The China Technology Transfer Project

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SYNOPSIS OF PROJECT DATA

Country:	China: Shaanxi, Anhui, Hunan, Heilongjiang Provinces
Project:	Agricultural Technology Transfer Project
Financing:	About US$207 million, of which US$100 million is a World Bank loan
Implementing agency:	State Office for Comprehensive Agricultural Development
Dates:	Approved April 28, 2005; original closing date (December 31, 2010) extended to December 31, 2011
Includes support for:	About 120 subprojects.

CONTEXT

Since the end of the 1990s, China's agricultural sector has entered a phase of urgent and challenging structural transformation dictated by five major developments:

- ***Lagging agricultural output and incomes.*** Farm income growth had fallen alarmingly behind overall income growth. Policy priorities have shifted from concerns over food self-sufficiency and low consumer prices toward serious concerns about income growth for the farming population and the widening disparity in rural and urban incomes.
- ***Natural resource pressure.*** As agricultural output expanded rapidly in the 1990s, production encroached into more and more fragile ecological environments, and farmers adopted unsustainable production practices.
- ***Changing demand and consumer preferences.*** Rapid growth in the nonagricultural economy and growing urbanization caused changes in food preferences and consumption patterns. Demand for meat, fruit, vegetables, and other high-value commodities, including "green" and organic food, rose rapidly.
- ***Demand for advanced food processing and marketing.*** Increasing urbanization and differentiation of the food consumption structure demanded an advanced processing, marketing, and catering industry. Enterprises in this sector have mushroomed throughout the country. Most of these enterprises were naturally competing with small-scale farmers on profit margins, or entirely new agricultural markets emerged in which smallholders often had a relatively weak position.
- ***New market challenges and opportunities.*** China's accession to the World Trade Organization required rapid liberalization of trade practices and further opening up of the border. Internal production and food quality standards had to be improved and adjusted to international standards.

A critical bottleneck for the transformation required in the agricultural sector was the slow transfer and adoption of modern science, technology, and knowledge-intensive agriculture. The prevailing farming environment in China was characterized by a highly fragmented production structure dependent on a multitude of very small farms. This farm structure made it difficult: (1) to expand the use of new technologies and/or supply high-value markets that need a critical mass, farm size, or contain other critical elements to reach economies of scale, (2) to reach farmers by the traditional extension system, because the national extension system model is poorly suited to reach large numbers of farmers and meet their increasingly individualized demand for knowledge and information, and (3) for farmers to know about and respond effectively to market signals. The government-based research and extension system was not sufficiently responsive to the new challenges and opportunities presented by agricultural technologies, markets, and farmers' demands. It was supply-oriented,

engaged in extending the government's programs and production targets, and had no effective means of dealing with the constraints small-scale farmers encountered in adopting new technologies.

The Technology Transfer Project responded to strategic concerns in China's agriculture by providing a learning platform for developing innovative models for public sector facilitation and support, including fostering better PPPs in agriculture. The primary addressee of the project was the public sector's agricultural support and development system, in particular the State Office for Comprehensive Agricultural Development (SOCAD), which is China's main funding institution, disbursing about US$2 billion each year for agricultural development in the country. A significant amount of this budget supports agribusinesses. Any improvements in targeting these funds and improving funding modalities would therefore have a tremendous impact.

PROJECT OBJECTIVES AND DESCRIPTION

The project's overall development objective was to develop and test innovative models for agricultural technology transfer and application aimed at generating additional farm income with potential for scaling up. In this way the project sought to give poor farmers a chance to participate in high-value agricultural markets, domestically and internationally. This objective was to be achieved by supporting viable models for restructuring and modernizing agricultural production, processing, and marketing through various forms of vertical and horizontal integration, the introduction of innovative technologies, and new institutional arrangements and PPPs.

