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M – 00302 | Case Study

Enhancing Farmers' Seed Systems through Empowerment of Women: A Case Study from China

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Abstract
Maintaining farmer's seed systems is important to secure the adaptive capacity both ecologically and socially for global food systems, and to secure genetic diversity. In a mountain village of southwest China, a Participatory Action Research Team has carried out action research for more than 20 years to support women's participation in participatory breeding and to enhance the farmers' seed system. In this case study, the team assisted women in the conservation of local varieties and establishment of community seed banks to enhance farmers' seed systems. The women-led agricultural cooperatives promoted the economic development of the community and improved the sustainability of farmers' seed system through eco-circular agriculture and the community supported agriculture (CSA) model. In this participatory process, the empowerment of women improved women's comprehensive ability and provided the guarantee of human resources for enhancing farmers' seed system. Multi-stakeholder processes also extended important support to this model work.

Keywords
Participatory plant breeding; Community seed bank; Farmers' cooperative; Ecocircular agriculture

1. Introduction

Maintaining farmer's seed systems contributes to securing the adaptive capacity both ecologically and socially for global food systems, and to securing genetic diversity. A wide range of local varieties, through years of selection and optimization by farmers, possess strong resistance to risks. It is crucial to explore effective pathways to enhance farmers' seed system under the current pressure of the commercialization of seeds and market monopoly. In this article, one example from Guangxi, China is presented; it incubates changes to enhance the farmers' seed system through women empowerment process.

Over the past half-century, the commercialization of seeds driven by the Green Revolution has led to the abandonment of local crop varieties, leading to a 75% loss of genetic diversity worldwide (Xu *et al.,* 2012). In China, the number of local varieties of major food crops observed 71.8% decrease, from 11,590 in 1956 to 3,271 in 2014 (Liang, 2018).

Being one of the most culturally diverse provinces of China, Guangxi also belongs to the ecologically fragile region due to its widespread karst mountainous rocks. Environmental constraints are coupled with social issues such as poverty and feminization of agriculture. Conserving the rich germplasm resources of farming families, improving the fragile ecosystems and achieving a local development present challenge. Solutions with a feature of joint development of nature and people could inform those who rely on mountainous areas for their livelihood and well-being, which accounts for approximately 12% of the global population (Xu, 2018).

Photo 1: A view of Guzhai Village (Photo by Qiubi)

The Participatory Action Research Team (hereafter referred to as "the Project Team") of the Chinese Academy of Sciences coordinated the implementation of a series of interventions including participatory plant breeding (PPB) in 6 villages in Guangxi province, and Guzhai Village was one of those 6 villages. One of the objectives of the interventions was to strengthen farmers' seed systems through empowering farmers, especially women farmers as they are the dominant labour forces in farming as men migrates to cities for wage earning jobs. All activities were implemented in multidisciplinary collaborations with the research institutes at both national and provincial levels, such as the Chinese Academy of Agricultural Sciences (CAAS) and the Guangxi Academy of Agricultural Sciences (GAAS), and with strong support from the local authorities. Involvement of private sector and local NGOs were also very important to the success of the project.

2. Conservation of Local Varieties

2.1. Improvement, selection and technology dissemination of local varieties:

Women have been breeding traditional crop varieties since the beginning, ensuring the continuation and development of local maize, soybean and other

crops, and working with outside specialists on PPB trials to produce new varieties. The Project Team coordinates frequent visits from domestic and international experts for knowledge sharing and capacity building in this regard. Meanwhile, good experiences and knowledge are also shared with other villages through the farmer's seed network.

Photo 2: A farmer seed fair at Guzhai Village (Photo by Simon Lim)

Photo 3: Farmer's participatory evaluation of Maize PPB&PVS trial (Photo by FSN)

2.2. Community seed bank:

In 2006, the preliminary resource registry began documenting both the biological and cultural heritages of the communities with texts and pictures, which were to be the vehicles for sustainable nature-community development. The establishment of the Community Seed Bank (CSB) in 2018 marks a new era for the sustainable usage of natural resources. Like the thousands of CSBs found in over 20 countries, it started out a self-managed entity aimed at strengthening the local seed system. But it grew in size soon and linked up with government germplasm banks and other institutions, which makes it possible for local varieties to be preserved and disseminated at much larger scales. Today the Guzhai community seed bank has 124 local varieties in its registry and 63 local varieties in its physical inventory. It is a source for the diverse ecological vegetable production, which is now the community's main industry.

