



Innovation and Practice of China's Agricultural Assistance

A Case Study on China's Agricultural Technology
Demonstration Center in Mozambique



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China International Development Cooperation Agency

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Acronym Index

AGDPO	Agriculture Development Policy Operation
ATCP	Agricultural Technical Cooperation Project
ATDC	Agricultural Technology Demonstration Center
CAD Fund	China-Africa Development Fund
DAC	Development Assistance Committee
ECOWAS	Economic Community of West African States
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FECC	Foreign Economic Cooperation Center of Ministry of Agriculture and Rural Affairs of the People's Republic of China
FOCAC	Forum on China-Africa Cooperation
IFAD	International Fund for Agricultural Development
JICA	Japan International Cooperation Agency
HDI	Human Development Index
MDG	Millennium Development Goal
MARA	Ministry of Agriculture and Rural Affairs of the People's Republic of China
MOFCOM	Ministry of Commerce of the People's Republic of China
NGO	Non-governmental organizations
ODA	Official Development Assistance
SADC	Southern African Development Community
SDG	Sustainable Development Goal
SFVCF	Sustainable Food Value Chain Framework
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
OECD	Organization for Economic Cooperation and Development
PARP	Poverty Reduction Action Plans
PEDSA	Agricultural Development Strategy Program
PNISA	National Investment Plan for the Agrarian Sector
PPP	Public-Private-Partnership
PQG	Mozambique's Five-Year Plan

Executive Summary

For more than sixty years, China has been dedicated to providing cooperative developmental aid to developing countries under the framework of South-South Cooperation, thus making concrete contributions to the achievement of the United Nations (UN) Millennium Development Goals (MDGs). In the context of the UN-led 2030 Agenda for Sustainable Development, China is not only making efforts to achieve the 17 Sustainable Development Goals (SDGs) domestically but is also proactively supporting other developing countries in achieving the SDGs. In order to better understand China's efforts in the area of developmental cooperation, and to introduce and promote China's experience in this field among the international community, the United Nations Development Programme (UNDP) and the government of China decided to jointly develop case studies on China's cooperative developmental projects, which represents the first cooperation between the two parties.

Agricultural assistance has always been one of the major components of China's developmental assistance. Providing agricultural assistance to Africa is not only a prime example of China's participation in international development cooperation, but also a key area for cooperation between China and Africa. Agricultural technology demonstration centers (ATDCs) were one of the major initiatives announced by China at the Forum on China-Africa Cooperation (FOCAC) in 2006 and 2009. Combining multiple forms of development cooperation, ATDCs are agricultural assistance projects that aim to support peoples' livelihoods and promote agricultural development in recipient countries through investment from Chinese enterprises. ATDCs represent an innovative type of agricultural assistance project developed by China in recent years. As the epitome of China's ATDC projects in African countries, the ATDC in Mozambique will be analyzed in this case study.

The study was jointly initiated by UNDP and the government of China. The Foreign Economic Cooperation Center (FECC) of China's Ministry of Agriculture and Rural Affairs was entrusted by the government of China to be the Chinese implementing agency in this case study. UNDP participated throughout the research process as the international partner. In September 2016, UNDP China and the FECC formed a joint research team and conducted field research on the ATDC in Mozambique.

The research followed an evaluative framework frequently used by international development agencies. Researchers collected primary data through standardized questionnaires during field visits as the main body of evidence. Desk reviews were also conducted to provide supplementary information.

The research shows that, given the local agricultural context, China's ATDC in Mozambique was able to bring in new agricultural technologies and identify crop varieties that fit local conditions. The ATDC, as an innovative agricultural assistance approach, aligns well with the objectives of Mozambique's agricultural development and has exhibited a new pathway for the agricultural development of the country. It also sought to establish partnerships across multiple stakeholders and continues to explore ways to enhance the sustainability of agricultural assistance. Furthermore, it contributed to hunger, poverty reduction, and food security in the country.

China's ATDC project represents an innovation in cooperative agricultural development aligned with South-South Cooperation. Featuring both marketization and a platform that integrates investment and development assistance, the "Construction-Technical Cooperation-Commercial Operation" model is a novel approach to future agricultural assistance that China has presented to the international community. The design of the ATDC project fits within the South-South cooperative framework and emphasizes mutual learning and common

development among development cooperation partners in the global south. Building on traditional agricultural assistance projects, the ATDC has also introduced infrastructure construction in select areas. This has enabled China to provide more comprehensive agricultural assistance to recipient countries and create innovative value chains for agricultural assistance. Another important feature of the ATDC is that it involves the private sector in the carrying out of market-oriented activities, with empathizing the smallholder farmers' role in agricultural assistance. The approach is not only an innovative pilot in China's agriculture assistance, but also redefines the traditional conception of international development assistance. It serves as an innovative cooperative model under the umbrella of South-South Cooperation.

In order to improve the effectiveness and sustainability of China's ATDC projects, this study provides two recommendations. First, the ATDC should actively establish channels for exchange and cooperation with the international community, strengthen communication capacities, enhance exchange with the international community, and promote mutual learning and coordination. Second, the ATDC should continue to explore ways to combine developmental assistance with investment activity and support the upgrading of developing agricultural sectors. This has the potential to introduce new ideas to the models and mechanisms of modern international developmental cooperation.

I. Background

1. Africa's Development: Achievements and Challenges

In September 2000, world leaders met at the United Nations (UN) headquarters in New York, where they endorsed the Millennium Declaration and adopted the eight "Millennium Development Goals" (MDGs). The event marked the beginning of an international development agenda for the following 15 years, focused on the implementation of the goals and the enhancement of livelihoods worldwide. Building on the results of the MDGs, world leaders adopted the 2030 Agenda for Sustainable Development, along with its 17 Sustainable Development Goals (SDGs), which represents an ambitious global development agenda for the 15 years up to 2030.

A continent of 54 countries, Africa has made important contributions to the achievement of the MDGs. According to MDG report 2015, Africa's average GDP growth rate reached 5% since 2011¹, representing some of the fastest growing countries in the world, such as Ethiopia (10.39%), Cote d'Ivoire (8.89%), Tanzania (6.96%), Senegal (6.49%), and Mozambique (6.61%)². However, development within and across African countries is not balanced. The continent is still home to 34 of the world's 48 least-developed countries (LDCs) and many African countries³, particularly the sub-Saharan Africa countries, are still facing challenges such as gender discrimination, high unemployment rates, and imbalances in rural and urban development. While Africa made progress towards the MDGs, it encountered obstacles to the achievement of a few goals, especially the eradication of extreme poverty and hunger, reducing child mortality, improving maternal health, and ensuring environmental sustainability. In the past decades, sub-Saharan African countries have made progress in poverty reduction, with the poverty rate falling from 56.5% in 1990 to 48.4% in 2010. Yet, this was still far behind the 28.25% poverty reduction target set in the MDGs⁴. The sub-Saharan African region also suffers from severe food scarcity. Data shows that between 2011 and 2013, 25% of its total population was still living in hunger and malnutrition.

With the exception of select years, since 1990 Africa has been the largest recipient of net official development assistance (ODA) from the members of the Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development (OECD). The net ODA Africa received from OECD DAC member countries reached USD 51.0 billion in 2015 and USD 50.2 billion in 2016⁵.

In contrast to OECD DAC member countries' declining trend in aid assistance to African countries, global south countries are playing an increasingly significant role in the support of African countries' development, a trend aligned with the objectives of South-South Cooperation. South-South Cooperation partner countries are not only providing financial support to African countries, but more importantly, sharing critical knowledge, skills,

1. The Millennium Development Goals Report 2015:

<http://www.cn.undp.org/content/china/zh/home/library/mdg/mdg-report-2015/>

2. Source: data from the World Bank and the International Monetary Fund in 2015.

3. The Least Developed Countries of the United Nations Conference on Trade and Development Report 2015:

<http://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=1393>.

4. Ibid, 1

5. Summary of African Development Assistance Data of OECD in 2018:

<https://www.oecd.org/dac/financing-sustainable-development/development-finance-data/Africa-Development-Aid-at-a-Glance-2018.pdf>

and relevant technologies to enhance self-development capacities. Given the similar background and context shared among global south countries, the experience drawn from one can be applied to the others. This also applies to China's aid to Africa.

2. China-Africa Agricultural Development Cooperation

Over the last few decades, China has become a major South-South Cooperation partner. As the largest developing country in the world, China's experience in poverty reduction and economic development provides important lessons for other developing countries. As a means of sharing resources and experience, China's South-South Cooperation has gradually expanded in scale and scope over the last decade and aims to improve peoples' livelihoods and contribute to socio-economic development in recipient countries⁶. In addition to financing and materials, China also shares its expertise and technology with other developing countries.

China has published two white papers on "China's Foreign Aid" in 2011 and 2014 respectively, where it provides official data, relevant policies, and an enumeration of its achievements in development cooperation. The 2014 White Paper on China's Foreign Aid shows that from 2010 to 2012, China provided RMB 89.34 billion (USD 14.41 billion) in developmental assistance to 121 countries, including 51 countries in Africa. Africa was the largest recipient region, accounting for 51.8% of China's of the total. The latest official data shows that over the past 60 years, China has provided more than RMB 400 billion in financial aid to 166 countries and international and regional organizations and trained more than 12 million personnel from developing countries.

Given the similarities between developing countries in the area of agricultural development, China is in a unique position to provide relevant assistance to countries in need, based on its achievements and experience to date. Such experience makes agricultural assistance a key focus area for China to make a significant impact.

To date, China has established diplomatic relations with 53 African countries. It issued two African policy documents in 2006 and 2015 respectively, which provide policy guidance for cooperation between China and Africa across various fields. The African policy document released at the end of 2015 identifies two major factors hindering Africa's development: backward infrastructure and inadequate professional and skilled personnel. It also proposed two priority areas for cooperation between China and Africa for the next 10 years: industrialization and agriculture modernization. In this policy document, China suggests that it will not only provide "hardware" support to Africa—i.e. physical infrastructure construction—but also strengthen their "software" cooperation—i.e. professional training and technology transfers. It is thus likely that China-Africa agricultural cooperation over the next decade will combine both "hardware" and "software", with an overarching focus on helping African countries move up the global value chain.

The Forum on China-Africa Cooperation (FOCAC) has become the most important high-level platform for pragmatic cooperation between China and Africa, during which Chinese and African leaders announce important policies and measures in political, economic, and cultural cooperation. Since the first FOCAC in 2000, Chinese-African cooperation has been significantly strengthened in a number of areas. Agricultural cooperation has always been one of the priorities on the agenda.

6. The Right to Development: China's Philosophy, Practice and Contribution, 2016. A white paper issued by the Chinese Government in 2016 http://www.xinhuanet.com/politics/2016-12/01/c_1120029207_3.htm

At the 2006 FOCAC Beijing Summit, China announced eight policy measures to support cooperation with Africa, including the establishment of 10 agricultural technology demonstration centers (ATDCs) therein. In 2006, then-president Hu Jintao promised to construct 10 ATDCs in Africa. In 2009, at the Fourth Ministerial Conference of the FOCAC, the Chinese government announced eight new measures for developmental assistance to Africa, including an increase in the number of ATDCs to 20 by the year 2012. At the UN High-level Meeting on the Millennium Development Goals in 2010, China pledged to establish 30 ATDCs in other developing countries.

At the Sixth FOCAC and the second Leaders' Summit in 2015, China proposed a "1+5+10" cooperation framework for the following three years, which refers to the upgrading of China-Africa relations from a "strategic partnership" to a so-called "comprehensive strategic and cooperative partnership". The five pillars of China-Africa relations include political, economic, cultural, security, and international affairs. There are 10 cooperation plans, including plans for agricultural assistance and poverty reduction. As of 2016, 22 Chinese ATDCs were operational in 21 developing countries, all promoting learning and technology in agriculture and extending agricultural varieties that suit local conditions. They were also found to be providing training for large numbers of technical and managerial personnel.

