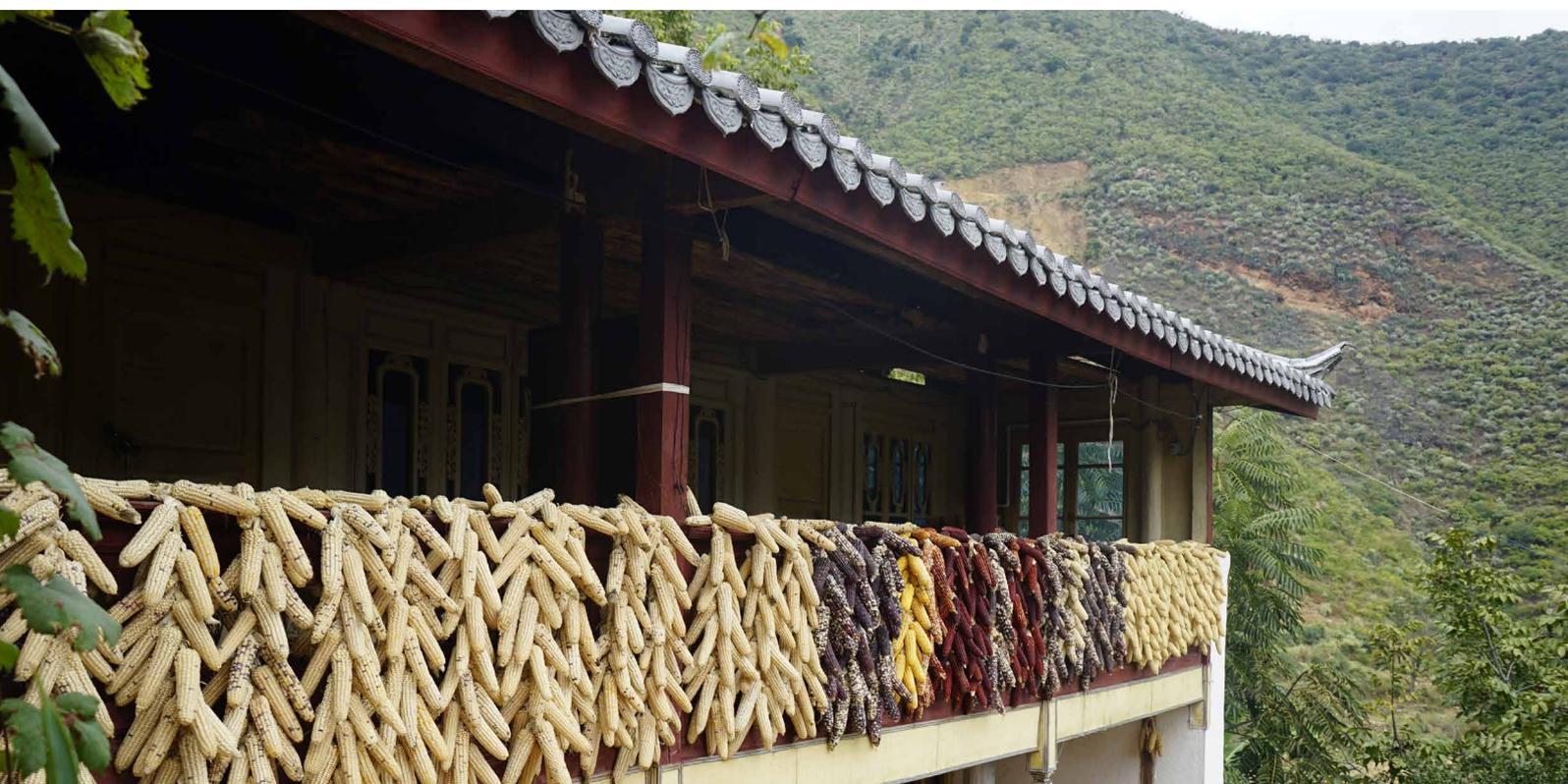


Sowing Diversity Harvesting Security Sustaining Future



An Impact Assessment of China's Seed Policy

Sponsor:



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International Ecosystem Management Partnership
国际生态系统管理伙伴计划



