

Seeds in farmers' hands: community seed banking in China¹

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What is a community seedbank and why it matters

Although China is experiencing a rapid and massive urbanization process, it is still a country with 260 million smallholder farmers of which 97% are farming households, with an average landholding of 0.6 ha (National Bureau of Statistics [NBS], 2017).

In recent decades, the rural communities and farming systems in China have suffered from the loss of agrobiodiversity and the erosion of farmer seed systems as local crops and varieties are replaced by modern cultivars. According to the Ministry of Agriculture and Rural Affairs (MARA), 11,590 grain crop varieties were planted in China in 1956, but only 3,271 varieties remained in 2014, representing a loss rate of 71.8% (Xinhua News, 2018).

To control the decrease in crop variety diversity and quantity of agricultural germplasm resources, the MARA has invested in the enlargement of the national genebank system. China's ex-situ conservation systems will be able to conserve 1.5 million accessions (Xinhua News, 2019). However, despite this impressive number, the formal genebank system still faces many challenges to address the loss and lack of sustainable use of agrobiodiversity.

In addition to the formal genebank system, there is a farmer seed system for the in-situ conservation and sustainable use of agrobiodiversity. In this system, smallholder farmers are not only seed savers, but also provide very important evolutionary (crop) services, which are a public

good and upon which plant breeding depends (Bellon et al., 2018). This community-based seed system has largely remained unrecognized and unsupported by the formal system.

In the farmer seed systems, community seed banks can play a key role in complementing the conservation activities of the formal genebank system and providing other important collective goods, such as historical and cultural treasures and values. A community seed bank is defined as a locally governed and administered institution whose core function is to conserve seed for local use (Development Fund, 2011). In the bank, seed is stored in a shared facility for a short time (usually one to three years) and then regenerated by members of the community seed bank, collectively (e.g., on a piece of land owned by the community seed bank) or individually. Beyond this core conservation function, community seed banks have a broad range of additional purposes and vary significantly in scope, size, governance and management models, infrastructure, and technical aspects.

Although community seed banks have existed in various parts of the world for about 35 years (Vernooy et al., 2019b; Shrestha et al., 2020), the concept is still relatively young in China. Nevertheless, their number has increased in recent years to 42 in the first half of 2022.

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The Chinese way of community seed banking

Chinese community seed banks have developed in three phases: emerging phase, pilot phase, and mainstreaming phase.

In the emerging phase, the first formal community seed bank was the Xiding Crop Germplasm Resource Bank, established in Xiding township, Menghai county, Xishuangbanna prefecture of Yunnan province, in 2010. The local gene bank was supported by international, national, and local research institutes, with the main goals of conserving local crop varieties, organizing local farmers, to exchange them (mainly of rice and maize) and to showcase the local crop diversity (Yang et al., 2015). At the same time, Professor Yunyue Wang at the Yunnan Agricultural University supported Hani villagers to collect local traditional rice varieties and build seed banks based on scientific research (Li et al., 2009). Significant changes began in August 2015, when Farmers' Seed Network (FSN)² staff visited the Xiding genebank to meet with local farmers and researchers to learn from the operational experiences. In November 2015, the FSN participated in an international workshop on community seed banks organized by Bioversity International in New Delhi, India, and thereafter, integrated community seed banks into FSN's action agenda.

The pilot phase started from the establishment of a community seed bank in Stone Village in Lijiang City, Yunnan Province. The FSN facilitated farmers to do Participatory Plant Breeding (PPB) trials

since 2013 and the local seed bank is the result of collective efforts in seed conservation and utilization. Since then, the pilot work has been supported by Brot für die Welt and Oxfam Hong Kong (Beijing office) and more community seed banks have been established in Jiangsu, Guangxi, Yunnan, Inner Mongolia, Hebei, and Beijing. Meanwhile, FSN translated and published the book *Community Seed Banks: Origins, Evolution, and Prospects* (Vernooy et al., 2015) and the manual *How to Develop and Manage Your Own Community Seed Bank: Farmers' Handbook* (Vernooy et al., 2020 a, b, c). The two books provide facilitators and farmers with a practical tool for establishing and managing community seed banks.

