



**Chinese agriculture
technology
demonstration centres
in Southern Africa:
the new business of
development**

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ABSTRACT

Chinese aid in the African agriculture sector is one of the enduring forms of involvement on the continent. The launching of Agriculture Technology Demonstration Centres (ATDCs) in 2006 marked a new intensive phase in agricultural aid, which seeks to find sustainability through public-private partnerships and to promote Chinese commercial pursuits. Based on in-depth fieldwork in Mozambique and South Africa, this paper provides a critical analysis of ATDCs practices. As per the three key objectives of the ATDC - technology transfer, business development, and sustainability -, the authors find three major results. First, the agro-technology transfer proves to be beneficial but at a very localized level. Second, Chinese agribusiness companies have been introduced to the host countries through the platform of the ATDC, and are partially fulfilling the commercial aim of the project. Third, the long-standing problem of aid unsustainability remains a major concern with the newly launched ATDC project. The deficiency of policy design and lack of effective bilateral interactions are identified as the main reasons for the problems experienced.

Keywords*

Chinese agricultural aid; Africa; agriculture technology demonstration centre (ATDC); Mozambique; South Africa

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INTRODUCTION

Chinese agricultural aid in Africa dates back to the late 1950s, and still remains an essential part of Chinese contemporary aid towards the continent. Due to the significance of agriculture to economic development and social upliftment, the sector has always been given special priority by the Chinese government in its aid pledges. The aims and modalities of Chinese agricultural aid in Africa have however undergone substantial changes over the last five to six decades. This is particularly the case with the country's aid reforms since the 1980s, which began to put more emphasis on aid performance and on serving a wider range of foreign policy objectives.

The Agriculture Technology Demonstration Centre ('the ATDC' or 'the Centre' hereinafter), a flagship project of Chinese contemporary agricultural aid programme in Africa, is a key institutional expression of this transformation of Chinese foreign aid. It combines both diplomatic and commercial goals, involves a diversity of public and private actors, and adopts a complicated operational mechanism. Furthermore, it represents an innovative dimension of Chinese agricultural aid, in that it is a hybrid of different forms of aid programming previously utilised (e.g. farms, agro-technology demonstration/extension stations, experts dispatch), with some of the mechanisms being intentionally designed to avoid problems experienced in the past.

While the ATDC project has attracted wide attention from both domestic and international observers since its inception in 2006, there has been a dearth of fieldwork-based research conducted in this arena. Of the existing research, most has concentrated on policy analysis and captured only the inception phase of the projects (Xu and Qin, 2011; Tang, 2013; Scoones, et al. eds., 2013; Tang, et al., 2014; Chichava, et al., 2014). The way the ATDCs are implemented, how the different Centres operate and the dynamics of these Centres over time have not been the focus of studies to date.

In short, in order to obtain a fuller insight into the Chinese agricultural aid programme, it is necessary to analyse the ATDC operations over the past ten years and to provide a comparative investigation into functioning ATDCs in different country settings. Specifically, this paper aims to: first, study the objectives and modalities (actors and operational mechanisms) of

the ATDC project; second, analyse the actual practice of the ATDC through in-depth case studies of the ATDCs in two Southern African countries: Mozambique and South Africa; third, provide some policy recommendations to improve the ATDC performance.

Three sources of data informed this qualitative research. Primary data was collected through a semi-structured questionnaire-based survey. Through a combination of purposive and chain referral sampling, 10 interviews were conducted for the ATDC in Mozambique and 22 interviews were conducted for the ATDC in South Africa. The interviewees involved stakeholders from both the Chinese and host-country sides, covering the Chinese staff working in the ATDCs, the Mozambican and South African officials, staff and workers. Observational data was obtained, during the survey period, through site visits, allowing an understanding about the physical setting. Finally, secondary data including documentation regarding plans, project structure and project governance were collected from both public sources and the interviewees in order to corroborate the findings from interviews and observations. All fieldwork was conducted in Mozambique over a period from October 2013 to January 2015 and in South Africa from April 2013 to January 2015.

This paper is organized in five sections. Section I outlines the general picture of the ATDC project, examining its objectives, actors and mechanisms. Section II and III investigate the specific cases of the ATDCs in Mozambique and South Africa, respectively. Section IV provides an integrated analysis of three key topics: technology transfer, business introduction and sustainable development. Finally, section V, provides conclusions and policy implications.