农民种子网络
FARMERS' SEED NETWORK/CHINA

Key Messages



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- 1 China's seed policies have gone through four main development stages. The focus of policy support has shifted from being farmer-centered to public research driven, followed by a move to being market driven, then to market oriented, and finally to supporting enterprises to become bigger and stronger; gradually, seeds have changed from natural resources with a public attribute to private property and commodities with a market value. In this process, farmers' role, rights and interests are increasingly marginalized.
- 2 The diversity of local varieties of the 3 staple food crops (maize, rice, and wheat) and traditional food crops (millet, soybean, vegetables etc.) nationwide showed a trend of rapid decrease, main staple food crops were decreasing faster than traditional food crops, and the reduction rate and share were in direct proportion to the commercialization rate of crops and varieties. The breeding basis of 3 staple food crops tends to narrower with the increase of the hybrid variety rate.
- 3 The farmers' seed systems based on smallholder farmers' seed saving, exchange, selection and seed production are under serious threat, and the diversity of crop varieties in field has reduced rapidly in general. At same time genetic base for breeding are getting increasingly narrower especially the 3 staple food crops at different degree.
- 4 Given the existing differentiation among regions in China, the rapid socio-economic development and prosperity in the last few decades have further significantly increased the regional differences in food production. Food consumption and needs become increasingly bigger and diverse. Combined with the pressure of climate change in recent years, the long-term existing seed policy and seed systems aiming at high yield mainly cannot satisfy the increasingly differentiated and diversified agricultural production modes and food demands in different regions. From the perspective of the seeds needs, we found that China's agriculture presents the following three modes in terms of production and operation modes and their regional distribution, i.e., 1) *Industrialized agricultural mode, in NE and North China and* 2) *Emerging agroecological mode, along the east coast regions and around the big cities* 3) *Traditional agricultural mode in SW and NW China.*



- 5** The formal seed system and the farmers' seed systems that ought to support and complement each other have gradually become separated from each other. The overall trend is that the farmers' seed systems are increasingly marginalized and farmers are increasingly dependent on the seed market. At the same time, the germplasm base used in the formal seed system is narrowing and increasingly relies on foreign germplasm resources. The overall trend of China's agriculture and seed industry shows negative externality, narrowing breeding base, and uniformity of genetic source.
- 6** The analysis of the existing PPB (Participatory Plant Breeding) and PVS (Participatory Varietal Selection) action exploration and practices in the last 2 decades in SW China illustrated their technical and institutional innovations and potential scaling out and up mechanisms and pathways for linking the formal and farmers seed systems in China.
- 7** It is positive and promising that the New Seed Law (revised in 2016) in China provides legal protection for farmers' rights and interests (article 37). This is crucial for enhancing farmers' seed system and recognizing its contribution to national food security and sustainable development in China. In line with the state's ecological civilization construction goal and the national rural revitalization strategy, appropriate supportive policy and enable institutions are needed to improve the existing seed system into more diversified and resilient seed systems through effective seed laws implementation with inclusive regulations.



- 8** To adjust the seed policy in support of the current green agriculture transformation, reconstruction of public values is the first priority. Inspiration and inputs for this can be drawn from good practice examples in the country. Examples are a Participatory Plant Breeding (PPB) initiative with almost 20 years of experience and other cases of farmer-led seed conservation and sustainable use. These examples have generated several technological and institutional innovations as well as policy recommendations. The team makes three major policy measures and suggestions to support:
- 1) Conceal seed in public:** Strengthen the farmers' seed systems and guarantee the seeds security, supporting on farm conservation and sustainable use of farmer seeds for protecting farmers' interest and ensuring seeds security.
 - 2) Make innovations through joint efforts:** Promote a balanced development of the main interest groups of both formal and farmers' seed systems for constant innovation; Building linkages among farmers, public researchers and seed enterprises for coherent and complementary collaboration in different stages of seed development i.e. from on farm conservation, pre-breeding to seed selection, breeding and seed production.
 - 3) Diversified resilient seed systems for green transformation:** Support the development of multiple diversified resilient seed systems and provide a wider living germplasm resource base and agroecological seeds for supporting the green transformation of agriculture. To support multiple models and sizes of seed supply in different regions at different levels serving the emerging multi-functional agro-ecological farming practices across China for the healthy and sustainable food systems.

Introduction

Human civilization began with agriculture, and agricultural civilization began with the domestication of seeds. Agriculture is the foundation of the sustainable development of society, and seeds are the source and fundamental premise of the sustainable development of agriculture. Abundant and diverse crop germplasm resources that carry diversified genes have constantly interacted with human beings in nature during the evolution process. The diversity of crop varieties is indispensable premise of maintaining the sustained stability and resilience of the whole ecosystem and meeting the diversified demands of human society.