²The FSN was founded in 2013 and is based on the participatory action research of the Center for Chinese Agricultural Policy (CCAP) of the Chinese Academy of Sciences (CAS) and the Guangxi Maize Research Institute (GMRI), Chinese Academy of Agricultural Sciences (CAAS), in the Southwest of China. It brings together over 40 communities as action pilots and living laboratories from 17 provinces across China and works closely with the United Nations Environment Programme – International Ecosystem Management Partnership (UNEP-IEMP) of CAS, GMRI, Institute of Crop Science of the Chinese Academy of Agricultural Sciences (ICS-CAAS), China Agricultural University, Yunnan Agricultural University, Kunming Institute of Botany (KIB), and some civil society organizations, such as the Beijing Farmer Market and the Food Think. The FSN aims to enhance the farmer seed system through community-based participatory action and capacity building and by linking the formal system and civil society for collaboration and support.

Since 2020, a training course has been developed and a series of trainings organized by FSN. The training course has quickly become an important platform to scale out and mainstream the concept as well as practical experiences of community seed banks across the country. At COP 15 held in Kunming 2021, representatives of Chinese community seed banks gathered to demonstrate the vibrant experiences to scientists and policy makers. Inspired by the remarkable results of community seed banks with a great development prospect, FSN and Food Think, a non-profit social media platform, which promotes sustainable agri-food systems in China, co-launched a project to promote community seed banks in 12 local communities and family farms.

By June 2022, there were 43 community seed banks in 17 provinces across the country, and their number is increasing steadily. More importantly, a national CSB network has been established to organize a large variety of events, including an annual meeting, seed fairs, and trainings for consolidating and mainstreaming community seed banks and the national network, and to share innovative ideas on in-situ and on-farm seed conservation.

Three examples of community seed banks in China

Women-led cooperative for the conservation and utilization of farmer's varieties in Guzhai Village, Guangxi, southwest China

In 2001, a group of women farmers from Guzhai Village in the karst mountains of Guangxi province joined the Participatory Action Research program initiated by the Center for Chinese Agricultural Policy (CCAP). The program focused on PPB, community-based natural resource management, and biodiversity enhancement. In 2012, Guzhai Village formed a women-led farmers' cooperative, producing a PPB variety, Guinuo 2006, as well as conserving high-quality local maize, soybean, and chayote shoots. At the end of 2019, the village formally established a community seed bank conserving 63 crop varieties, e.g., maize, bean and pea, squash and melon, vegetables, and wild medicinal plants. Of the total collection, 37 are landraces. Currently, 89 villagers use the seed bank, of which 21 are young men and women, the rest are women over 50 years old. The Guzhai seed bank is linked to the formal genebank. In 2019, breeders of the GMRI collected three landraces, namely Mexican white maize, local yellow maize, and local glutinous maize, from the Guzhai seed bank and put them into the National Genebank and the Guangxi Academy of Agricultural Sciences Germplasm Bank for conservation.



Valuing “old” seeds for dynamic conservation of agricultural heritage in Wangjinzhuang Village, Hebei, North China

Wangjinzhuang Village is located within the famous Dryland Terrace System of Hebei province, which was designated as a China Nationally Important Agricultural Heritage System (China-NIAHS) in 2014 and a Globally Important Agricultural Heritage System (GIAHS) in 2022. Agrobiodiversity is a living source for local farmers and the key source of their traditional agricultural heritage. With the abundance of traditional varieties, the local Dryland Terrace Conservation and Utilization Association decided to set up a community seed bank. In November 2019, the local seed bank was established with 171 preserved crop varieties, including 82 landraces. The farmers’ seed bank is open to all villagers who can use the seeds with the consent of the Association. It quickly became a public space to showcase agrobiodiversity and remind villagers that “old” seeds are quietly dwindling, and everyone must work together to preserve them for today and the future.