As the China-Africa relationship strengthens, agriculture will remain a key area of cooperation. Although some policies and data have been released, China's agricultural cooperation projects in Africa are still largely unknown to the international community. To improve knowledge at the project level, case studies are needed, to help the public better understand the details of specific projects as well as their results and effects. This will give visibility to the role China is playing in supporting sustainable development in developing countries at the micro level.

3. Research Background

In 2012, Rebecca Grynspan, then Under-Secretary-General of the UN and Associate Administrator of UNDP, met with Li Jinzao, then Vice Minister of Commerce in China. The two sides committed to strengthening the international community's understanding of China's development cooperation and decided to jointly carry out case studies on China's projects in this area. The China-Mozambique ATDC project was China's first ATDC in Africa. As a typical example of China's "Construction-Technical Cooperation-Commercial Operation", it was selected as one of the projects for case study analysis. A researcher from the UNDP China office participated in the project throughout the process. In 2016, the case study project officially began. It was the first time that UNDP and the government of China engaged in such cooperation. The objectives of the cooperation were to use internationally-accepted standards to assess the result of China's development cooperation projects and to share China's experience with the international community.

3.1 Basis for the Research

The research design and the framework employed drew from development project evaluation standards commonly used by the international community. Such standards provided the basis for field research, desk reviews, and data collection and analysis. Notably, due to severe challenges on tracking data from various stakeholders located in different places in Mozambique and China, this study intends to be an assessment but not a strict project evaluation or impact assessment. However, to the extent possible the research team applied evaluation criteria of relevance, effectiveness, efficiency, results, sustainability and partnership/cooperation in the study, and we hope that this first effort at evaluation will encourage others to do more rigorous assessments of other projects in the future. The guiding questions of the research framework are as follows:

(1) Relevance

Main guiding questions: Is China's agricultural cooperation project consistent with the priority development strategies of the recipient country and local communities? Is it also in line with China's development assistance policies and the development assistance policies for Africa?

(2) Efficiency

Main guiding question: Have the tasks of the project been completed as planned?

(3) Effectiveness

Main guiding questions: Have the objectives of the project been achieved? To what extent? What are the factors that led to the results?

(4) Results

Main guiding questions: What has the project contributed to the social, economic, and governmental dimensions of the recipient country? What are the factors that led to these changes?

(5) Sustainability

Main guiding questions: Can the project's operation and management continue? Can the intended development impact of the project sustain in the long run?

(6) Cooperation and Partnership

Main guiding questions: Are the project stakeholders satisfied with the project? Has the project facilitated engagement with multilateral organizations? Has the project promoted cooperation between China and the recipient country in other areas?

3.2 Research Methods

(1) Field Research

Field research was the preferred methodology and refers to in-country research on the ATDC in Mozambique through interviews and case collection. The Economic and Commercial Counsellor's Office of the Embassy of China in Mozambique recommended a Mozambican agricultural expert to participate in the field research and assist in coordinating and confirming various interviews.

According to the criteria and questions in the research framework, seven semi-structured interview outlines were designed for central government officials, local government officials, representatives of international organizations, local partners, community representatives, technicians, and farmers respectively (Annex 1). During the field research, the research team also visited project sites. Three farmer associations located near the ATDC in Boane were selected as community representatives. The research team also conducted semi-structured interviews and group interviews with the heads of the communities/organizations, as well as with farmers. In this study, "community" refers to the villages around the ATDC; "organization" refers to the farmer associations around the ATDC. Farmers were selected from the villages around the ATDC through random sampling. The Ministry of Science and Technology of Mozambique and the Boane municipal government represented the central and local governments of the recipient country. The South Branch of the Agricultural Research Institute of Mozambique (IIAM) was selected as a local partner of the ATDC. The research team conducted semi-structured interviews with representatives from above three institutions. In addition, representatives from relevant international organizations and embassies in Mozambique also participated in semi-structured group interviews.

(2) Desk Review

Desk review refers to collecting and analyzing documents from China's MOFCOM, the Ministry of Science and Technology of Mozambique, Hubei Lianfeng, the ATDC, and other sources through the Internet and other channels. The documents include data and reports from international organizations, China's relevant policy documents, reports related to developmental assistance or the agricultural development strategies of recipient countries, and project documents relevant to the ATDC. It aims to obtain comprehensive information about the project to understand the project's implementation and results.

(3) Household Questionnaires

Questionnaires (Annex 2) were used as a complement of the above two methods and were meant to collect the socio-economic background data on the rural communities around the ATDC, including the age and gender of the community members and basic situation of the households. The other objective was to obtain information on project results and feedback to provide quantitative data for analysis.

Natural villages in the ATDC area were selected as units for analysis. With the assistance of local agricultural experts and staff members of the ATDC, questionnaires were average distributed to each natural village randomly. The research team provided basic guidance for the distribution, completion, and collection of the questionnaires. At the end of the field research, 100 questionnaires were distributed in Megas Village, 925 Village, and PSK Village, all within the Boane District, of which 98 were collected.

3.3 Method of Analysis

This case study focused on six principles including "relevance", "efficiency", "effectiveness", "results", "sustainability", and "cooperation and partnership". Data was collected through field research, desk reviews, and household questionnaires. Quantitative data from the questionnaires was processed using SPSS software and triangulation was used to draw the results and experience of the ATDC project⁷. The case study also provides recommendations for the ATDC's work going forward.

The research team adopted a framework that has been widely used by the international community. However, a few concerns arose associated with the choice of methodology. First, given that each country's development cooperation approach has its own features, a universal evaluation framework may not fully apply or generate results that reflect the entirety of China's development projects. Second, as the study was undertaken during the early phase of the project, its long-term developmental impact has not been fully determined or evaluated, especially regarding the operation modality that uses aid to leverage private investment. Third, villages within the project's neighboring areas are scattered with poor road conditions, such that data collection was confined to select geographical areas. These factors need to be borne in mind when reading and interpreting the analyses.

7. Triangulation was used in the process of data collection and analysis and was related to specific indicators of the assessment framework; this was to ensure the credibility of the research results.

3.4 Research Process

From September 7 to 12, 2016, the UNDP-FECC joint research team conducted field work on the ATDC in Mozambique, during which Mr. Vasco João Lino, former director of the Ministry of Science and Technology of Mozambique, was invited to join the research team as an agricultural expert. During the field work, the research team visited the PSK Village Farmers' Cooperatives, the Megas Village Farmers' Cooperatives, and the 925 Village Farmers' Cooperatives in the District of Boane and conducted interviews with 20 people, including local farmers and community representatives, the Mozambican Ministry of Science and Technology, the Boane municipal government, the South Branch of the IIAM, and the farmer cooperatives in Boane District. The research team also met with representatives and officials from international organizations based in Mozambique including UNDP, the UN Food and Agriculture Organization (FAO), the World Bank, Japan International Cooperation Agency (JICA), as well as the European Union and the German Embassy. A total of 98 questionnaires and about 400 minutes of interview recordings were collected.

II. Agricultural Development in Mozambique

1. The Development Status of Mozambique



Figure 1. Map of Mozambique

Table 1. Development data of Mozambique

Land area	800,000 square kilometers
Population	About 29.67 million (2017)
GDP (USD current)	11.3 billion (2017)
GDP per capita (USD current)	393.2 (2017)
GDP growth rate	3.7% (2017)
Gini coefficient	54 (2014)
Average life expectancy	Male: 56.1 Female: 59.1 (2017)
Net enrollment rate	Elementary: 88% Secondary: 18% (2014)
Poverty rate (national poverty line)	46.1% (2015)
Literacy rate (aged 15 and above)	58.8% (2015)
Infant mortality rate (per 1000)	56.7 (2015)
Malnutrition rate of children under 5	43.1% (2009-2015)
Under-five mortality rate (per 1,000 live births)	79 (2015)
Human Development Index	0.418 (2015)
Human Development Index Ranking	181st (among 188 countries) (2015)

Sources: World Bank and UNDP

The Republic of Mozambique is located in the southeastern part of Africa and is a member of the Southern African Development Community (SADC). The capital city is Maputo. Mozambique is classified by the UN as one of the 48 LDCs in the world. In terms of administrative division, Mozambique has 10 provinces and 43 districts, including a municipality. As a multi-party democracy, its constitution stipulates the separation of powers between the legislature, the executive, and the judiciary, as well as free elections.⁸ Since the restoration of peace in 1992, Mozambique's political situation has been stable. The Mozambique Liberation Front (FRELIMO) won the multi-party parliamentary and presidential elections held in 1994, 1999, 2004, and 2009. In October 2014, Mozambique held its fifth general election, in which FRELIMO won for the fifth consecutive time, with its candidate Filipe Nyusi elected as the new president.⁹

8. Mozambican government: <http://www.portaldogoverno.gov.mz/por/Mocambique/Politica>

9. Ministry of Foreign Affairs of PRC:

http://www.fmprc.gov.cn/web/gjhdq_676201/gj_676203/fz_677316/1206_678236/1206x0_678238/

Assessed on: 25/08/2017

Mozambique is a traditional agricultural country and agriculture plays a prominent role in its economy. Agriculture and fisheries account for more than 25% of the country's GDP. About 80% of its national income and 7 to 11% of its economic growth come from agriculture and fisheries (Poverty Reduction Action Plan, 2011-2014).¹⁰ Agricultural land in Mozambique accounts for 56.7% of its total land area. Arable land encompasses 5.65 million hectares with 300,000 hectares already cultivated.¹¹ The main food crops are corn, rice, soybeans, and cassava. Cashews, cotton, sugar, and sisal are some of its traditional agricultural export items. There are also tropical crops in Mozambique, including coconut, tea, and tobacco. Mozambique is rich in fishery resources such as shrimp, shellfish, squid, tilapia, and other seafood, and is one of the world's largest producers of cashew nuts. Fresh and dry coconut, tea, and cotton production also rank among the largest among African countries.

2. Challenges and Needs of Mozambique's Agricultural Development

Agricultural development has been prioritized in a number of national development strategies and policy documents. Agricultural development and food security have been considered some of the top priorities in Mozambique's Five-Year Plan (PQG), three Poverty Reduction Action Plans (PARP/PARPA), Agricultural Development Strategy Program (PEDSA), and National Investment Plan for the Agrarian Sector (PNISA). These documents suggest that:

(1) Agriculture is fundamental for domestic economic development and plays an important role in poverty reduction. The five strategic objectives in the agricultural sector are: increased production and guaranteed food security; increased production of agricultural items and moving up the global value chain; encouraging market-oriented agricultural production; promoting the sustainable use of land, forests and wildlife; development of human capital and institutional capacity for the agriculture sector (Five-year Plan, 2010-2014).

(2) Mozambique's household-based agriculture is characterized by low productivity. As a result, agriculture and rural development are viewed as some of the top priorities, with a focus on providing opportunities for increasing household income. It is suggested that rural development relies on human capital, infrastructure, and the strengthening of food security policies. Rice should be one of the key crops for research (Poverty Reduction Action Plan, 2011-2015).

(3) A lack of food crops, including rice, significantly hinders Mozambique's development. Low productivity is one of the main reasons for its backward agricultural development. This is due to traditional farming methods and a lack of proper agricultural inputs, such as improved seeds. Therefore, resources and partnerships related to agricultural investment need to be leveraged. Moreover, food supply, productivity, and the emergency response capacity of small producers should be enhanced. It is also necessary to expand arable land, strengthen sustainable management and the management of water systems, enhance connectivity with the market by improving infrastructure, and improve research and extension capacities so that producers and processors improve their capacity to utilize relevant technology (Agricultural Development Strategy Program, 2010-2020).¹²

10. Source: Worldbank

http://databank.worldbank.org/data/Views/Reports/ReportWidgetCustom.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n

11. Source: FAO: <http://www.fao.org/faostat/en/#country/144>

12. Strategic Plan for Agricultural Development is a strategic policy document in agriculture based on Comprehensive Africa Agriculture Development Program.

