiodiversity. In this brief, we report on the question: *In the context of the Sino-German collaboration, what can the two countries learn from each other to advance the policy agenda for agrobiodiversity? What are today's challenges and opportunities?*

China

China, with its highly diverse agroecological areas and long farming history, is richly endowed with agricultural biodiversity resources. Farmers and farming communities have conserved their crops and varieties for many centuries. This practice has allowed crop varieties to gradually adapt to new climate and environmental conditions. In recent decades, however, local agrobiodiversity conservation efforts have come under pressure due to

industrialization, modernization of agriculture, out-migration, and the ageing and changing demographics of the rural population. New conservation and sustainable management initiatives have emerged to withstand and counter this pressure, such as bio-cultural heritage sites, community seed banks, conservation areas and farms, and farmers' markets (**Figures 1 and 2**). A national agrobiodiversity policy could be of much value to support these initiatives, but the country has yet to develop, approve, and implement it, despite a plea made by a group of researchers already a decade ago to design a national agrobiodiversity policy (Vernooy et al. 2013). On the positive side, China's recent policy developments pay attention to some key elements of an imagined national agrobiodiversity policy as the country is trying to pay more attention to agroecology, genetic re-sources conservation, "green" (energy) development, and healthy diets, among others. According to the Chinese government, the key to safe-guarding food security is to implement a new agricultural strategy by strengthening the conservation and utilization of germplasm resources and establishing seed banks. Funds will be made available for these objectives.



Figure 1: Beijing Farmers' Market
Credit: Bioversity International/R. Vernooy



Figure 2: May Organic Farm in the vicinity of Suzhou, Jiangsu province
Credit: Bioversity International/R. Vernooy

Core policy elements

At the legislative front, China's provisions on conservation and sustainable utilization of genetic resources are reflected in laws and regulations at all levels: the first level is the national constitution; the second level is the national law (e.g., the recently revised Seed Law of the People's Republic of China, with more attention paid to farmer-managed seed systems); the third level are departmental regulations (e.g., China Biodiversity Conservation Action Plan, 1994; Measures for the Administration of Crop Germplasm Resources, 2003); and the fourth level is related to policies and strategic action plans (National Biodiversity Conservation Strategy and Action Plan, 2011-2030; Medium and Long Term Development Plan For the Conservation and Utilization of Crop Germplasm Resources in China, 2015-2030). Concerning international policies of genetic resources conservation and sustainable use, China is a party member of the Convention on Biological Diversity. The Government of China is committed to fulfilling the Convention's obligations, as well as other relevant international obligations, and to strengthen international exchanges and cooperation in food and genetic resources. Although China has not (yet) joined the International Treaty on Plant Genetic Resources

for Food and Agriculture (ITPGRFA), there is general awareness in the country about its importance, and there is agreement that further discussions will be held about China's position and roles in the international arena.

China has established and maintains an extensive formal national gene banking system (with multiple entities and activities across the country), which conserves more than

500,000 accessions of more than 10,000 cultivated and wild species. Characterization, monitoring, distribution, and regeneration are regular activities. Priorities for the coming years are to collect landraces across the country; establish the registration system for crop landraces by farmers with support from scientists and local governments; evaluate and identify the biological, economic, ecological, and cultural values for crop breeding; building resilient production systems; and support specific product development. A second priority is to improve the management of the ex situ system; and a third priority is to improve the use efficiency of germplasm by making the information better available on the characteristics of accessions conserved in the national gene banks and providing elite germplasm for breeding and related research (Bai et al. 2024).

In recent years, community seed banks have started to play crucial roles in in situ and on-farm conservation, contributing to improving farming communities' livelihoods and the state's food security agenda (Song et al. 2021). The Farmers' Seed Network of China has been instrumental in building up a national network of community seed banks of almost 100 seed banks, some of which are connected to Globally Important

Agricultural Heritage Sites (e.g., Wangjinzhuang dryland terraces in Hebei Province) (**Figures 3 and 4**).

However, the national gene bank system has not yet actively collaborated with the community seed banks, and accessions from community seed banks have yet to be incorporated in the national gene bank system.



Figure 3: Wangjinzhuang Dryland Terraces, Hebei province
Credit: Bioversity International/R. Vernooy



Figure 4: Wangjinzhuang community seedbank
Credit: Bioversity International/R. Vernooy

Germany

Germany, although still a country with large rural areas, has undergone many changes in its natural resource basis, with a notable reduction in agrobiodiversity. However, the country has put considerable effort in developing a supportive policy environment for the conservation and sustainable use of its remaining agrobiodiversity. This has been done in alignment with the objectives of international agreements and instruments, such as the Convention on Biological Diversity, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), the Commission on Genetic Resources for Food and Agriculture of the FAO (CGRFA), and the Green Deal of the European Union. In March 2024, the government published the “National Strategy on Genetic Resources for Food, Agriculture, Forestry and Fisheries” (BMEL 2024), which replaces the agrobiodiversity strategy from 2007 (BMELV 2007). It supports contributing to an eco-friendlier agriculture and forestry, the conservation of genetic resources in agriculture, and complements and contributes to several related policies in Germany (e.g., the National Biodiversity Strategy, 2007 and the 2035 Arable Farming Strategy).