The seed bank is currently managed by the members of the Association based on a management charter. It maintains a diversity block and seed register, contributing to the dynamic conservation of agrobiodiversity and biocultural heritage. In 2020, the Association started to set up farmer-led seed multiplication fields for maintaining viable seeds and adapting them to the local climate. Compared to the alarming loss of local seed diversity in North China, Wangjinzhuang Village still retains many varieties of vegetable, bean, legume, and especially millet, the main staple food.

Banking seeds for organic farming and healthy nutrition in Kunshan, Jiangsu, East China

Yuefengdao Organic Farm is located west of Kunshan City near the Yangcheng Lake, Jiangsu province, and covers an area of 32 acre. In 2015, Yuefengdao and the FSN organized a baseline survey of the local seed system. This survey revealed that the rice landraces had almost disappeared while the dominant cultivars, in particular Nanjing 46, were promoted by local agricultural extension agents and seed companies. Moreover, some local aquatic vegetables were at risk of extinction due to the habitat loss. On a positive note, local farmers still maintain some soybean landraces as part of the seasonal diets. To address the challenges, Yuefengdao established a seed bank in 2017 to preserve the important varieties collected in the communities. The seed bank is used to access and use organic farming seeds to meet market demand and consumer preferences. The seed bank preserves 165 crop varieties and has been supported by the local government since 2020.

Among the abundant rice varieties conserved in seed bank, Suyunuo stands out. It is a local sticky rice variety with special color, aroma, and taste. In 2015, Yuefengdao obtained a small amount of rice seed from the genebank of the Jiangsu Academy of Agricultural Sciences to examine the local adaptability and market response of this “lost” variety. After seven years of improvement by Yuefengdao and the local community, the sowing area of Suyunuo has enlarged to 0.82 acre. On the consumer end, this “lost” variety needs time to reappear on the table. Currently, the local agricultural extensionists are interested in improving Suyunuo to be more resistant to lodging and pesticide. This case demonstrates that organic farms can benefit greatly from support by public research institutes, when repatriating seed from the genebank to farmers’ fields.



Challenges, prospects, and the way forward

These three examples clearly demonstrate the diversity and versatility of community seed banks. Not only can they conserve seed and provide smallholder farmers with low-cost, high-quality seed, but they also play a significant role in sustaining the livelihoods of farming communities and China's food security as well as in building long-term resilient agri-food systems. Farmer's growing demand for available and adaptive seeds and consumers' needs for healthy, diverse, and local food have created space for local crops and seeds. These are the main reasons and drivers for the rapid growth of community seed banks in China.

However, the formal system has a strong top-down approach to modernization that has neglected the role of smallholder farmers and their practices. The national genebank system has not yet actively collaborated with community seed banks, and accessions from community seed banks have yet to be incorporated into the national genebank system.

Currently, community seed banks in China face two challenges: first, keeping seed healthy and qualified for inspection and quarantine, and second, having effective participation and management mechanisms. Both challenges can be addressed through targeted technical and management training. NGOs such as the FSN are indispensable in bringing community seed banks to the attention of scientists and policy makers and providing them with resources (technology, finance, training, and supportive policies). We have two suggestions to promote and consolidate community seed banks as an indispensable mechanism of farmer management of seeds:

1. Establish a mechanism for safeguarding and exchanging genetic resources between national and local germplasm banks and community seed banks to effectively conserve and utilize local seed varieties
2. Use the national and international policy framework to explore new mechanisms for benefit sharing among community seed banks and to protect and motivate farmers to participate in seed selection and conservation.