(4) Challenges in agricultural development include: the use of agricultural inputs and modern technologies has not been applied extensively; the effect of technical support services in the agricultural sector cannot work due to scattered distribution and inadequate transportation networks; the coverage and quality of agricultural extension and research networks are limited. In particular, there are 1,087 employees in Mozambique's agricultural research system, of which only 167 are researchers. Among such a small number only 18 or 19 persons have a doctorate degree. The lack of talent in the agricultural sector poses a great challenge to Mozambique's agricultural research and development (Mozambique's Agricultural Investment Program, 2014-2018).

3. International Communities' Agricultural Assistance to Mozambique

Responding to these challenges, many international development agencies are providing agricultural support to Mozambique in various forms. The UN system is committed to supporting Mozambique's policies and institutional framework for food security in the country. It is also committed to promoting agricultural technology, building the capacity of farmer associations, diversifying agricultural technologies, increasing agricultural productivity, and reducing post-harvest losses (UN Development Assistance Framework for Mozambique, 2012-2015). For example, UN agencies, including the FAO, World Food Program (WFP), International Fund for Agricultural Development (IFAD) and UN Industrial Development Organization (UNIDO), are all active in Mozambique's agricultural sector, strategically guided by the UN Development Assistance Framework. In addition, the World Bank implemented its Mozambican Agriculture Development Policy Implementation Plan and Agriculture Development Policy Operation (AGDPO), which aim to support medium-term reform programs.

III. China's ATDC in Mozambique: Practice and Experience

In 2006, then-president Hu Jintao, promised to construct 10 ATDCs in Africa. In 2009, China announced eight new measures for cooperation with Africa in the 4th Ministerial Conference of the Forum on China-Africa Cooperation, which included an increase in the number of ATDCs to 20 by 2012. In 2010, the Chinese government announced the construction of 30 ATDCs as part of the United Nations Millennium Development Goals. To date, China has established ATDCs in over 20 countries of Africa and Asia.

ATDCs have become a major cooperation modality under China's development assistance programs. The Chinese government adopted the "Construction-Technical Cooperation-Commercial Operation" agricultural assistance program to explore the sustainable development of ATDCs; construction, technical cooperation, and commercial operations represent the three project stages. By bidding, Chinese enterprises and scientific research institutions are approved to implement ATDCs. In the construction stage, project implementers offer facilities and other necessities for the ATDC, such as training buildings, experimentation and demonstration fields, the reconstruction of rural roads and irrigation facilities, and the provision of required equipment and machinery within two to three years. In ATDCs, once the construction is completed, a three-year stage of technical cooperation will begin. The Ministry of Commerce of the People's Republic of China provides financial support for the construction and technical cooperation period to the implementers responsible for the commercial operation of ATDCs. This allows them to make full use of the triennium to explore feasible business models and market-based mechanisms to ensure the long-term sustainability of the centers. After three years, ATDCs move to the stage of commercial operation on the basis of self-reliance and self-financing. For instance, some ATDCs were able to sell seeds, agri-products in market, and offer agricultural technology services to customers in recipient countries, and even neighbor countries.

1. Overview of the ATDC in Mozambique

1.1 Project History

As part of the implementation of the 2006 FOCAC initiatives, the Chinese government and the Mozambican government signed the Protocol on Cooperation between the Government of the People's Republic of China and the Government of the Republic of Mozambique on China's Assistance in the Construction of Agricultural Technology ATDC in Mozambique (hereinafter referred to as the "Cooperation Protocol") in 2008. Covering an area of 52 hectares, the Mozambique ATDC is the first of China's assistance to Africa, operating under the "Construction-Technical Cooperation-Commercialized Operation" mode. The center is located in the Mozambique Academy of Agricultural Sciences Southern Institute in Boane, 28 kilometers southwest of Maputo. It was implemented by Hubei Lianfeng Overseas Agricultural Development Company Limited (hereinafter referred to as "Lianfeng"). The center completed construction in November 2010 and was approved by the government of China in July 2011. It was formally handed over to Mozambique in April 2012. Subsequently, the center entered the technical cooperation stage, which ended in April 2015. In February 2016 the center started commercial operations, during which time the Ministry of Agriculture and Food Security of Mozambique took charge for the project and the South Branch of the IIAM became the local partner. The ATDC and IIAM signed a Memorandum of Understanding (MOU) on China-Mozambique Agricultural Technology ATDC Operation and

Management.

1.2 Program Objectives and Contents

According to the Cooperation Protocol, the implementation of the ATDC covered the following: construction of office buildings, allocation of space for training and production, construction of dorms for living, creation of demonstration fields, development of irrigation facilities and roads, and the purchase of necessary equipment and machinery.

The objectives and components of the project were: (i) to complete project construction; (ii) test and breed major crops, fruit trees, livestock and poultry; (iii) select locally suitable breeds from the lab for demonstration; and (iv) transfer useful technologies to Mozambican government officials, agricultural and technical personnel, and farmers through training courses. It was expected that the ATDC project would raise farmers' income and promote agricultural development. In addition, the ATDC attempts to promote a sustainable food value chain that encompasses agricultural food products, seedlings, agricultural machinery sales, and paid technical services, all with financial support from the private sector.

1.3 Institutional Arrangements

MOFCOM provided financial assistance to the ATDC project on behalf of the Chinese government. The Ministry of Science and Technology of Mozambique operated and managed the ATDC on behalf of the Mozambican government. Hubei Lianfeng, as the implementing partner of the ATDC, performed various tasks during each phase.

Table 2. China-Mozambique division of labour during ATDC cooperation

	China	Mozambique
Construction phase	Complete the construction of the functional area of the ATDC; provide necessary machinery and facilities to guarantee operation; provide seeds and agricultural materials.	Provide land for project implementation free of charge; offer concessions and support; assist Chinese engineering and technical personnel in completing relevant procedures.
Technical cooperation phase	Introduce various breeds of livestock and crops; conduct experiments and research, breed selection, and demonstrations; carry out agricultural production technical training; guide the application and dissemination of relevant techniques; expand the variety and production of improved seeds; provide technical services.	Designate a focal point responsible for project coordination and liaison; support the work of staff members of the ATDC.
Commercialize-d operation phase	Achieve sustainable development for the ATDC through industrialized and self-sustaining operations.	Select a Mozambican institution to jointly manage the ATDC with Hubei Lianfeng.

2. Practice of the ATDC in Mozambique

2.1 Meeting the Development Needs of Mozambique Based on Local Context

A series of policy documents from the Mozambican government show that agricultural productivity in Mozambique remains low and its link with the market remains weak. Additionally, the slow development of agriculture has hindered the improvement of local income and food security. A series of official documents show that increasing production and productivity and ensuring food security have been prioritized by a number

of regional organizations and international development agencies in their work in Mozambique. These agencies have provided support and assistance of different kinds at both the policy and project level. The international community's support for Mozambique has provided opportunities for cooperation with the ATDC.

Interviews with representatives of international development agencies also show that productivity in the agricultural sector has been a major challenge for many years. On the one hand, this is because Mozambique's food production is mainly based on subsistence. 85% of its agricultural production consists of smallholder farming and these areas alone are not capable of producing all necessary food crops. On the other hand, it is the lack of infrastructure that weakens the link between agricultural production sites and the market. Yet another challenge facing Mozambique's agricultural development is the lack of improved seed and related technologies.

Tian Guangfeng, China's former Ambassador to Mozambique, and Venancio Masinga, former Minister of Science and Technology of Mozambique, signed a cooperation agreement for the ATDC in Maputo on November 2, 2008. The cooperation agreement drew from the Mozambican government's 2005-2009 Five-Year Plan and took into account "Mozambique's demand for the expansion and diversification of agricultural products, as well as the need to achieve effective income growth from agricultural production and processing, access appropriate technology, and use and develop land through scientific research".

In Lianfeng's 2008 ATDC Implementation Plan, the project aims at "helping Mozambique to improve its capacity for self-development through the construction of an ATDC in Mozambique. The design of the ATDC is based on Mozambique's needs for agricultural production infrastructure, technology, talent, and productivity, in line with the key areas and challenges identified in multiple national development strategies and program documents. The plan points out that the work of the ATDC is based on the expectations of the Mozambican government, natural conditions and market demand, and the various technical advantages in Lianfeng. The plan also includes rapidly increasing Mozambique's grain yield and total output through field crop demonstrations, training and promotion sessions, all meant to enhance food security, raise farmers' income, improve peoples' living standards, and eliminate poverty."

To "rapidly increase in Mozambique's food yield and production and increase food security" and "rapidly increase farmers' income and peoples' living standards and eliminate poverty", the ATDC has defined its areas of work, namely, using breeding technology for big-field crop seeds complemented by planting and garden techniques. These are the main demonstration techniques, which have four major functions, namely, experimentation and research, demonstrations and extensions, technical training, and industrialized development. All of these laid a strong foundation for Mozambique's agricultural industrialization and improved its connection with the market.

Vasco is the former director of the Department of International Cooperation at the Ministry of Science of Technology in Mozambique. According to him, enhancing food security, increasing yields, reducing dependence on imports, promoting agricultural mechanization, and improving seed quality are some of the major areas for Mozambique's agricultural development. "The ATDC played a crucial role in improving seed quality, promoting market-oriented agriculture, improving income, and reducing poverty in Mozambique", he said.

2.2 New Ideas and Alternatives for Mozambique's Agricultural Development

1) ATDC Stimulated Local Communities' Interest in Agriculture by Introducing New Ideas and Techniques

The ATDC introduced new crop varieties and agricultural technologies which helped dispel farmers' previous conception that their land is only available for yielding certain crops. Such a change in mindset is crucial for upgrading the agricultural industry at the initial stage of development. According to interviewed officials and farmer representatives, the ATDC facilitated local agricultural development not only through the sharing of knowledge and technologies, but also by disseminating new development ideas. The ATDC has broadened peoples' horizons and raised their awareness of and willingness to explore all possible avenues of agricultural production.

The Power of New Ideas

The research team interviewed household representatives from three farmer cooperatives. Some farmers have visited the ATDC and found that the crops there were of very high quality. They were interested in the cabbage from the center, as the cabbages grew bigger there and had no worm holes—they believed that they could also grow such cabbage. Other farmers mentioned that the most important skills they picked up at the ATDC were those having to do with farm management and planning skills, as well as planting techniques. The ATDC made them realize that planning farming activities in advance is crucial to achieving final output goals.

Vasco said that, after participating in training at the ATDC, farmers not only learned new techniques, but also realized that they could increase crop production by adopting improved seed varieties and new skills.

The director in charge of economic development in the Boane district indicated that although farmers were not used to growing rice, the ATDC's rice plantation proved that they could grow rice of a high yield. This provided the local government with new options and it is now considering growing rice on a large scale in this area. More importantly, new varieties and technologies provided by China have broadened farmers' horizons and allowed them to realize the potential of increased production. ATDC has brought new ideas for agricultural production to the district.

China's ATDC demonstrates some differences between China's development cooperation and that of other international and traditional bilateral development partners. According to Mozambican officials, there are two major differences. First, the ATDC project is based on an agreement at the governmental level where both sides expressed strong political will to ensure successful implementation. Second, the Chinese experts' long-term stay in Mozambique proved to be much more beneficial for generating positive long-term impacts compared with other development partners that sent personnel on a short-time basis.