In the process of thousand-year agricultural civilization, a variety of seeds have been preserved and accumulated from generation to generation through farmers' seed selection, saving and exchange in adaptation to natural and livelihood changes. Seeds have been accumulated and evolved into current colorful, complex and diverse living seed system. The complexity and diversity of this system determine its resilience and sustainability, thus ensuring the ecological balance and stability and the human food security.

China's long history of agricultural civilization is the basis for maintaining the sustainable development of the country and society. At present, there are still more than 600 million people living in rural areas in China; 260 million smallholder farmers, who have a farming area per household of less than 0.6 hectares, are the "main force" of agricultural production (Ministry of Agriculture and Rural Affairs, 2017), and they are guaranteeing the national food security and sustainable development. Smallholder farmers are the main food producers, and they are also at high risk of suffering poverty. The 14 concentrated contiguous poverty-stricken areas identified by the Chinese government in China are all located in rural areas, which most have China's long and rich agricultural resources and practical knowledge that have potential powerful advantages in coping with rapid socio-economic changes, climate change challenges and poverty problems.



Crop seeds as a common public resource embedded in traditional farming system have existed in China for more than 4 thousand years. Farmers have been the main actors to conserve this precious resource in resilient farmer seed systems, which are local, diverse and central to their livelihood and communities. Farmers' seed selection, saving and exchange are at the heart of the traditional farmer seed systems. These activities contribute to conservation and evolution of agricultural biodiversity adapting to changes for generations, climate resilient farming and diversified healthy food systems. Farmers' ownership and access to seeds are farmers' rights and vital for a sustainable agriculture transformation and sustainable food systems.

This brief provides a synthesis of a review of China's seed policies in the last five decades, from the perspective of small holding farmers, based on a participatory comprehensive assessment by a group of multi-disciplines scientists carried out between March 2016 to October 2017 in 2 stages in 7 provinces representing 3 major agroecological regions in China.

Key Findings and Main Conclusions

1

Since 1949, China's seed policies have gone through four main development stages. The focus of policy support has shifted from being farmer-centered to public research driven, followed by a move to being market driven, then to market oriented, and finally to supporting enterprises to become bigger and stronger; gradually, seeds have changed from natural resources with a public attribute to private property and commodities with a market value. In this process, farmers' role, rights and interests are increasingly marginalized.

China's seed policies since 1949 can be divided into the following four main development stages:

Stage 1 (1949-1977): Relying mainly on farmers' agricultural cooperatives' self-grown, self-selected, self-saved and self-used seeds, with the supplement of necessary adjustments; taking farmers as the principal part;

Stage 2 (1978-1999): Regionalization of variety distribution, specialization of seed production, mechanization of seed processing, standardization of seed quality, and unified seed supply by county; double-track system;

Stage 3 (2000-2010): With WTO entering, moving towards the market and globalization; gearing to international standards;

Stage 4 (2011-present): Seed market concentration; supporting for making the domestic seed companies bigger and stronger for market competition.