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References

- [1] Bellon, M. R., Mastretta-Yanes, M., Ponce-Mendoza, A., Ortiz-Santamaría, D., Oliveros-Galindo, D., Perales, H., et al. (2018). Evolutionary and food supply implications of ongoing maize domestication by Mexican campesinos. *Proc. R. Soc. B* 285:20181049. doi: 10.1098/rspb.2018.1049
- [2] Development Fund (2011). *Banking for the Future: Savings, Security and Seeds. A Short Study of Community Seed Banks in Bangladesh, Costa Rica, Ethiopia, Honduras, India, Nepal, Thailand, Zambia and Zimbabwe*. Oslo: Development Fund. Available online at: https://www.utviklingsfondet.no/files/uf/documents/Rapporter/-Banking_for_the_future.pdf (accessed 16 November 2020)



[3] Li, C., He, X., Zhu, S., Zhou, H., Wang, Y., Li, Y., et al. (2009). Crop diversity for yield increase. *PLoS ONE* 4: p.e8049. doi:10.1371/journal.pone.0008049

[4] National Bureau of Statistics [NBS]. (2017). Main Data Bulletin of the Third National Agricultural Census (No. 1). Beijing: NBS. Available online at: http://www.stats.gov.cn/tjsj/tjgb/nypcgb/qgnypcgb/201712/t20171214_1562740.html (accessed 16 November 2020).

[5] Shrestha, P., Clancy, E., and Vernooy, R. (2020). A Level Up: Community Seed Banks in Nepal Join Forces. Rome: Bioversity International, Rome; Pokhara: LI-BIRD. Available online at: <https://hdl.handle.net/10568/108049> (accessed 16 November 2020)

[6] Song, X., Li, G., Vernooy, R., and Song, Y. (2021) Community Seed Banks in China: Achievements, Challenges and Prospects. *Frontiers in Sustainable Food Systems* 5:630400. doi: 10.3389/fsufs.2021.630400

[7] Vernooy, R., Bessette, G., and Otieno, G. (eds.). (2019a). Resilient Seed Systems: Handbook, 2nd Edn. Rome: Bioversity International. Available online at: <https://hdl.handle.net/10568/103498>

[8] Vernooy, R., Shrestha, P., and Sthapit, B. (eds.). (2015). Community Seed Banks: Origins, Evolution and Prospects. London: Routledge. doi: 10.4324/9781315886329

[9] Vernooy, R., Bessette, G., Sthapit, B., Dibiloane, A., Lettie Maluleke, N., Abner Matelele, L., et al. (2020a). How to Develop and Manage Your Own Community Seed Bank: Farmers' Handbook (Updated Version). Establishing a Community Seed Bank: Booklet 1 of 3. Rome: Bioversity International. Available online at: <https://hdl.handle.net/10568/92000>

[11] Vernooy, R., Bessette, G., Sthapit, B., and Porcuna Ferrer, A. (2020c). How to Develop and Manage Your Own Community Seed Bank: Farmers' Handbook (Updated Version). Management, Networking, Policies and a Final Checklist: Booklet 3 of 3. Rome: Bioversity International. Available online at: <https://hdl.handle.net/10568/92002> (accessed 16 November 2020)

[12] Xinhua News (2018). "China is facing the dilemma of seed conservation." October 9, 2018. Available online at: http://www.xinhuanet.com/fortune/2018-10/09/c_1123530826.html (accessed 16 November 2020)

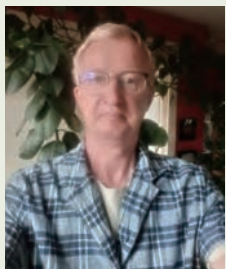
[13] Xinhua News (2019). "National Bank of Crop Germplasm Resources to be built in March with capacity of 1.5 million accessions." January 17, 2019. Available online at: http://www.xinhuanet.com/politics/2019-01/17/c_1124000762.html (accessed 16 November 2020)

[14] Yang, Y., Zhang, E., Jarvis, D.I., Bai, K., Dong, C. A. Xinxiang, Tang, C., et al. (2015). "China: the Xiding gene bank in Yunnan," in Community Seed Banks: Origins, Evolution and Prospects, eds R. Vernooy, P. Shrestha and B. Sthapit (London: Routledge), pp. 94-98.

[15] Yiching Song, Xiaoting Hou-Jones, Xin Song (2022). Community-based network: How organizing farmers can channel finance for nature and climate to locally led EbA. Available online at: <https://storymaps.arcgis.com/stories/fb90a8e1ef6d44e89e61ae9b937268fa>



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