Varieties and technologies are key to the agricultural industry. By introducing new varieties and technologies, the ATDC has helped improve the capacity for self-development in Mozambique's agricultural sector, thus providing a new approach to agricultural development. During the three years of technological cooperation, the ATDC implemented food crop planting experiments, vegetable planting experiments, and livestock and poultry breeding experiments. In grain crop farming tests, the ATDC tested hybrid rice combinations and upland rice imported from China and selected ten high-yielding and good-quality rice varieties suitable for local farming. The paddy rice varieties have a maximum yield of 10.74 tons per hectare and the upland rice has a yield of over 6 tons per hectare. Two out of the ten varieties have been approved by the Mozambican Agricultural Ministry to take the district-level tests.

The ATDC also conducted a trial planting of corn varieties imported from China and local corn varieties. Six Chinese corn varieties were found able to adapt to the local climate, with a maximum fresh corn cob weight

of 15 tons per hectare. One of the local corn varieties has an average yield of 6.75 tons per hectare, about four times the local average yield. In terms of vegetable planting experimentation, the ATDC introduced 20-30 vegetable varieties from China, including white radish, tomato, chili, and cabbage. More than eight of them have shown positive results in terms of average output and growth cycle. Regarding livestock and poultry breeding tests, the ATDC introduced the Swaziland boar and passed the quarantine of Mozambique's Ministry of Agriculture. At the same time, it is equipped with breeding, forage, and anti-epidemic medicine. At present, the number of boars has reached 300. In addition, the ATDC has developed a cotton planting test, which has also performed well.

Building on the testing work, by 2014 the ATDC had tested and demonstrated a total of 80 crop varieties, including 12.7 hectares of rice and 6.7 hectares of corn. It has also tested 80 vegetable varieties over a growing area of 6.7 hectares. Meanwhile, driven by Lianfeng, the ATDC has turned the Hubei-Gaza Friendship Farm in Gaza Province into a rice demonstration base, where it has produced new rice varieties suitable for extension in Mozambique and has developed rice planting techniques. In addition, it has cooperated with other Chinese companies investing in Mozambique's agricultural sector to conduct large-scale rice testing and demonstration. The Hubei-Gaza Friendship Farm has grown around 333 hectares of rice in 2011, which also prompted surrounding villages to start large-scale rice planting.

While the shortage of various inputs has put a constraint on Mozambique's agricultural development, the ATDC has contributed to improving country's techniques for growing improved varieties and increasing market supply. It has also driven the diversification of agricultural development. The director in charge of economic development at the municipal government of Boane district suggested that there were very few good varieties in Mozambique and that those which were good were imported and not able to meet local demand. In addition, local farmers have limited purchasing power and are unable to afford such spending.

During the three years of technological cooperation, the ATDC provided agricultural resources through demonstrations and the extension of new varieties. Training was also provided, which has helped promote modern technologies and good varieties in Mozambique, filling the gap in its agricultural development, especially regards the shortage in good varieties and technologies. According to questionnaire results, 65.8% of respondents were positive when asked about whether they had sold seeds selected from the ATDC project. Because of the good quality of seeds produced, the ATDC has become a production base for improved varieties in Mozambique. The director also said that the ATDC has driven the development of the agricultural processing industry. For example, ATDC participants learned to make jam using newly learned technologies. Introducing agricultural product processing techniques has laid the foundation for upgrading Mozambique's agricultural value chain.

2) ATDC Draws Focus on Capacity Building Nationwide to Support Agricultural Development

The ATDC has consolidated both planting techniques of demonstrated crop species and pig breeding techniques, extending these techniques at two levels. The first level was to local government officials and experts. The second level was by providing seeds and conducting technical demonstrations of agricultural and pig breeding techniques to farmers at the demonstration sites of the ATDC. Agriculture-related agencies of the Mozambican government have organized agricultural experts and relevant agricultural staff to pay visits to the ATDC to learn about planting techniques to cultivate aerobic rice, corn, and vegetables varieties conducive to tent-cultivation.

The director of the South Branch of the IIAM said, "With regard to crop planting technique extension, the techniques taught at the ATDC are very good; the distance between crops is narrow and the yield is high. The rice yield at the ATDC is 6-7 tons and can sometimes reach 9 tons, while in the local area it may only reach 3-4 tons. As for pig breeding, the ATDC has done a good job. Its pig breeding is centralized with enough forage, which can fatten the pig in a short time. This is more efficient than the local method. The breeding method at the ATDC being so concentrated requires pretty high levels of forage. Therefore, local farmers have trouble achieving this."

The director at the Boane municipal government pointed out that the number of improved seeds produced in Mozambique is very limited. Large amounts of seeds are imported from South Africa but still cannot meet the local need. The ATDC made investment and produced improved seeds with reasonable prices. This could help increase production.

Among those farmers who answered the questionnaire, 96.9% have visited the demonstration site of the ATDC and 83.7% have visited the breeding site at the ATDC. This shows that the demonstration work has a high coverage. The following table shows that most farmers answering the questionnaire have made use of the new seeds and techniques introduced by the ATDC. Among those farmers, approximately 39-50% indicated that they had consistently used the techniques.

Table 3. Use of techniques introduced by the ATDC

Use of techniques introduced by the ATDC	All the time (%)	1-2 times a week (%)	About 5 times a week (%)	Never (%)
New seeds provided by ATDC	39	22	33	6
Crop planting techniques introduced by ATDC	50	18	31	1
Pig breeding techniques introduced by ATDC	47	14	24	15

Questionnaire results also show that among the new seeds introduced by the ATDC, corn, tomato, and cabbage seeds rank as the top three most popular among participants, as shown in the figure below.

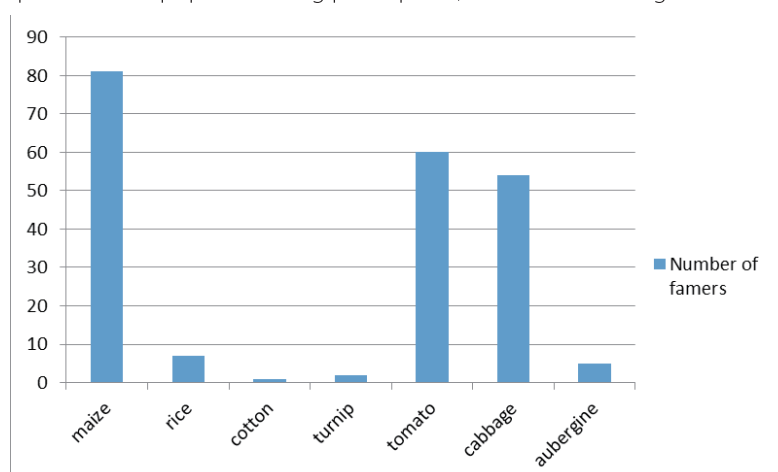


Figure 2. The main seeds adopted by farmers, introduced by the ATDC

Regarding crop planting techniques, soil fertilizer knowledge was adopted by the largest number of respondents, followed by vegetable planting techniques. Agricultural machinery operation and repairing and

maintenance techniques were the least used, as they are not the main focus of the ATDC. Additionally, the amount of agricultural machinery at the ATDC is also limited, which makes it impossible to conduct large-scale demonstrations and extensions.

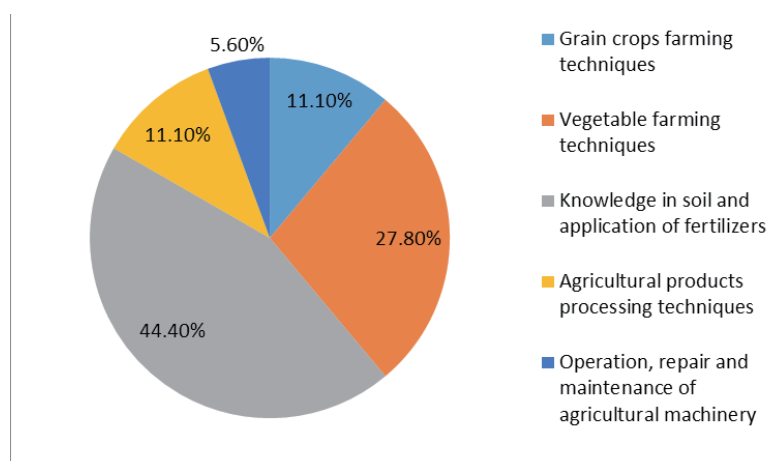


Figure 3. The application of different agricultural technique knowledge introduced by the ATDC

Among all the breeding techniques demonstrated and extended, the application rate of pig breeding was the highest, rising up to 80%. The pig breeding technique introduced by the ATDC is simple and easy to learn, making it popular among local farmers.

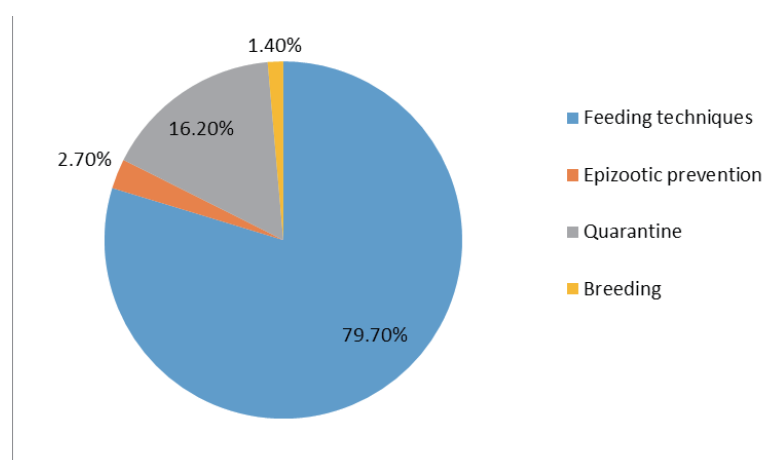


Figure 4. The application of pig breeding techniques introduced by the ATDC

According to the Implementation Plan, the ATDC aims to raise the technical level of agricultural personnel in Mozambique through training activities, as a way to boost local agricultural production levels and help Mozambique achieve self-development. There are three kinds of trainees: agricultural officials, technical staff, and producers¹³. The ATDC is responsible for developing training materials, providing courses, and offering

13. Agricultural officials: officers work in agricultural departments and organizations; agricultural technical staff: officers are engaged in technical works in agricultural departments and organizations; agricultural producers: farmers and others who actually are engaged in agricultural activities.

practical guidance. In addition, it is also responsible for providing necessary accommodations and support to participants. According to the data of training participants, the ATDC has conducted the below training activities during the technical cooperation phase between 2012-2014:

Table 4. Training activities during the technical cooperation phase

Year	Number of training courses	Number of participants	Target audience	Training details
2012	7	238	Agricultural officials, agricultural technical staff, and agricultural producers	Rice planting techniques, vegetable planting techniques, agricultural machine operation techniques, stock and poultry breeding techniques
2013	8	358		
2014	9	233		

As the following figure shows, among all the participants in the training courses organized by the ATDC, more than 60% participated one time, showing a low repetition rate. Officials from the Mozambican Ministry of Science and Technology suggested that the training organized by the ATDC selected participants from the entire country and different classes were designed for different participants coming from across Mozambique.