Photo 4: LU Rong-Yan examines seeds in the Community Seed Bank (Photo by Qiubi)

3. From Conservation to Community Development

3.1. Eco-circular agriculture and the CSA model:

Around 2008, as people's awareness for ecological environmental protection and food safety rose, the Project Team introduced Farmers' Friends (a local NGO) and the Community Supported Agriculture (CSA) model in Guzhai village. Gradually, the Project Team created the "maize—pig—vegetable" eco-circular agriculture model. The wide adoption of eco-circular methods improved the local environment and led to the direct supply of their vegetables to an organic restaurant in Nanning City.

Photo 5: Ecological vegetables (Photo by Qiubi)

3.2. The women-led agricultural cooperatives:

From the initially established women's group to an officially registered professional cooperative, the scale has grown three-fold since its hatch, receiving continued support from external parties and multiple levels of the government. The Cooperative has nearly 100 households, with women a backbone of the Cooperative, accounting for 85% of its working members. Its total annual income is expected to rise to approximately 1.57 million yuan (equivalent to 0.23 million USD) in 2020, with an average annual household income of 15,000 yuan (or USD 2225). At the same time, the Cooperative actively assumes social responsibility to alleviate poverty and encourages the inclusion of poor households. It also facilitates a better comprehension of an eco-friendly and healthy way of production and life.

4. The Ways Forward

4.1. Multidisciplinary and multi-level participation:

Under the coordination of the Project Team, links were established between communities and different levels of research institutions, civil society organizations, hotels, government agricultural extension services, etc. The involvement and support of local governments has also played an important role in the process. Not only was it an important means of strengthening farmers' seed systems, but the resources also pulled by having stakeholders at various levels made it possible for the Cooperative, which is a special form of enterprise to adapt to the rural communities. The diversified and integrated development of farmers' cooperatives can become an important rural development path in China.

4.2. Empowerment of women:

In the process of the development, the Cooperative leader, once an ordinary rural woman has now become a pillar of the community. The process also

strengthens the leadership and social and economic empowerment of rural women, awakens the ordinary sense of ownership of rural women, whose overall capacity to contribute to and benefit from the sustainable development of their communities is enhanced.

Photo 6: Local seed passed down through generations (Photo by Qiubi)

4.3. Policy advocacy:

The Project Team translated the results of the research into policy through dialogues, proposals and media publicity. Project Team also submitted policy proposals to the multiple levels of government agencies through different channels, calling for the promotion of the healthy development of farmers' seed systems in China, enhancing the influence of farmers' seed systems through multi-faceted crossover cooperation platforms, promoting agricultural biodiversity conservation, and making long-term strategic reserves for food security.

5. Conclusion

From the participatory breeding activities in 2000 to the sustainable use of agrobiodiversity, the farmers' seed system in the community has been enhanced and developed sustainably in the whole process. In the process of participatory action research, strengthening rural women's leadership, comprehensive ability and breeding technology has awakened women's sense of ownership, and improved their overall ability to strengthen farmers' seed system and women's benefit from it. Under the coordination of the participatory action research project team, the community has established cooperative relations with multiple institutions, and the diversified support has played an important role in women's empowerment, strengthening farmers' seed system and policy advocacy.

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Author' Declarations and Essential Ethical Compliances

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	Author 1	Author 2	Author 3
Conceived and designed the research or analysis	Yes	Yes	Yes
Collected the data	Yes	Yes	Yes
Contributed to data analysis & interpretation	Yes	No	Yes
Wrote the article/paper	Yes	No	No
Critical revision of the article/paper	Yes	No	No
Editing of the article/paper	Yes	No	No
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Has this research used human subjects for experimentation? No

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Research involving Plants
During the research, the authors followed the principles of the Convention on Biological Diversity and the Convention on the Trade in Endangered Species of Wild Fauna and Flora. Yes

Research on Indigenous Peoples and/or Traditional Knowledge
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No

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