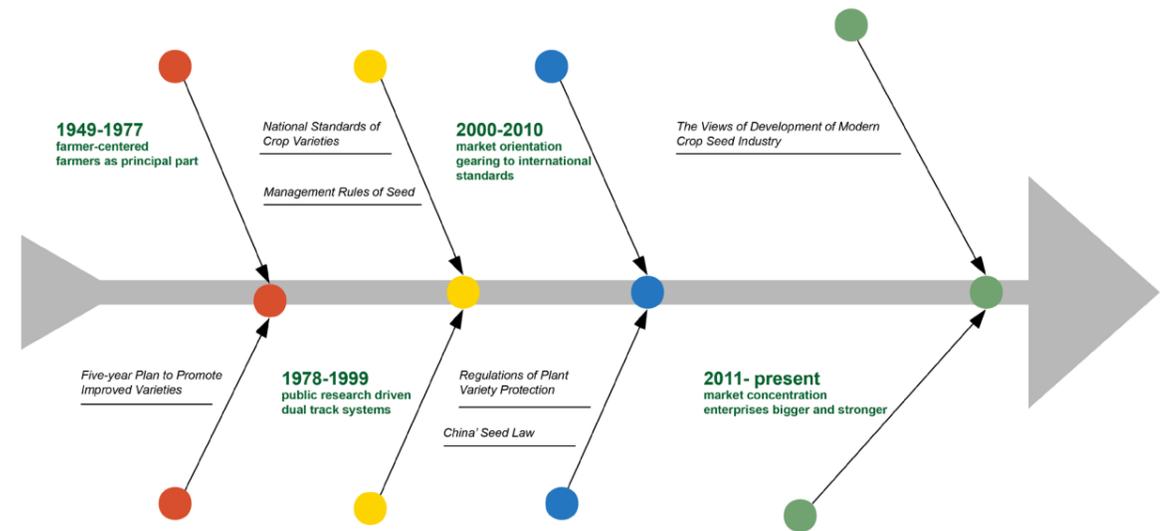


Figure 1. Four development stages of China's seed policy

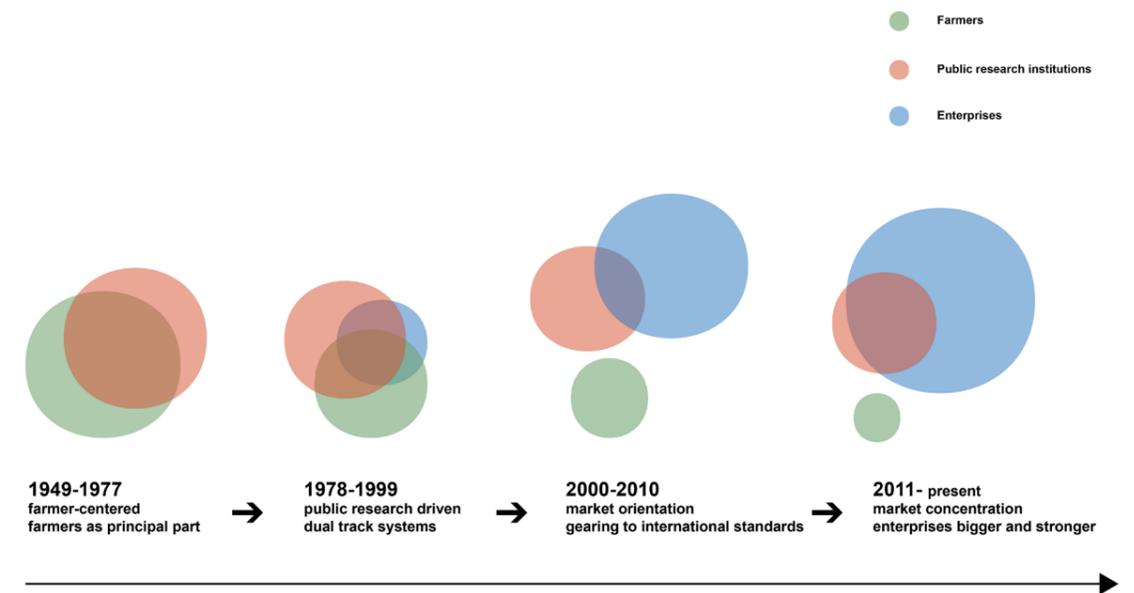


Figure 2. The historical trend of relationships between farmers, public research institutions and enterprises

2

In the past 30 years, the diversity of local varieties of the 3 staple food crops and traditional food crops nationwide showed a trend of rapid decrease in biodiversity, main staple food crops were decreasing faster than traditional food crops, and the reduction rate and share were in direct proportion to the commercialization rate of crops and varieties. The genetic breeding basis of 3 staple food crops tends to narrower with the increase of the improved variety rate.

Maize with high commercialization rate and improved variety rate is the most seriously reduced. In terms of spatial distribution, in the regions where industrialized agriculture is concentrated, such as Northeast China and the North China Plain, the rate and proportion of local crop variety reduction are much higher than that in the southwestern and northwestern mountainous areas, and the trends of monocropping and uniformity are obvious.