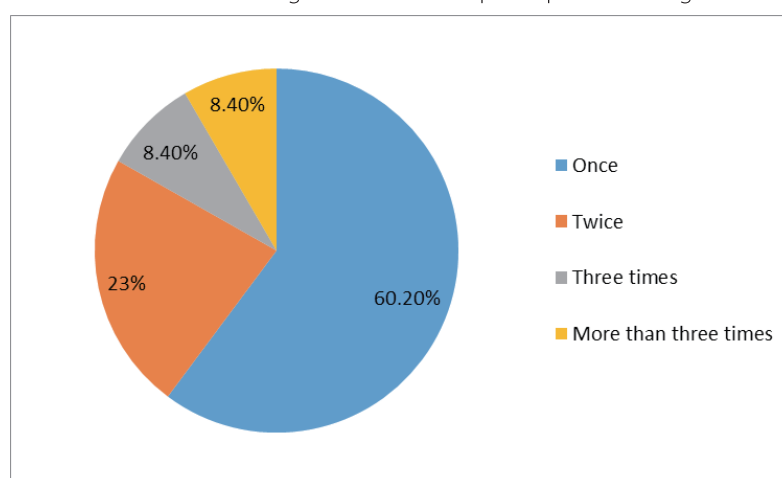


Figure 5. Proportion of farmers who participate in training organized by ATDC, broken down by number of sessions

Due to their participation in training activities organized by the ATDC, evidence shows that farmers have learned new agricultural knowledge and techniques and have applied them in production. More than half of the respondents to the questionnaire used the techniques once; more than 40% used them several times. The data shows that the application rate of new techniques is quite high. In addition, 96.8% of the respondents received one-on-one technical guidance provided by Chinese experts from the ATDC, which shows that the service and assistance provided by the experts has had a broad range of coverage.

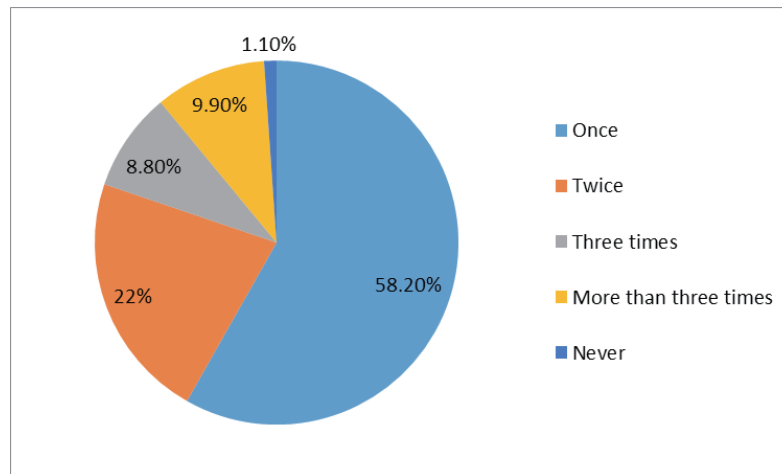


Figure 6. The application rate of techniques provided in the training

Aldeia, a farmer in PSK village, said: "Participation in the ATDC's training requires passing the selection process. My wife has participated twice in trainings organized by the ATDC and the cabbage and tomato planting techniques she learned have enhanced our crop production. The training staff have also approached her to share certain techniques."

Sofia, a farmer from the cooperative in Megas village, said "The ATDC provided training in rod insertion and field ridge establishment techniques. By applying them in my own field, production increased by about 30%. The techniques are very useful and she has learned many things. The quality and quantity of Chinese products are different and Chinese experts teach us how to plant rice, vegetables, and corn. I like the techniques of the ATDC very much".

While there is appreciation for the training and the ATDC, representatives from different farming cooperatives also mentioned issues such as damaged water conservancy irrigation facilities and equipment that have not yet been repaired. They also described the insufficient purchasing power of farmers and the lack of agricultural funds, all which affect agricultural production and the technical guidance provided by ATDC experts. As a result, final production is not ideal; because of the limited scale and number of experts, not all the areas can be covered. The ATDC still needs to increase its technical guidance to farmers. Certainly, China has always appropriated special funds for use as agricultural assistance funds, which has provided strong support necessary for the ATDC to be fully effective and functional. In the future, supporting the ATDC's work and expanding the benefits thereof will require the involvement of not only the Chinese, but also the Mozambique government, private sector, and the international scene as a whole.

2.3 ATDCs built the gateway to partnerships with multiple stakeholders

In terms of cooperative relationships, the ATDC has three main types of partners:

1) Local farmer cooperatives in surrounding villages serve as the most direct communication channel between the ATDC and villagers.

Farmer cooperatives are responsible for selecting the right participants and managing various training activities organized by the ATDC.

2) Chinese companies engaging in Mozambique's agricultural investment

Hubei-Gaza Friendship Farm is a strong example. The ATDC and other Chinese companies worked together to carry out rice demonstrations and extension sessions on the farm, that is, the ATDC provided technical support while Chinese companies provided managerial support. As such, research and experimentation are inextricable from technical training and agricultural development in the ATDCs. The rice demonstrations at the Friendship Farm are of a large scale and with widespread effects. By August 2014, the farm had developed 11,000 hectares of land. This has facilitated local rice production and has been welcomed by local farmers.

The ATDC and relevant Chinese companies have maintained good cooperative relationships. At the same time, through the bridge built by the ATDC, Chinese enterprises such as Hubei Wanbao Grain and Oils Group and Hubei Hefeng Grain and Oils Group successively invested in Mozambican agriculture. In 2011, Hubei Wanbao Grain and Oils Group entered Mozambique and devoted themselves to building an industry chain to bring together grain production with processing and sales. In 2012, Hubei Hefeng Grain and Oils Group founded "Lianhe African Agricultural Development Limited Company" and began carrying out land transfers, planting rice, and setting up grain processing factories in Sofala Province in Mozambique. The arrival of Chinese enterprises improved the supply capacity of Mozambique's agricultural products and promoted better local employment rates.

The Farmland Pioneer: "Wanbao"

Since ATDC started technical cooperation, the demonstration center has been conducting rice planting experiments and demonstrations in the Hubei-Gaza Friendship Farm (hereinafter referred to as "Friendship Farm") in Mozambique Province. In 2011, being attracted by the natural resources in Gaza province and rich rice plantation in ATDC, Wanbao Grain and Oils Limited Company from Hubei came to Mozambique and set up Wanbao African Agricultural Development Limited Company (Wanbao Co.) to promote agricultural development in Mozambique, using roughly 333 hectares of demonstration fields in Friendship Farm. In April 2012, the production of this ATDC demonstration field reached 8.25 tons/ha, which was a big achievement of African grain yields. It was a big news among local media and Mozambican government.

With the support of the Mozambican government, Gaza local government decided to lend more lands to Wanbao Co. in order to promote rice production. According to the agreement signed by Wanbao Co. and the local government, the company handed over 10% of the developed land to local farmers to operate. So that the local farmers mastered the technique of planting rice, Wanbao Co. gave every farmer 1-2 hectares of farmland and the enterprise provided support and technology. After the farmers mastered planting technology (once the yield per hectare reached 5 tons), the company divided 3-4 hectares of farmland for rice planting and provided the means of production for farmers. After harvesting rice, the farmers sold the rice to Wanbao Co., Wanbao Co. settled all surplus funding to the farmers after the cost of production was deducted. In 2014, the land development scale of Wanbao Co. reached 11,000 hectares. The land reclamation of Wanbao Co. didn't have any impact on the local farmers' land property system. Hubei Wanbao Grain and Oils Co. transported more than 100,000 tons of unhusked rice to a self-built warehouse for storage, which was then processed into rice for sale in the local market.

When harvesting rice, Hubei Wanbao Grain and Oils Co. employs over 1,600 local farmers, which has increased the income of local farmers in Mozambique. In addition, Wanbao Co. has also built three primary school for the community. In the year of 2013, when Mozambique was suffering from flood, Wanbao Co. donated 10 tons of rice to victims.

3) Other institutions

The ATDC has also established connections with Chinese universities and institutions, actively supporting

relevant research. The third type of partners are international organizations and institutions. The cooperation between the ATDC and international organizations serves to provide developmental assistance in the form of demonstrations and technological extension and maintains the commercial operations of the ATDC.

The ATDC has worked with different parties and carried out various forms of cooperation. In 2013, supported by FAO, the Mozambican government arranged for a 90-day training seminar held at the ATDC for roughly 30 agricultural officials and technical staff members. The training spanned rice and corn cultivation techniques and vegetable breeding techniques. In 2014, the sixth China-Mozambique-International Fund for Agricultural Development (IFAD) Workshop on South-South Cooperation was organized by the Chinese Ministry of Finance in partnership with the Ministry of Science and Technology of Mozambique. It was held in Maputo. 80 representatives from 15 countries and organizations learned about the construction and operation of the ATDCs. They also visited the vegetables, agricultural machinery, livestock, poultry exhibitions, and rice processing lines.

Since 2013, the ATDC undertook the "International Green Super Rice Pilot Project" funded by the Bill and Melinda Gates Foundation (Gates Foundation) in cooperation with the International Rice Research Institute of the Chinese Academy of Agricultural Sciences. Over the past three years, more than 30 new rice varieties have been tested annually and more than 10 high-yield and quality rice varieties suitable for local planting have been selected, of which two have been approved by the Ministry of Agriculture of Mozambique for use in local district trials, technical research, demonstrations, trainings, and extensions. The capacity of the ATDC to actively cooperate with different types of institutions and organizations and maintain good relations with them has strengthened its external communication and helped create opportunities for its own operations.

China's development assistance is deeply rooted in its society and culture. Under the larger framework of South-South Cooperation, which differs from the traditional ones in terms of both form and rationale, stronger communication and mutual understanding with the international community is encouraged. Compared with other short-term technical training projects, the long-term management and demonstration training by the Chinese experts at the ATDC provides favorable conditions for establishing partnerships with local communities and the international community at large.

2.4 Future Vision of the ATDC

As mentioned in section (a), a series of Mozambican policy documents have prioritized the promotion of market-oriented agriculture, which has also been a challenge for the country. However, the ATDC is piloting innovative initiatives in this area. The third stage of the implementation of the ATDC project, that is, the commercial operations, has drawn attention from different stakeholders. According to the Sino-Mozambique cooperation protocol on the ATDC, starting from the fourth year after its establishment, the ATDC will be jointly operated and managed by enterprises selected by the Chinese side along with organizations selected by the Mozambican government. It is expected that the operation costs would be covered by the profits generated from the ATDC's own business.

Before the ATDC began technical cooperation, Lianfeng already had its commercial operation plan finished. Following the concept of industrialized development in the commercial operation phase, the ATDC is going to build on the work carried out in the technical cooperation phase related to food, vegetables, and breeding. Additionally, it will perform market-oriented functions including experimentation, demonstration, training, and extension, under the guidance of the policies of both governments. This is to allow the ATDC to become part of the private sectors' own business activities.

The ATDC has started commercial operation. The Mozambican counterpart responsible for the ATDC has changed from the Ministry of Science and Technology to the Ministry of Agriculture, the latter being designated "IIAM", to work with Lianfeng on the management of the ATDC in this phase. After discussion, the MoU on the Operation and Management of the China-Mozambique ATDC was signed in February, 2016 and is slated to last seven years.

Under the MoU, the ATDC, as a non-profit research institution affiliated with the IIAM, will carry out agricultural technology experiments, demonstrations, and extension work during the commercial operation period. Management and technical staff designated by China and Mozambique will be responsible for the production and sale of agricultural and animal products in addition to providing training activities and agricultural technology extension. This activity is to sustain the operation of the ATDC. After discussion, the Mozambican side decided that the ATDC will continue its work in experimentation, demonstration, training, and the extension of agricultural technology, it will also conduct market-oriented operations consistent with the idea of sustainable development.

Future Vision of the ATDC

Mozambique's government officials expressed confidence and hope that the ATDC will play a larger role in the future.

Vasco said that while other countries' projects are more oriented towards private sector investment and development, the China-Mozambique ATDC is a cooperative project between the two governments and as such will be more effective in the long-term. The ATDC project carries Chinese characteristics, namely, the sharing of China's own knowledge and technology and the provision of research institutes with physical sites for practice. The Mozambican government hopes that the ATDC can bring more crop varieties and carry out further market-oriented business operations in a self-sustaining way.

The mayor of Boane said that Boane is the country's agricultural center, aiming to also become the agricultural research center as well. The training activities of the ATDC played a major role in helping Mozambique to achieve that goal. In addition, the technology and new varieties introduced by the ATDC have contributed to improvements in local productivity.