Since mid-2005, the project has been underway in four provinces (Anhui, Hunan, Heilongjiang, and Shaanxi), which includes the Yangling High Technology Agricultural Demonstration Zone. The initial closing date of December 2011 was extended by one year to provide more time for analysis and to learn from experience. The main components of the project are:

1. ***Technology transfer and information markets and services,*** which includes the building of technology transfer markets and exhibition and demonstration facilities.
2. ***Promotion of commercially attractive key technologies and new institutional arrangements,*** including (1) researcher-investor-farmer technologies, which involved the partial financing of typically tripartite joint ventures with the objective of designing successful investment models in which researcher-investor-farmer partnerships are tested; (2) targeted technology transfer, which financed technology transfers targeting farmer groups who did not have adequate access to information, capital, or decision-making power to adopt technologies on their own; and (3) public support programs, which involved financing activities that enabled the private sector to realize its role in commercializing innovative technologies (such as food testing and certification or use of IPRs) and technologies that did not appeal to the private sector on commercial grounds but had a clear public good nature (such as water-saving technology or waste treatment).

PROJECT INNOVATIONS

The *first innovation* of this project was that, unlike traditional public sector support projects, it combined public funding for research, extension, training, and institution building with private investment. The government funded the development and dissemination of public goods, but these activities were implemented by the private sector to foster the integration of public and private investments (World Bank 2010).

The *second innovation* of this project was to focus on technologies that increase smallholders' incomes. Often public investments in agricultural research raise smallholders' productivity but not necessarily their incomes (World Bank 2010).

The *third innovation* was to develop and fund institutions such as farmer associations as part of the "technology package," provided they would improve the dissemination of new technologies.[1] In addition, under all subproject proposals involving commercial enterprises it was made mandatory that at least 50 percent of the subproject funding would be used to directly support farmers in providing the raw material for the enterprises (production base or farm outreach).

The *fourth innovation* was to design this project specifically as a learning platform. Recognizing that a single project could have only a limited impact in a country as big as China, the project was designed as a stepping-stone to improve the effectiveness of public investment and partnership arrangements by partnering with private players. For this purpose a framework for M&E was designed to extract and disseminate lessons from this project, particularly in two areas: (1) the understanding and rationale for public funding (why and in what areas is it justified to use public funds for agricultural development) and (2) the improvement of procedures for the use of public funds (such

as contracts with private partners, working with farmer cooperatives and associations, and similar arrangements) (World Bank 2005–10).

BENEFITS, IMPACT, AND EXPERIENCE

Many subprojects supported under the project generated remarkable benefits in terms of value added, additional income, or entire new lines of business with new products and markets. These achievements were based on: (1) innovative institutional and partnership arrangements (for example, public sector research with companies or farmer organizations or research-farmer or research-company arrangements); (2) innovative funding arrangements; and (3) innovative technologies fostered by these new partnerships. However, the project was designed as a learning project. As such its achievements in terms of value-added or additional income cannot be seen as an end but provide only the tool for learning and drawing more generic lessons. The project developed an analysis and lessons learning framework (World Bank 2005–10), but the evaluation process continues, with a consolidation of results yet to come. Even so, some key outcomes have been identified.

National and provincial agricultural support programs have already adopted several design elements tested under the project. A number of policy documents have been prepared, which influenced SOCAD's funding policies, including:

- The combination of company and farm outreach support under a joint investment.
- Importance of farmer associations as new and valuable partners in PPPs.
- PPP arrangements to be guided by a clear understanding of public good outcomes to be specified in contractual arrangements with objectives, indicators, and milestone-based targets.
- Monitoring of PPP contracts and performance as a crucial success factor.

Models have been developed with innovative management approaches and technologies for women farmers. The outmigration of male labor from many rural areas in China increases not only the demand for technologies suitable for women but the need for women to develop their managerial skills as farm operators and entrepreneurs. The project developed a model partnership with the All-China Women's Federation that successfully addressed these needs.

Technology barriers caused by fragmented production and small farm size were overcome by partnerships between companies and farmers or farmer associations. For example, organic food production or integrated pest management technology were difficult for individual famers to adopt because their small holdings prevented them from exploiting commercial opportunities. However, in groups and in combination with a strong processing or marketing partner, smallholders could be linked with commercial opportunities.

New products and markets, which require the commitment of multiple stakeholders over time to develop and reach, were opened by involving the public sector as a broker. A typical example was the development of camphor production in one area, where an investor used the support of the local government and the project to organize farmers to plant sufficient trees and build a critical mass of production required for a viable processing facility.