The German plant genetic resources system is characterized by an effective long-term conservation infrastructure with internationally recognized genebanks and well-qualified plant research institutions. There are currently six national genebanks (**Figure 5**). These consist of more than 100 collections hosted and curated by a varied range of actors at the Federal, Laender, and local level, and by private individuals. Four of these genebanks are decentralized networks that are specialized in the conservation of certain crops, namely the German Genebank for Fruit Crops, the German Genebank for Grapevine, the German Genebank for Ornamentals, and the Genebank for Crop Wild Relatives. The federal central ex situ genebank is situated at the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK). It ranks among the oldest and most significant collections in the world, with an overall

stock of 151,000 samples of more than 3,000 different species from almost 700 botanical genera.

All German genebanks conserve their accessions according to the FAO genebank standards (FAO 2013). Accessions are distributed under the terms of the TPGRFA for the purposes of research, breeding, and training, with the Standard Material Transfer Agreement (SMTA), or a special Material Transfer Agreement for ornamentals based on the SMTA. Of the more than 184,000 accessions preserved in German genebanks, about 65% are of species included in Annex I of the ITPGRFA and have been notified as part of its multilateral system. Similar to China, collection, documentation, characterization, monitoring, distribution, and regeneration, are regular activities.

The attention to in situ conservation of crop wild relatives has increased over the past decade. The German Network of Genetic Reserves has been established in 2019 as a framework for in situ conservation of priority crop wild relatives (Thormann 2020). Specialized networks under the Network include genetic reserves harboring populations or plant communities identified based on agreed criteria and managed by coordination units located in relevant agencies or institutions. Apart from the government institutions, a wide range of non-governmental organizations and individuals are engaged in conservation and management of plant genetic resources on farms or in gardens (**Figure 6**).



Figure 5: Dahlem Seed Bank, Berlin
Credit: Bioversity International/R. Vernooy



Figure 6: VERN e.V. garden, Greiffenberg
Credit: Bioversity International/R. Vernooy

Core policy elements

The coordination and governance structure of genetic resources for food and agriculture in Germany goes back to a concept of the Federal Ministry of Agriculture published in 2000 (Oetmann 2000). It recognized the sharing of decentralized responsibilities among the respective public and private actors, and governmental levels with distributed mandates and funding. It also led to the establishment of a central information and coordination center for genetic resources, which facilitates data sharing, communication, and co-operation. It also supports efficient contributions of German stakeholders to European structures and international bodies. The main components of the German coordination and governance structure are:

- Federal Ministry of Food and Agriculture (BMEL) with a coordination division related to genetic resources for food and agriculture and additional domain-specific divisions for plant, animal, forest and aquatic genetic resources;
- National Strategy and national programs for plant, animal, forest, and aquatic genetic resources;
- National expert committees for plant, animal, forest, and aquatic genetic resources, consisting of Laender authorities and a wide range of experts and stakeholders;
- Scientific Advisory Board for Biodiversity and Genetic Resources;
- Information and Coordination Centre for Biological Diversity (IBV) at the Federal Office for Agriculture and Food (BLE);
- National inventories for plant, animal, forest, and aquatic genetic resources
- National information platform/website (<https://genres.de/en/>).

In addition to the overall agrobiodiversity strategy, respectively the Strategy on Genetic Resources, domain-specific national programs for genetic resources for animal, aquatic, forest, and plant resources were developed. They are functional instruments that describe the detailed

measures to be implemented throughout Germany in each of the domains within a certain time-period, set priorities, facilitate the monitoring of activities and achievements, and assist in linking stakeholder groups. National expert committees for plant, animal, forest, and aquatic genetic resources, consisting of Laender authorities, and a wide range of experts and stakeholders, are in charge of guiding the implementation of the national programs.

The Information and Coordination Centre for Biological Diversity (IBV) keeps an oversight and facilitates the implementation of the national programs through information, documentation, communication, and coordination measures. The Centre communicates relevant international information and necessary actions to the national stakeholders and vice versa. Plant genetic resources experts at the IBV coordinate the European and global collaboration in genetic resources for food and agriculture conservation and use. They coordinate the interactions with and the contributions to the European Cooperative Programme for Plant Genetic Resources. They advise and represent the Ministry in the collaboration with and sessions of the ITPGRFA and the Intergovernmental Technical Working Group of the CGRFA and take care of all related international reporting obligations.