The director of the Boane municipal government also indicated that Boane has been providing food and agricultural products for neighboring markets and has great potential in the field of agriculture. He hopes that the ATDC will become an international center in the future, attracting international agricultural personnel and foreign investment. Nuro, director of the South Branch of IIAM, said: "The ATDC's technology extensions and research and experimentations are sustainable. It has become the hub for sharing agricultural technologies. After it became operational, many companies requested to visit the ATDC."

By establishing multi-party and multi-layered cooperative partnerships, the ATDC has been exploring the path of sustainable development. As an innovative attempt at China-Africa agricultural cooperation, the ATDC's operation in the sustainable development phase will be advanced by both countries and will need joint efforts to face the opportunities and challenges of the next stage.

IV. China's ATDCs: Trials of Innovative Development Cooperation Approaches

China's ATDCs represent experiments that seek to strengthen the effectiveness and long-term sustainability of developmental cooperation. The idea responds well to the debate on the efficiency of aid alone to deliver development impact at scale, due in part to the lack of incentive schemes and the institutional capacity of aid beneficiaries. The ATDCs try to address this challenge through a blended approach that uses aid as an enabler to leverage private investment. In other words, it uses a broad-based Public-Private-Partnership (PPP) approach.

1. Innovative Cooperation Modality Bringing Private Investments to Development Cooperation

The advantage of adopting a PPP modality lies in the combined strengths of varied types of resources. The goal is to explore a sustainable business model for development projects that can operate on its own without external support. Aid could be used as a "first mover" of financing to kick off development projects that would otherwise attract no commercial financing given their risk-return profile. This is the case for China's ATDC, where aid has set in motion the construction of infrastructure, aimed at clustering production factors, as an initial step toward industrial development. This has also helped to establish a platform for partnerships and fundraising across multiple stakeholders.

ATDCs provide a channel to overseas markets for the Chinese private sector. Wanbao Co., for instance, has established its own rice brand in the local market, which is a joint effort with local farmers and the government that has contributed significantly to local job creation. The ATDC has thus benefitted both China and the recipient country in a number of ways. Nevertheless, such cooperation objective needs to be carefully maintained to ensure long-term sustainability. A delicate set of operational mechanisms, including the right economic incentives, is essential. The commercial operation of ATDCs also attracts international resources, such as the Bill and Melinda Gates Foundation. Such partners the ATDCs have regarded as important during the commercial operation phase, given the potential to cooperate with them in scientific research, demonstrations, extensions, human resource capacity-building, and the creation of industrial agricultural chains with a focus on local smallholder farmer development.

The ATDC is a bold attempt that effectively links development assistance with market-oriented operations. From the perspective of global development cooperation, it is hoped that this platform, effectively combining public sector assistance with private sector investment, will play an important role in future international development assistance work.

2. Innovations in Value Chains for Agricultural Assistance

The agricultural value chain is a set of linked activities that starts from production, aggregation, and processing

and leads to distribution¹⁴. International communities have long called for a sustainable value chain in the field of agricultural development. The sustainable food value chain framework (SFVCF) issued by the FAO suggests that, from a societal perspective, infrastructure is one of the core elements in advancing a sustainable value chain¹⁵. For ATDCs, infrastructure construction was the first step in project implementation. Notably, all facilities, including buildings, farmland, and irrigation facilities, as well as roads covered by the ATDC project, have become the property of the recipient countries. As such, infrastructure support has provided a solid "hardware" foundation for the local experts, farmers, and staff to perform their tasks and for Chinese experts to complete effective technical operation.

Other than this so-called "hardware" support, the capacity-building provided by ATDCs facilitates the production capacity and productivity of the SFVC. At the production level, ATDCs introduced new varieties and techniques to recipient countries through training sessions and demonstrations in the field. In Mozambique, for instance, the ATDC provided training for farmers' capacity-building regarding rice yields and production. The crop seasons in 2017 have shown impressive yield increases, jumping from the before-training average of less than 2 tons per hectare of paddy to 7–9.7 tons per hectare after training. Moreover, the private sector actors working with the ATDCs have also contributed to productivity through investments in irrigation and drainage schemes, the provision of electricity, land levelling and preparation, input supply, the training of farmers in climate resilient production technology, and value chain development from production to processing.

On the economic front, ATDCs allocate the risks between local farmers and the private sector, mitigating local communities' risk of marketing, which contributes to the SFVC. More specifically, Wanbao Co. adopted a contract farming¹⁶ model based on an agreement with the Gaza Provincial Government. As per this agreement, local farmers received training and technology transferred from Wanbao Co. The trained farmers then moved to plots allocated by the local counterpart agency for larger-scale production. Subsequently, Wanbao Co. purchased paddies from those farmers under contract for processing and marketing. The rice value chain is listed as follows:

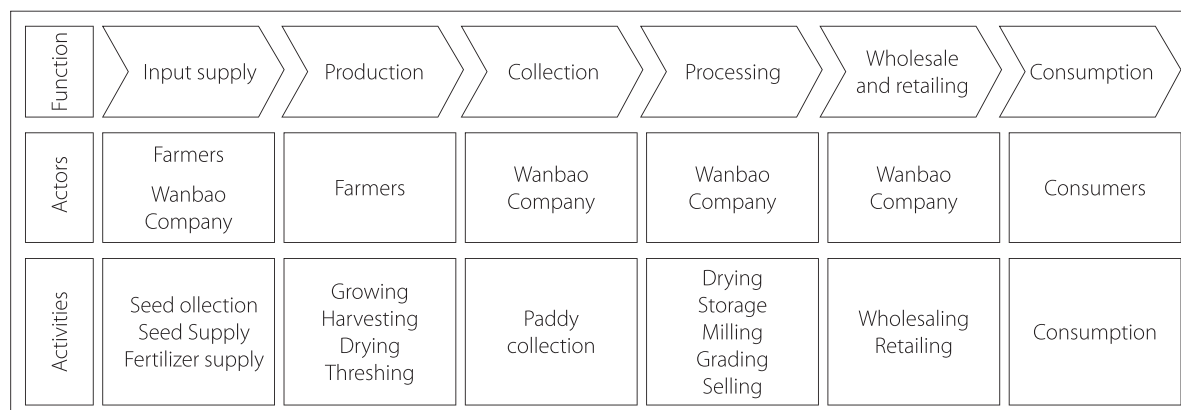


Figure 7. Rice Value Chain

14. Source: IFPRI <http://www.ifpri.org/topic/value-chains>

15. Source: FAO <http://www.fao.org/3/a-i3953e.pdf>

16. Contract farming refers to a system whereby a central processing and exporting unit purchases the harvests of individual farmers, and the terms of the purchase are arranged through contracts. The contract usually specifies how much produce the contractor will buy and at what price. The contractor often provides credit inputs and technical advice. Contracting is a way of allocating the risks between producer and contractor; the farmer takes the risk of production and the contractor the risk of marketing.

3. Innovations in Empathizing with the Smallholder Farmers' Role in Agricultural Assistance

Beyond the internationally-recognized Public-Private-Partnership (PPP) model, ATDCs are an attempt at a Public-Private-Partnership-Producer (PPPP) model that emphasizes smallholder farmers' interests.

The smallholder farmers' improved knowledge and skills in agriculture were gained through various capacity building activities. Interestingly, the introduced techniques and varieties triggered local smallholder farmers' interest in rice production in Mozambique. Additionally, contract farming directly linked smallholder farmers to private sector counterparts. In Mozambique's case, smallholder farmers from Xai Xai worked with Regadio do Baixo Limpopo (RBL) of the public sector on land allocation, land levelling, and preparation. They were also engaged through forward contracts¹⁷ with Wanbao Co. to grow rice paddies and negotiate prices and the quantity of the final product. Although contract farming can hardly guarantee smallholder farmers' interests during their interactions with private sector actors, it provides, at the very least, a channel for smallholder farmers to have direct conversations with RBL and Wanbao Co.

17. A forward contract is a customized contract between two parties to buy or sell an asset at a specified price on a future date. A forward contract can be used for hedging or speculation, although its non-standardized nature makes it particularly apt for hedging.

V. Recommendations for Exploring Innovative Modalities for the ATDCs

1. Strengthening External Communication and Cooperation

Given the unique characteristics of each country's cooperative developmental approach, China's ATDCs are still largely unknown to the international community. To better coordinate and consolidate resources and efforts to achieve scalable, sustainable, and resilient agricultural development, China could more actively engage in external communication at various levels.

At the policy-making level, China could participate in global and regional dialogues on international development cooperation, so as to learn about different development cooperation policy approaches. At the recipient country level, China could more actively participate in coordination mechanisms among development partners to enhance mutual understanding about both the policies and the projects. At the project level, China and other development partners could arrange for regular interactions about certain projects. Simultaneously, Chinese agricultural experts need go deeper into the local agricultural community to communicate with local groups of farmers more effectively and directly. In addition, appropriate cultural and language training could be arranged for Chinese personnel before they are sent abroad. This would help them better adapt to local conditions and enhance communication with their local counterparts.

Strengthening external communication can help improve development partners' understanding about China's development cooperation while also allowing China to hear different views and suggestions from the international community more directly. This could help China improve its development cooperation and better align it with international standards. It is also beneficial for enhancing coordination in international development cooperation and creating synergies for the sustainable development of recipient countries. Conducting agricultural development cooperation with many international organizations and traditional supporters may also provide new thoughts and avenues of exploration for solving the agricultural assistance puzzle caused by the fragmentation of global assistance.

2. Continuing to Explore Systematic Public-Private-Partnership approach

Although the operation of ATDCs will gradually become market-oriented, the purpose of development assistance will not be changed. In the phase of commercial operation, the development assistance component of the project should include two parts. The first is to introduce new varieties and techniques suitable for local conditions. The second is to conduct technical training for farmers and in-field technical guidance for households, farmer cooperatives, and surrounding areas. The Chinese government considers the variety breeding of hybrid rice and the demonstration and promotion of production and planting technology as central to sustainable agricultural assistance. Such is beneficial to local crop yields and helpful in the fight to reduce poverty. Nevertheless, to increase agricultural output, African countries not only need improved seeds and appropriate production technology, but also good irrigation facilities, suitable fertilizer, and a corresponding market network. China will continually work to provide support in the form of agricultural knowledge, technology, and facilities to African countries.

Even though ATDCs still function to provide developmental assistance, the sustainability of such development

should continue to be explored in every phase. At present, ATDCs encounter difficulties in their outreach to farmers due to staffing limitations and communication barriers, which create further obstacles to fulfilling farmers' needs and providing timely guidance. This requires a systematic approach to strategic and long-term planning, so that manpower and the scale of cooperation can be well-arranged in advance. Another important task is to further explore how to leverage aid more effectively for trade and investment through ATDCs. To maintain financial sustainability, a blended financing approach that could bring in a wide range and variety of resources from diversified stakeholders, both public and private, including private enterprises, financial institutions, multilateral development agencies, and non-governmental organizations (NGOs), may be further explored to mobilize interest, partnerships, and capital in the future. To this end, China's South-South Cooperation Aid Fund may present an opportunity to leverage other channels of resources.