Many subprojects show that organizing farmers into associations or under company-farmer arrangements enables them to enter into higher-value production through branding, product certification (green or organic certification, for example), or accessing new markets (especially export markets). In some instances, farmers were organized because companies were the driving force, but in others farmer associations alone achieved these objectives.

Contractual arrangements between the government and private entities introduced under the project showed that private institutions could successfully deliver public goods and services. Many subprojects involve farmer associations or companies providing animal health services, training farmers, or providing other extension services. Most project proposals target poor farmers or disadvantaged groups. Several proposals have involved innovative technologies and environmental services, such as the treatment of manure, waste, or crop residues.

Although the private sector is assuming many functions traditionally performed by government institutions, the project has demonstrated that the government remains central to areas such as food safety, protection of property rights, regulations, and policy direction. Project investments in those areas (for example, in food quality standards testing and certification in Yangling, or testing for the presence of genetically modified ingredients and certification in Anhui) show the importance of the government in relation to the private sector in agricultural development.

LESSONS LEARNED AND ISSUES FOR WIDER APPLICATION

The summary of impact and experience gives some indication of the lessons that the project has already provided.

The sections that follow explain some of these lessons in greater detail. They concern the importance of aligning project objectives to the context, supporting multiple stakeholders at the same time to attain such goals as a more equitable sharing of benefits, and the importance of assessing and matching potential partners with care.

Importance of objective and context

One of the most critical success factors for this project was that it was based on a critical analysis of the sectoral context and a vision for the sector's development. For example, the decision to aim for income and value generation versus quantity and productivity increases had far-reaching implications for the design and approval of individual subprojects. Similarly, the decision to emphasize farmer-based investments for farmer groups or in combination with enterprise investments was based on the recognition that farm incomes had high priority given the wide urban–rural income disparity.

Supporting multiple stakeholders under one investment

Traditionally a kind of a "trickle-down" effect was expected when either companies or research institutions were supported through project funding, with the expectation they would have a positive influence on farm incomes. In many cases, this effect did not occur. The project has taken a probably unique approach in combining funding for different groups of stakeholders in a single investment, often under a joint business plan. Different arrangements such as company-farmer, research-farmer, or research-company-farmer were supported. The main advantages of this approach were as follows:

- ***It reduced the risk*** that companies would use public funds to crowd out farm production and important sources of farm household income for high-value products (for example, that a meat processor would run its own pig farm). In line with the overall rural development objective, the project forced companies to enter agreements with farmers or farmer organizations to source their raw material from farm households and allocated at least the same amount of funding to support farmers (with technical and management training, basic infrastructure, and other resources).
- ***It controlled the sharing of benefits.*** Supporting companies and farmers under a joint investment makes it possible to monitor and control the distribution of benefits.
- ***It facilitated the commercialization of research results.*** Linking public research (individuals as well as institutions) with companies or farmer groups and associations in a joint business undertaking helps to ensure that research results are directly relevant to business. Different arrangements have been tested successfully, such as contracts between researchers and companies or farmer associations, or participating researchers and research institutions as shareholders.

Another lesson from the project is that the Chinese political and administrative environment made it difficult to select proposals based on competitive procedures. A matching grant system was chosen as the preferable approach to select private partners and suitable proposals. The selection and approval of proposals was often combined with a "negotiation process," in which many proposals were modified to sharpen the public good outcomes and develop them into PPPs (in other words, elements of a solicitation process were incorporated).

Choice of companies and private partners

Initially several companies applying for support perceived the project as an opportunity to receive public funds to resolve a difficult business situation—startup companies or companies that could not obtain additional commercial financing. Many of these companies could not afford to wait until their proposal had been vetted and funds became available, so they dropped out of the process. The *key lesson* from this experience is that a project needs to provide sufficient design clarity on whether it aims to act as a business support and development project or a project aimed to support PPPs, in which case:

- ***Private partners need to be thoroughly appraised*** for their financial capacity, management skills, technical know-how, and experience.
- ***The PPP should not be the primary determinant*** of a partnering company's financial success.
- ***Companies with a track record of successful businesses*** in a field relevant to the PPP objective provide the highest chance for a successful partnership.