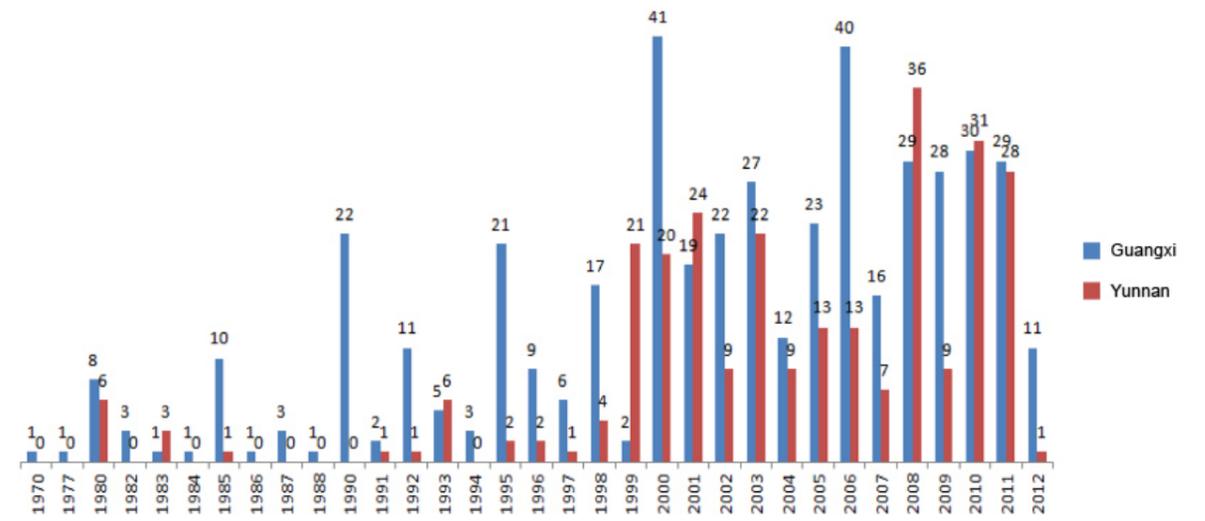


Figure 4. The quantity/numbers of disappeared farm varieties in Guangxi and Yunnan in the past 30 years (1970-2012); Data source: SIFOR,2014

Proportion of acreage of rice varieties

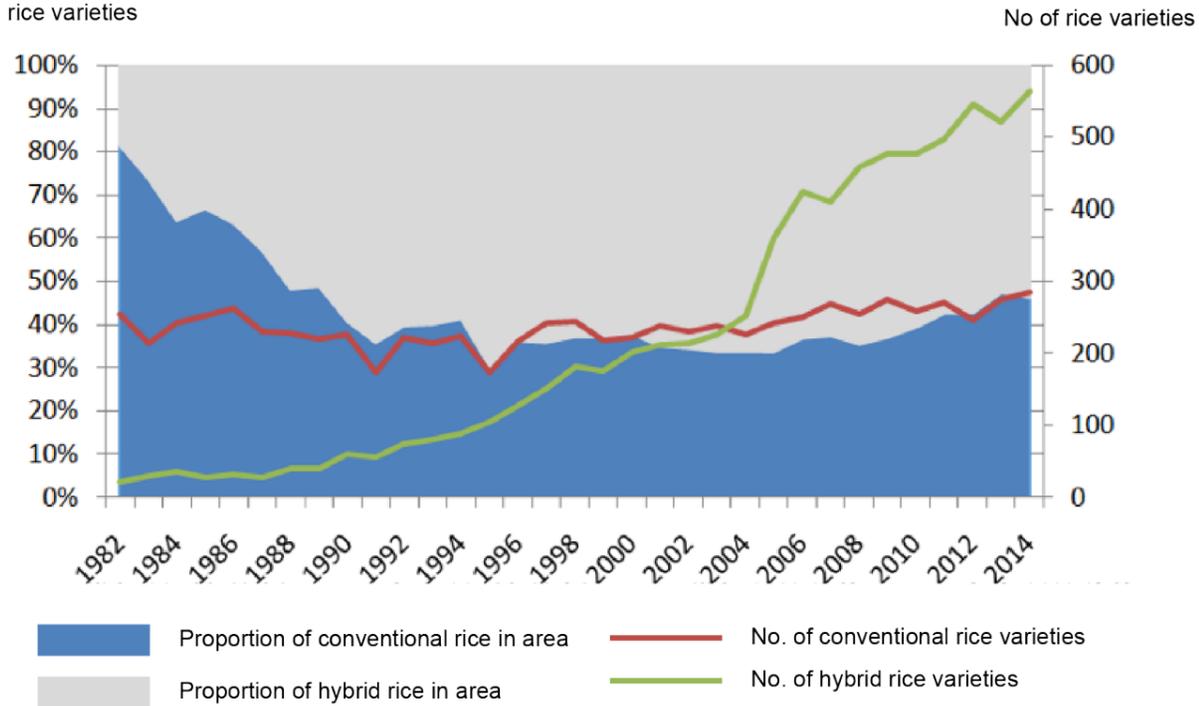


Figure 3. The quantity and area of rice varieties over 6,667 ha nationwide (18 provinces) in 1982-2014; Data source: collated according to the Statistical Table of the Promotion of Main Crop Varieties in China (MOA, 1983-2015)