Annex 1

a. Mozambique Central Governmental Official Interview Guideline

1. What are the current development priorities in your country? Is the project consistent with the priorities? If so, how?
2. What is the current poverty reduction policy in your country? Is the project consistent with the policy? If so, how?
3. What are the current agricultural development policies in your country? Is the project consistent with the policy? If so, how?
4. What do you think is the most important contribution of this project to your country?
5. What do you think of the infrastructure construction of the Center? Are you satisfied with its quality and functions?
6. Could you tell us something about the nationwide promotion of Chinese varieties and techniques? How many provinces have been covered by this promotion? How many farmers have adopted Chinese varieties and techniques? What role did the central government play during the promotion process?
7. Do you think the varieties and techniques introduced by the project are helpful to the agricultural development and food security of your country? If so, how?
8. Do you think this project has contributed to the increase of agricultural product supply in the market? If so, how?
9. Through cooperating with the Chinese project, have you identified any needs or possibilities to change the way you cooperate with other institutions or adjust the way you cooperate with other development partners. Have you identified any policy gap because of the project?
10. Have you seen any reports about the project in national mainstream media? If so, how did they report on this project and what do you think of it?
11. In general, what do you think about the project? Do you think this project has played an effective and efficient role in promoting agricultural development of your country? Do you expect China to continue to provide such support to your country in the future?
12. Did you work closely with Chinese colleagues during the project? Did this project facilitate other cooperation projects between the two countries in agriculture?
13. What can the Chinese side do more to support the project? What can the Mozambican central government do more to support the project?

b. Mozambique Local Governmental Official Interview Guideline

1. What are the current development priorities of the district/province? Does the project support these priorities? If so, in what ways?
2. What is the current poverty reduction plan of the district/province? Does the project contribute to the implementation of the plan? If so, in what ways?
3. What is the current agricultural development plan in the district/province? Does the project contribute to the implementation of the plan? If so, in what ways?
4. What do you think of the infrastructure construction of the demonstration centre? Are you satisfied with its quality and functions? Why or why not? Please comment on training facilities, farmland, and hog raising areas respectively.
5. What do you think of the equipment and materials provided by China? Did they meet the local agricultural development needs? How about their quality? Do they work well?
6. Do you think the varieties and techniques introduced by the project are helpful to the agricultural development and food security of the post/district/province? If so, how?
7. Do you think this project has contributed to the increase of agricultural product supply in the market? If so, how?
8. As far as you know, are there any new agricultural production organizations that have been established in the post/district/province due to this project? If so, please tell us something about these organizations.
9. Over the past 5 years, has the scale of the existing agricultural production organizations in the district/province increased in general? Did the project contribute to it? If so, how?
10. Over the past 5 years, has the productivity of the agricultural production organizations in the post/district/province been improved? Did the project contribute to it? If so, how?
11. Over the past 5 years, have agricultural product sales and sales revenue of the post/district/province increased in general? Did the project contribute to it? If so, how?
12. As far as you know, are there any new agricultural commercial organizations that have been established by farmers in the post/district/province? Did the project contribute to it? If so, please tell us something about these organizations.
13. If there are already existing agricultural commercial organizations run by the famers in the post/district/province, do you think the project contributed to its development?
14. Were there any agricultural product processing facilities in the post/district/province before 2012? If so, what procedures could they do and what end-products did they produce? Has there been any change in processing capacity since 2012 till now? What has contributed to this change? Did the project play a role?
15. Have factories' production and profits increased since 2012? What do you think contributed to it? Did the project play a role? How? Did the project also lead to changes in aspects? If so, which aspects and how?
16. If there had been no agricultural product processing factory before 2012, have any such factories been established since 2012? If so, do you think the project played a positive role in this process? How?

17. Have the agricultural products in the post/district/province been further processed since 2012? If so, do you think the project contributed to this? How?
18. Have more farmers been involved in processing activities? If so, do you think the project contributed to this? How?
19. Has poverty been reduced in the region in the past 5 years? If so, what do you think contributed to it? Did the project play a role? How? Could you please share with us the annual figures of poverty and hunger rate in the post/district/province for the past 10 years? Is this project helpful for increasing farmers' income in the post/district/province? How has this project changed the agricultural net income, non-agricultural income and overall income structure of farmers respectively? How has this project changed the agricultural employment rate in the post/district/province? Do you have the annual figures of these categories?
20. Have the average wage and working conditions of local people improved in the past 5 years? If so, what do you think contributed to it? Do you think the project played a role? If so, how?
21. Through cooperating with the Chinese project, have you identified any needs or possibilities to change the way you cooperate with other institutions or adjust the way you cooperate with other development partners? Have you identified any policy gap because of the project?
22. Could you please introduce the supporting measures for this project provided by the local government? How do they support the project?
23. Do you think such cooperation modality is sustainable? Can this modality be borrowed by other agricultural assistance projects in the future? Why or why not?
24. In your opinion, what are the short-term and long-term benefits and challenges of this project? Are the benefits of this project sustainable? Why or why not?
25. Have you seen any reports about the project on local mainstream media? If so, how did they report on this project and what do you think of them?
26. In general, what do you think about the project? Do you think this project has played an effective and efficient role in promoting local agricultural development? Do you expect China to continue to provide such support to the post/district/province in the future?
27. Did you work closely with your Chinese colleagues during the project? What do you think of the collaboration? Did this project facilitate other cooperation projects between the two countries in agriculture?

c. International Organization Interview Guideline

1. What do you think of the role of China's foreign aid in this country in general?
2. What is the mandate of your office in this country? Do you think the Chinese project is in line with your mandate? If so, how?
3. Have any of your colleagues visited the project? Do you think the varieties and techniques introduced by the project are helpful to the agricultural development and food security of this country?
4. Has there been any collaboration between your organization and the project? If so, what was it like? What do you think of the collaboration?
5. Do you know about the modality of such a project and do you think it is sustainable in the future? What do you think are the short-term and long-term benefits and challenges of this project?
6. What do you think of the approach, results and effects of Chinese agricultural aid? To what extent is it similar with or different from that of Western countries?
7. Are there any other comments or suggestions that you would like to provide to this project?

d. Mozambique Local Counterpart Interview Guideline

1. What do you think of the infrastructure construction of the demonstration center? Are you satisfied with its quality and functions? Why or why not? Please comment on training facilities, farmland, and hog raising areas respectively.
2. What do you think of the equipment and materials provided by China in general? Did they meet the local agricultural development needs?
3. Have you been involved in the crop seeds breeding work with Chinese experts? If so, what challenges did you face during this work and how were they solved? What supporting measures did your organization provide to facilitate this work? What are the experiences and lessons of the breeding work?
4. What do you think of the methods of the breeding work? Are the methods scientific, efficient and effective?
5. What do you think of the results of the breeding work? Are the new seeds suitable for the local natural and technological conditions? Compared to the traditional seeds, what are the differences between their yields? What are the advantages and disadvantages of the new ones?
6. Have you been involved in the hog and chicken breeding work with Chinese experts? If so, what challenges did you face during this work and how were they solved? What supporting measures did your organization provide to facilitate this work? What are the experiences and lessons of the breeding work?
7. What do you think of the methods of the breeding work? Are the methods scientific, efficient and effective in supporting farmers?
8. What do you think of the results of the breeding work? Are the new hog and chicken varieties suitable for the local natural and technological conditions? Compared to the traditional hog and chicken varieties, what are the advantages and disadvantages of the new ones?
9. What is the role of your organization in the farmer trainings, technician trainings and other trainings (if any)? If your organization was involved in organizing the trainings, how did your organization select farmers and technicians to participate in the trainings and how did you motivate them to do so?
10. Do you think the approaches of the trainings effective? Why or why not?
11. How many technicians in your organization have participated in the trainings? Do you think the trainings have improved their working capacity?
12. Which Chinese crops varieties were demonstrated here? How many hectares of lands were used for each variety demonstration respectively?
13. Do you think the Chinese cultivation demonstration has advantages over the other methods? If so, what are the advantages? If not, why? If you think the cultivation demonstration doesn't have advantages, why?
14. Did the cultivation demonstration successfully show these advantages? If so, how did the demonstration achieve this? If not, what do you think needs to be done to achieve this goal?
15. Could you estimate how many farmers, technicians and governmental officials have been to the demonstration fields? Are they interested in the demonstration?
16. Did the livestock raising demonstration successfully show these advantages? If so, how did the

demonstration achieve this? If not, what do you think needs to be done to achieve this goal?

17. Could you estimate how many farmers, technicians and governmental officials have been to the hog demonstration area? Did they show interest in the demonstration activities?

18. Have the agricultural product sales and sales revenue of the village increased since 2012? If so, do you think the project contributed to the increases? How?

19. Have any agricultural commercial organizations been established in the village since 2012? If so, do you think the project contributed to this? If there are existing agricultural commercial organizations in the village, do you think the project supported its development in any way?

20. Has the project made it easier for your organization (if any) and for farmers to sell agricultural products? If so, how?

21. Have these processing facilities provided by the project promoted agricultural product processing of your organization as well as of the farmers? If so, how?

22. Through cooperating with the Chinese project, has your organization identified any new ways to improve agricultural production and internal management, which made you and your colleagues work more efficiently? If so, how?

23. Do you think such cooperation modality between your organization and Chinese colleagues is sustainable? Why or why not?

24. In your opinion, what are the short-term and long-term benefits and challenges of this project? Are the benefits of this project sustainable? Why or why not?

25. Do you think the current project management structure is sustainable? Why or why not?

26. How many staff members of your organization have been involved in this project? What are their roles in this project? Will your organization maintain such human resource input in the next phases of the project?

27. Do you think the capital inputs (e.g. purchasing agricultural machines and chemical fertilizers) of this project are sustainable?

38. Could you introduce the long-term cooperation plan between your organization and your Chinese counterpart in the future? Has this plan been implemented? If so, could you give us some details?

29. What do you think of this project in general?

e. Mozambique Community Representatives Interview Guideline

1. Personal information of participating community representatives
2. How many households are there in this village? What's the total population? How many men and women? Which ethnic groups are there in this village and what's the population of each of them?
3. What was the average net income of the villagers in 2012 and now respectively?
4. How many people can read in the village? How many of them graduated from elementary school, junior secondary school, vocational school and senior secondary school respectively?

5. Land use in the village

Type of land	Hectares
Total land	
Farmland	
Paddy fields	
Dry lands	
Woodland	
Orchard	
Land for livestock or poultry raising	
Homestead	
Other land (please specify)	

6. Is there any road access to the markets nearby?
7. Is there access to electricity and clean water in the village?
8. What are the main industries in the village? Is there manufacturing in the village? In terms of agriculture, what are the main activities in the village (crop farming, livestock raising, forestry, fruit production and fishery)?
9. What are the major development challenges of the village?
10. How many people in the village mainly engage in crop farming, livestock raising and factory work? How many men and women in these jobs respectively? Has any of these changed as a result of the project?
11. What are the major administration or management organizations (e.g. village committee or similar organizations) in the village? What about agricultural production organizations? When were they established and how many members are there in these organizations respectively?
12. Has the work of the village administration or management organizations become more effective and efficient over the past 5 years? Did the project contribute to it? How?
13. Has the scale of the existing agricultural production organizations in the village increased in the past 5 years? Did the project contribute to it? How?
14. Has the project changed the way organization members collaborate? If so, how?
15. Are farmers now able to organize activities such as trainings and agricultural technique mutual-help by themselves? Have farmers established any new agricultural production organizations? Did the project contribute to it? How?
16. Once the project ends, do you think villagers would be able to continue to use the varieties and techniques

introduced by the project by themselves? Why or why not?

17. How many farmers do you think have adopted the new seeds and new cultivation techniques introduced by the project? Do they use these seeds and techniques very often? Which seeds and techniques are especially popular? Why? What do you think are the main reasons for some of the new seeds and techniques not being widely used?

18. How many farmers have adopted the new hog or chicken varieties and new raising techniques introduced by the project? How often do they use these varieties and techniques? Which varieties and techniques are especially popular? Why? What do you think are the main reasons for some of the new varieties and techniques not being widely used?

19. Do you think the agricultural product sales and sales revenue of the village have increased since 2012? Did the project contribute to it? How?

20. Are there more farmers who are able to sell their products than in the past? Why? Did the project contribute to it? How?

21. Have farmers been planting more and investing more (water, land, or fertilizers) in order to sell more agricultural products? Did the project contribute to it? How?