The Federal Ministry of Food and Agriculture (BMEL) assumes responsibility for the conservation and sustainable use of agrobiodiversity and genetic resources, which provide the basis for agriculture, forestry, fisheries, and the food industry. The BMEL has the following instruments at its disposal:

- Setting the framework for funding opportunities within the Joint Task for the Improvement of Agricultural Structures and Coastal Protection and the European Agricultural Policy and Fisheries Policy, Forest Climate Fund for the promotion of forest-related research and development projects;
- Funding for research projects, model and demonstration projects or nationwide

surveys in the field of biodiversity and consideration of genetic resources in relevant research programs of the BMEL and other federal ministries;

- Infrastructure maintenance and development in federal institutions;
- Funding of facilities and projects of national importance and research of national and supra-regional importance at project level;
- Events, provision of information services, coordination;
- Setting the legal framework.

The legal prerequisite to permit and market seeds of landraces and varieties of agricultural species and vegetable species, which are relevant for the conservation of genetic resources under facilitated conditions, is the EU-Regulation on Conservation Varieties adopted in 2009.

The overall aim is to find ways and measures to contribute with a broad diversity of genetic resources to a resilient, sustainable, and circular production of food and raw materials and to conserve a sufficiently large gene pool of genetic resources as an “option pool” of characteristics that will be essential in the future to adapt to different crises (**Figures 7 and 8**). Some challenges remain to be addressed. Among them are several coordination and conservation activities in the ex situ and in situ conservation networks, that would benefit from more long-term institutional support to stakeholders carrying out these functions.



Figure 7: Weltacker, Berlin
Credit: Bioversity International/R. Vernooy



Figure 8: Globus Naturkost supermarket, Eberswalde
Credit: Bioversity International/R. Vernooy

Advancing the agrobiodiversity agenda: core elements and recommendations

This brief review of agrobiodiversity-related policies, laws, and regulations of both countries allows to reflect on differences and similarities, and to identify five core agrobiodiversity policy-related elements. These five core elements can serve as entry points for collaboration between the two countries to advance capacity building, exchange of knowledge and experiences, policy development, and research. Under each of the core elements, the Sino-German Agrobiodiversity Network formulated some expert recommendations (in italics), some of which are of particular relevance for China.

1. A complementary strategy: long-term conservation, promotion, and sustainable use of agrobiodiversity through ex situ, in situ, on-farm conservation, and various types of plant breeding

- *Establish the mechanism of Payments of Agrobiodiversity Conservation Services, through which farmer communities, community seed banks, and seed saver organizations can apply for funding to implement local agrobiodiversity initiatives*
- *Legal recognition of and technical support for community seed banks and organized seed savers groups or associations to practice and strengthen in situ and on-farm conservation activities, exchange knowledge and experiences among themselves, and create public awareness about agrobiodiversity*
- *Creation of nature reserves or biospheres, as a kind of Other Effective Area-based Conservation Management Measure under the Convention on Biological Diversity, where the conservation and sustainable use of agrobiodiversity are combined through the involvement of the local population and relevant stakeholders (China)*

2. Adding value to the sustainable use of agrobiodiversity: effective and responsible value chains for agricultural genetic resources, e.g. through local product development

- *Support direct marketing of local agrobiodiversity-based products, e.g. through public procurement schemes*
- *Establish a program for regional value chain coordination that brings value chain actors together to develop and promote novel agrobiodiversity-based quality products*

3. Sustaining agrobiodiversity through agroecology: maintaining sustainable ecological balances and ecosystems services over time through agroecological practices and integrated plant protection measures

- *Develop regulations for the integration of old plant varieties in agroecological practices, such as agroforestry, crop rotation, and intercropping*
- *Promote, support, and train national extension services in the use of agroecological practices that reduce or make no use at all of chemical fertilizers and pesticides*

4. The indispensable link: connecting the conservation and sustainable use of agrobiodiversity to resilient seed system development

- *Promote and support regional networks of on-farm experiments for the evaluation, selection, and improvement of important local varieties, implemented by farmer associations, community seed banks, and seed saver groups*

5. Creating synergy: promoting and fostering multi-stakeholders, inter-ministerial, inter-sectoral consultation, knowledge exchange, and collaboration

- *Establish a national, multi-stakeholder agrobiodiversity committee (China)*
- *Promote and support trans-disciplinary, on-farm agrobiodiversity research with a long-time horizon to monitor trends, address challenges, and identify opportunities for conservation and sustainable use*
- *Support the establishment of a global information platform about community seed banks and their collections*

Acknowledgement

We thank the members of the Sino-German Agrobiodiversity Network for their contributions to the agrobiodiversity policy dialogue carried out during 2024.

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