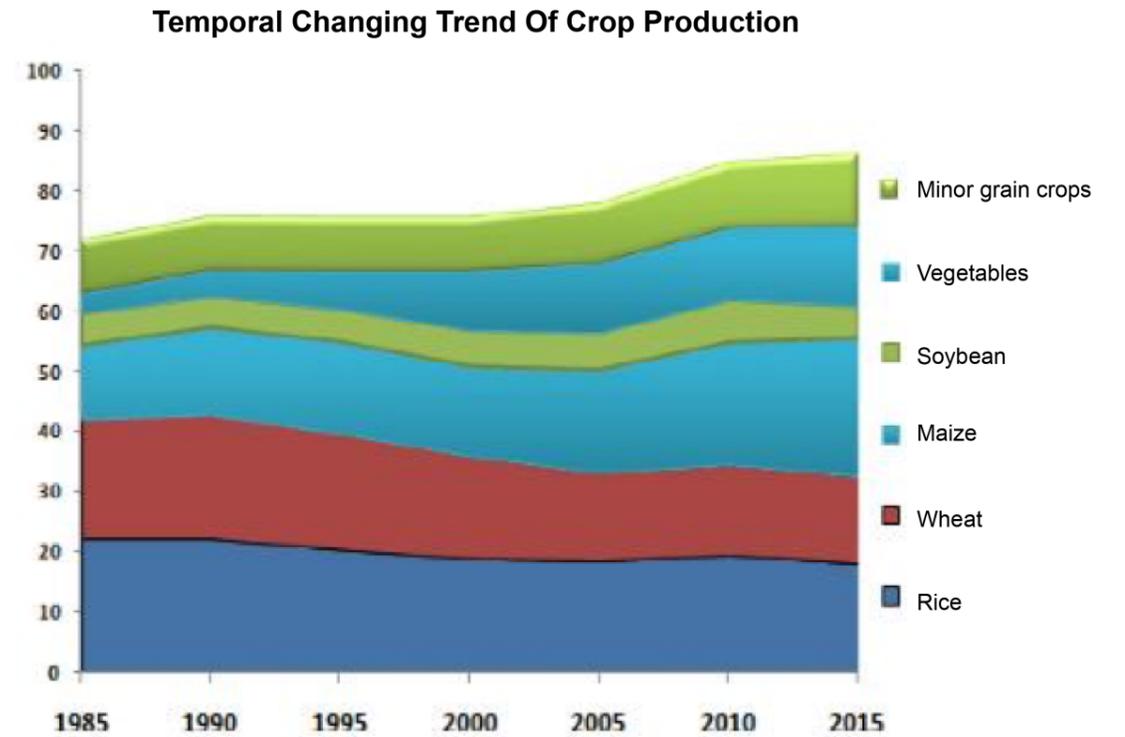
3

The farmers' seed systems based on smallholder farmers' seed saving, exchange, selection and seed production are under serious threat, and the diversity of crop varieties has reduced rapidly.

The farm varieties, traditional agriculture and food culture accumulated on a long-term basis by farmers in response to natural conditions and social and cultural needs are rapidly disappearing. The smallholder farmers' market dependence increased and resulted in their increasing loss of traditional knowledge, culture in crop variety selection and conservation, and their rights to seeds.



Figure 5. The changing trend of varieties in typical regions of the three agricultural modes; Data sources: project research data (2016)



Spatial Changing Trend Of Crop Production

Minor grain crops are gradually concentrated in Southwest and Northwest China.

Vegetables are shifted from suburban to rural areas and increasingly concentrated.

Maize, rice, wheat and soybean production are concentrated towards advantageous areas.

Figure 6. The changing trend of food crop production caused by the food consumption changes

4

With the rapid socio-economic development and prosperity, the regional differences in food consumption and needs become increasingly bigger and diverse. Combined with the pressure of climate change in recent years, the existing long-term seed policy and seed systems aiming at high yield mainly cannot satisfy the increasingly differentiated and diversified agricultural production modes and food demands in different regions. From the perspective of the seeds needs, we found that China's agriculture presents the following three modes in terms of production and operation modes and their regional distribution:

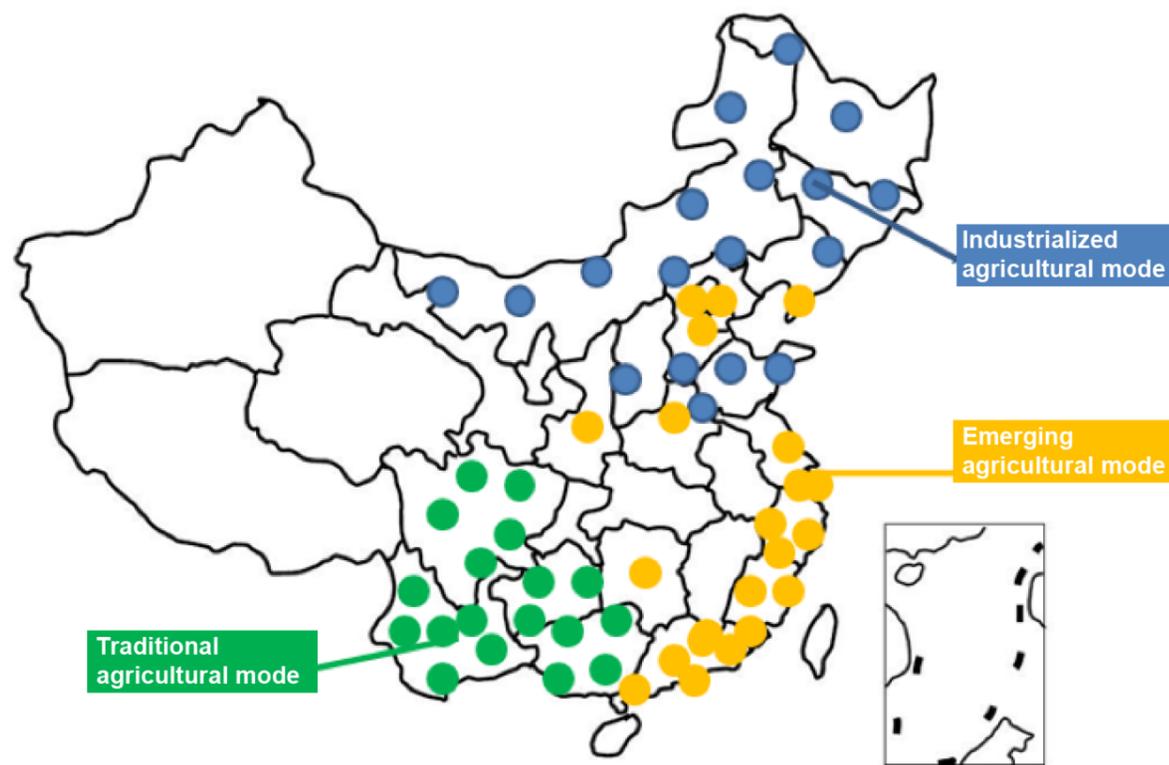


Figure 7. Three agricultural modes and their regional distribution

1 Industrialized agricultural mode

Northeast and north China are typical regions with monocrop food crops (maize and wheat) with hybrid varieties. The policy orientation is still to pursue high yield, but in general consumers' demand are changing for high-quality crop types and varieties e.g., northeast quality rice, high-protein soybeans, high-quality coarse cereals, etc. Seed supply for these newly emerged demands is with insufficient support.

2 Emerging agricultural mode

The better off eastern coastal areas are the typical region with increasing diversified demands in food market. The consumption of organic and ecological agricultural products is growing rapidly, which has promoted a rapid development of community supported agriculture (CSA) by new farmers in China. However, their increasing urgent demand for organic and ecological seeds are unfulfilled.

3 Traditional agricultural mode

It is mainly the mountainous areas in southwest and northwest China, where most of China's ethnic groups and indigenous communities settled and poverty concentrated areas. It is biodiversity abundant and bio-culture rich areas, thus forming a biodiversity hotspot and living "seed bank" in China. However, these areas also face severe challenges, i.e., the disappearance of local crops and varieties is very fast, and the traditional farmers' seed selection and breeding system (i.e., seed saving, seed exchange and seed selection) is threatened by the rapid spread of hybrid varieties promoted by the formal seed system. The farmers' seed systems and its on farm conservation and sustainable utilization of local seeds, urgently need more policy support and social recognition for maintaining the living gene bank for China and beyond.