22. Are there any new agricultural commercial organizations that have been established by farmers in the village due to this project? If so, please tell us something about these organizations.

23. If there are existing agricultural commercial organizations in the village, do you think the project supported its development in any way?

24. Were there any agricultural product processing facilities in the village before 2012? If so, what procedures could they do and what end-products did they produce? Was there any change in processing capacity from 2012 till now? What has contributed to this change? Did the project play a role? How?

25. Have agricultural product processing factories' production and profits increased since 2012? What do you think contributed to it? Did the project play a role? Did the project also lead to changes in other aspects? If so, which aspects and how?

26. If there had been no agricultural product processing facilities before 2012, have any such facilities been used since 2012? If so, do you think the project played a positive role in this process? How?

27. Have the agricultural products in the village been further processed since 2012? If so, do you think the project contributed to this? How?

28. Have more farmers been involved in processing activities? If so, do you think the project contributed to this? How?

29. Do you see farmers consider strengthening their agricultural processing capacities? Do you think the project contributed to this? How?

30. Did the community administration or management organizations work closely with Chinese experts during the project? Do you think Chinese experts' work is helpful to the agricultural development of this village? How?

31. Do you think the current way of collaboration between the village and the Chinese experts can continue in the future? Why or why not?

32. What does your organization think of this project in general? (write down the comments from each organization)

33. How do men in the village participate in agricultural production activities and in household chores? How do women in the village participate in agricultural production activities and in household chores?

34. Ask female representatives to participate in making the female daily activity charts before and after the project.

35. Ask community representatives and Chinese experts to participate in making the seasonal calendars before and after the project.

f. Technician Interview Guideline

Name: _____ Gender: _____ Year of birth: _____

Contact information: _____ Address: _____

1. Are you a full-time or part-time technician? If you are a part-time technician, what is your main job?
2. How long have you been working as a technician? Which organization do you work for? What is the area that your promotion work covers?
3. Why did you decide to take part in the trainings? Which techniques delivered by the trainings attracted you the most?
4. What are the techniques that you have learnt from the trainings? Are they useful? Are the training methods (lecture and assessment etc.) effective? Why or why not?
5. Have you actively promoted the techniques that you acquired from the trainings? If so, which ones? How did you promote them? If not, why? During the promotion process, what were the challenges that you encountered?
6. Among all the techniques that you acquired from the trainings, which one is the most useful for you? Which one is the most popular in your village? Why?
7. In your opinion, has this project been helpful for improving the skills of local technicians? If so, to what extent?
8. Overall, what do you think about the training part of this project?

g. Mozambique Farmer Interview Guideline

1. Have you used the agricultural machines of the project? Are they durable and easy to operate? Do they work well? On the whole, did they help you? How?
2. Have you used the fertilizers or pesticides provided by the project? Are they useful? If so, how?
3. Have you or your family attended the trainings delivered by the project? If so, how many times? Who in your family usually attended them?
4. Why did you or your family decide to take part in the trainings? Which parts of the trainings attracted you?
5. Do you think the techniques introduced in the trainings have been useful for your field work? If so, could you give some examples?
6. Do you think the current facilities of the Center are sufficient for training activities?
7. Have you or your family ever received any one-on-one technical guidance from Chinese experts? Where did you usually receive it (e.g. in the training room, the demonstration field, your house, your own field or somewhere else)? What have you learnt from the technical guidance? Do you think it is helpful? Why or why not?
8. Have you used the seeds and cultivation techniques provided by the project? If so, how often? Do you think they are helpful to you?
9. Are you a cultivation demonstration household now? If so, why did you decide to become one?
10. Which new seeds and cultivation techniques have you used? Please name them. How many hectares of land are used to grow the new seeds?
11. How did the yields change after you used the new seeds and techniques? What about other changes?
12. Compared to the seeds you used to use, what are the advantages and disadvantages of the new ones?
13. Are you planning to increase the use of Chinese seeds and cultivation techniques in the future? Why or why not?
14. Have you discussed with your friends and neighbors about using Chinese seeds and cultivation techniques? What do they think of your results? Are there any other farmers that also used Chinese seeds and techniques like you? If so, what do they think about the Chinese seeds and techniques?
15. Have you used the new hog raising techniques introduced by the project? If so, how often? Do you think they are helpful to you?
16. Which new hog raising techniques have you used? Please name them. How many new hogs do you raise?
17. How well do your hogs grow after you used the new techniques? What about other changes?
18. Compared to the techniques you used to raise, what are the advantages and disadvantages of the new ones?
19. Are you planning to increase the use of Chinese raising techniques in the future? Why or why not?
20. Have you discussed with your friends and neighbors about using Chinese raising techniques? What do they

think about? Are there any other farmers that also used Chinese techniques like you? If so, what do they think about it?

21. Where do you usually sell your agricultural products? How far is the market from your home? Is it the place that most of your neighbors go to?

22. Has any new market been organized closer to your home since 2012? If so, do you think the project played a role? How?

23. How do you usually transport your products to the market? Did the project make it easier for transporting your products?

24. Do you remember the price at which you sell your agricultural products in 2012? For how much do you sell them now? What do you think contributed to this change? Did the project contribute to it? How?

25. If you want to sell products, what official procedures do you need to go through? Did this project make the procedures any simpler?

26. Do you think it is easy to sell agricultural products in your village in general? Has the project made it any easier? If so, in which aspects?

27. Overall, how has the Chinese project changed your and your family's life? Are you happy to be working with Chinese experts and are you happy with the project in general?

28. Do you think this project has played a role in leading to the changes in your household agricultural production since 2012? How?

Annex 2

Questionnaire for Households for the Case Study on Chinese Agricultural Technology Demonstration Center in Mozambique

Questionnaire No. _____

Name: _____ Contact information: _____

Date: _____ Investigator's name: _____

Address: _____ Village _____ Administrative Post _____ District _____ Province _____

Instructions:

1. Households within the communities where the project sites locate should account for 70% of all the respondents;
2. Female respondents should account for at least 30%.

Filled in by the investigator

Household in the communities of the project sites: (1) Yes (2) No
Gender of the respondent: (1) Male (2) Female A. Basic information

1. In which year were you born? _____

2. Education level:

- (1) Completely or nearly illiterate (2) Elementary school (3) Junior secondary school
(4) Technical secondary school (5) Senior secondary school or above

3. Changes in your family before and after the assessed project period (2012-2016)[For the families living in the project area between 2012 and 2016]

	2012	Now
How many male and female are there in your family?		
How many of your family members do farm work?		
How many females of your family do farm work?		
How much does your family make each year? (MZN)		
On average, how much does your family spend every day? (MZN)		
Are the quantity and quality of food enough for your family?		

4. Changes in household agricultural production before and after the assessed project period (2012-2016) (yield: kg/ha; output: kg; revenue: MZN)[For the families living in the project area from 2012 until now]

Type	2012					Now				
	Yield	Output	Household consumption	Sales volume	Sales revenue	Yield	Output	Household consumed volume	Sales	Sales revenue
Rice										
Cassava										
Maize										
Other crops (Please specify)										

Livestock and poultry										
Vegetables										
Fruits										
Others (Please specify)										

5. Changes in non-agricultural income before and after the assessed project period (2012-2016) (MZN) [If you have another job now, please answer this question]

Type	2012	2016
Wage income (as official, village official or teacher etc.)		
Business income (handicraft making, repairing or sales etc.)		
Other income (please specify)		

6. Do you think the Chinese Agricultural Technology Demonstration Center project played a role in leading to the changes in your household agricultural production since 2012?

(1) Yes (2) No (3) Hard to say

7. Do you think this project played a role in leading to the changes in your household income since 2012?

(1) Yes (2) No (3) Hard to say

B. Knowledge about the Chinese Agricultural Technology Demonstration Center project

1. Do you know there is a Chinese Agricultural Technology Demonstration Center around here?

(1) Yes (2) No

2. If yes, how did you know? (Multiple choice)

- (1) Accidentally found by myself (2) Broadcast/TV/newspapers
(3) Informed by relatives or friends (4) Participated in trainings
(5) Introduced by Chinese staff (6) Introduced by local staff
(7) Purchased agricultural products from the Center
(8) Others (please specify): _____

C. Participation in the Chinese Agricultural Technology Demonstration Center project

1. Have you ever been to the crop demonstration fields of the Center?

(1) Yes (2) No

2. Have you ever been to the hog raising demonstration area of the Center?

(1) Yes (2) No

3. How many times have you participated in the trainings organized by the Center?

(1) Once (2) Twice (3) Three times (4) More than three times (5) Never

4. In your practical work, how often do you use the skills gained from the trainings?

(1) All the time (2) About 5 times a week (3) 1-2 times a week (4) Never

5. What other activities of the project have you participated in? (Multiple choice)

- (1) Used agricultural machines provided by the Center (2) Worked for the site
(3) Sold improved seeds (4) Never participated in any other activities of the project
(5) Others (please specify): _____

6. During your participation in all the activities above, have you received one-on-one technical guidance from Chinese experts?

- (1) Yes (2) No

D. Effects on agricultural production and livelihood

1. How often do you use the new seeds introduced by the project?

- (1) All the time (2) About 5 times a week (3) 1-2 times a week (4) Never

2. If you have used the new seeds introduced by the project, which ones have you used? (Multiple choice)

- (1) Maize (2) Rice (3) Cotton (4) Turnip
(5) Tomato (6) Cabbage (7) Aubergine
(8) Others (please specify): _____

3. How often do you use the new crop-growing techniques introduced by the project?

- (1) All the time (2) About 5 times a week (3) 1-2 times a week (4) Never

4. If you have used the new crop-growing related techniques introduced by the project, which ones have you used? (Multiple choice)

- (1) Grain crops farming techniques (2) Vegetable farming techniques
(3) Knowledge in soil and application of fertilizers
(4) Agricultural products processing techniques
(5) Operation, repair and maintenance of agricultural machinery
(6) Others (please specify): _____

5. How often do you use the new hog raising techniques introduced by the project?

- (1) All the time (2) About 5 times a week (3) 1-2 times a week (4) Never

6. If you have used the new hog raising techniques introduced by the project, which ones have you used? (Multiple choice)

- (1) Feeding techniques (2) Epizootic prevention
(3) Quarantine (4) Breeding (5) Others (please specify): _____

7. Do you think the project made it easier for you to sell your surplus agricultural products?

- (1) Yes (2) No

8. In your family, who has participated in the project activities?

- (1) Male members (2) Female members (3) Both

9. Has the project helped female members in the family to (multiple choice):

- (1) Decide on how to conduct agricultural production (e.g. which crops to grow, which seeds to buy, and which agricultural technology to use)
(2) Provide guidance to family members on cultivation and keeping livestock
(3) Assign household work (housekeeping, farm work etc.) to family members
(4) Decide on how to spend money for the family
(5) Decide on how to distribute food among family members
(6) Decide on issues related to the education of children
(7) Others (please specify): _____

10. Has this project made you interact and cooperate more often with other farmers?

- (1) Yes (2) No

E. To what extent are you satisfied with the activities delivered by the project?

Activity	Very satisfied	satisfied	Fairly satisfied	Dissatisfied	Very dissatisfied
Variety demonstration and application					
Training organization					
Technical guidance in farmers' houses					
Providing free seeds					
Providing agricultural production materials (machinery, fertilizers, and pesticides etc.)					
Others (please specify):					
Overall satisfaction					

F. Opinions on and expectations for the Chinese Agricultural Technology Demonstration Center project

1. Overall speaking, do you think this project is useful to you and your family?

(1) Yes

(2) No

2. Do you expect China to continue such projects in your community?

(1) Yes

(2) No, reasons: _____

3. What do you think is the most valuable contribution of the project?

4. What do you think is the biggest challenge of the project?

5. What suggestions would you like to give to this project?