Insights and Synthesis

- 1** In recent 30 years, China's policy system has given insufficient support to maintain the public attribute of seeds and on farm conservation of farmers' varieties. Under the influence of objective factors, the three main interest groups involved in the formal seed system and the farmers' seed systems' (i.e., farmers, public scientific research institutions and seed enterprises) exist role conflict, confusion and function ambiguity, such a situation has become a severe challenge in sustainable seed supply for the current green transformation of agriculture.
- 2** The formal seed system and the farmers' seed systems that ought to support and complement each other have gradually become separated from each other. The overall trend is that the farmers' seed systems are increasingly marginalized and farmers are increasingly dependent on seed market with limited options. At the same time, the germplasm base used in the formal seed systems is narrowing and increasingly relies on foreign germplasm resources. The overall trend of China's agriculture and seed industry shows negative externality, narrowing breeding base, and uniformity of genetic source.
- 3** The 3 key stakeholders in the seed systems are facing different challenges at same time. The farmers' seed systems with smallholder farmers' seed saving, exchange, selection and breeding as the core are facing serious threats in the process of agricultural modernization. Agricultural public research institutions, which once guaranteed food security by increasing yield in the "green revolution" and played an active role in promoting modern technology, are faced with the dilemma of "sticking to technical support" or "trading technology for profit" in the process of marketization. The rapidly growing Chinese seed enterprises are faced with internal and external pressure at the same time. On the one hand, there is the unfair competition from public research and breeding institutions supported by public scientific research funds; on the other hand, there is the huge pressure from multinational companies with competitive advantages such as low price and high market share based on intellectual property rights and technology monopoly.
- 4** To cope with the challenges and linking the formal and farmers' seed systems, the multi-disciplinary action research team led by the scientists from the Chinese Academy of Agricultural Sciences (CAAS) and the Chinese Academy of Sciences (CAS) has carried out a Participatory Plant Breeding work in southwest China since 2000, and scaling out the similar PPB and PVS works in other areas of the country in the last almost 20 years. The current assessment team has review and analysis these existing PPB and PVS cases for understanding and summarizing their technical and institutional innovations and potential scaling out and up mechanisms and pathways for linking the formal and farmer seeds systems and forming into diversified and resilient seeds systems for ensuring China's seed security as base for the sustainable food systems.

Conclusions and Recommendations for policy actions

After the policy review, analysis, field investigation and discussion, the research team achieved a consensus in the process, and reached the following main standpoints and conclusions:

- 1** Sustainable development is a balanced development of society, economy and ecology. Public policies should emphasizes on the public resource attribute of seeds rather than only commercial values. Attentions should always be paid to the multiple attributes of seeds at different stages of the transition from public resources to commodities, so as to balance the interests of different interest groups and stakeholders for a sustainable and resilient seed systems development.
- 2** Seeds are a kind of public resource, and the farmers' seed systems formed by the on farm or in-situ conservation, exchange, improvement and use of seeds are the living genetic resource pool and knowledge base, which is the common heritage and the foundation and basis of sustainable agricultural development.
- 3** The important contribution and roles of farmers and the farmers' seed systems should receive more recognitions and supports in guaranteeing the diversity of seeds and traditional knowledge, for the sustainable development of ecology and society and the response to climate change.

On this basis, it is positive and promising that the New Seed Law (revised in 2016) in China provides legal protection for farmers' rights and interests (article 37 in the seed law). This is crucial for enhancing farmers' seed systems and recognizing their contribution to national food security and sustainable development in China.

In line with the state's ecological civilization construction goal and the current national rural revitalization strategy, appropriate supportive policy and institutions are urgently needed to improve the existing seed systems through effective seed laws implementation, to coordinate and rationalize the relationship and collaboration among farmers, public scientific research institutions and seed enterprises, and achieve the Sustainable Development Goals through collaborative innovation.



To adjust the seed policy in support of the current green agriculture transformation, reconstruction of public values and recognition of farmers' contribution are the first priorities. Inspiration and inputs for this can be drawn from good practice examples in the country. Examples are a Participatory Plant Breeding initiative with almost 20 years of experience and other cases of farmer-led seed conservation and sustainable use. These examples have generated several technological and institutional innovations as well as policy recommendations. The team makes three major policy measures and suggestions to support:

- 1** Conceal seed in public: Strengthen the farmers' seed systems and guarantee the seeds security, supporting on farm conservation and sustainable use of farmer seeds for protecting farmers' interest and ensuring seeds security.
- 2** Make innovations through joint efforts: Promote the balanced development of three main interest groups and constant innovation; Building linkages among farmers, public researchers and seed enterprises for coherent and complementary collaboration.
- 3** Diversified resilient seed systems for green transformation: Support the development of multiple diversified resilient seed systems and provide a germplasm resource base and agroecological seeds for the green transformation of agriculture. The use of multiple models and sizes of seed supply in different regions at different levels serving the emerging multi-functional agro-ecological farming practices across China for the healthy and sustainable food systems.



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