SECTION I. ATDC: OBJECTIVES, ACTORS AND MECHANISMS

The ATDC project was first proposed at the Beijing Summit of the 3rd FOCAC (Forum on China Africa Cooperation) in 2006. The Chinese government pledged to build 10 ATDCs in different African countries (FO-

CAC, 2006). The number was then increased to 20 during the 4th FOCAC of 2009 (FOCAC, 2009). By 2012, there had been in practice at least 23 Chinese-aided ATDCs, with the first 14 centres having finished construction and been transferred to the host governments, and nine others still in the process of completing a feasibility study or construction (Table 1).

Objectives

According to the official document which guides the practice of the ATDCs ('ATDC Guidance' hereinafter), issued jointly by China's Ministry of Commerce (MOC) and Ministry of Agriculture (MOA), the purposes of the ATDCs are explained as follows (MOC and MOA, 2011):

- I. To serve China's foreign strategy and promote bilateral relations with the recipient countries;
- II. To help increase grain production, improve agricultural technology, and enhance food security of the recipient countries;
- III. To provide a platform for Chinese companies to develop in Africa, and promote China's 'Agricultural Going Out' policy;
- IV. To build the ATDC into a base for agro-technology experiment and research, demonstration and extension, human resources training, and display.

Based on the ATDC Guidance, the objectives of the ATDC project can be interpreted mainly from two aspects. First, ATDCs are launched primarily for political/diplomatic considerations and act first and foremost as a Chinese government aid project in Africa (Objective I & II). The aim is to improve food security of the recipient countries through the transfer of Chinese advanced agro-technology (Objective IV), and thereby, to consolidate and strengthen the 'traditional friendship' between China and Africa. Specifically, the agro-technology transfer is expected to be realised by the execution of four functions: research, demonstration and extension, training, and display (Objective IV). These are also termed by the Chinese gov-

ernment as ‘public-interest functions’ (gongyixing gongneng) in that they are all supposed to be non-commercial activities.

Second, ATDCs project bear some commercial elements. This is a new feature compared to China’s earlier agricultural aid practice in Africa and this is in line with the country’s aid reforms since the 1980s². Most prominently, the commercial elements are manifested through the intention of establishing business platforms for Chinese agro-companies (Objective III), which is termed as business introduction in this paper. Also, similar to the practice of Chinese contemporary aid in general, the ATDC project is accompanied by and expected to promote export of Chinese agro-equipment and materials, among others (MOC and MOA, 2012).

Actors

The Chinese government incorporates Chinese companies, both state-owned and private, in the management of the ATDCs³. This demonstrates an element of government-company cooperation, and, in the case of private firms, a Public Private Partnership (PPP) model. To be qualified to operate and manage an ATDC, the companies, in principle, have to be national or provincial-level leading agro-companies in China and must have strong financial, managerial, and technical capabilities. The companies need to go through a bidding process - though not a fully open or competitive one - with the local and central Chinese governments having influence over the decision-making (Tang et al., 2014). No private actors from the host countries are currently involved in the implementation of the ATDCs.

While the Chinese company actors (referred to as the “implementing agents” hereinafter) are the main role players in the daily operation of the

² Important reform measures in the 1980s include, for instance, incorporation of company actors through the “contract and responsibility system” and strengthening of the post-transfer technical and management cooperation of aid projects, which primarily aimed at improving the aid efficiency and sustainability. More commercial-oriented reform started from the mid-1990s. Aid was increasingly used as an instrument to serve China’s economic foreign policy objectives, for example, through promoting foreign trade and investment. The aid financing channels were also diversified with more market capital (e.g. bank loans and company funds) being utilized.

³ There are also several cases, for instance, in Congo, Rwanda, Zambia and Zimbabwe (see Table 1), that the ATDCs are run by Chinese universities or research institutes. They sometimes also register a company under their names to operate the Centre.

ATDCs, they also work in conjunction with several government agencies of both China and the host countries. The Chinese MOC and MOA, central-level government actors on the Chinese side, are predominantly involved in the macro planning, facilitating and supervising the ATDC project. In most cases, each of the ATDC-recipient countries is twinned with one specific province (or provincial-level city) in China (Table 1), designated by the Chinese central government (MOC and MOA, 2011). Apart from providing general support for the implementation of the project, the local Chinese governments are expected to play a leading role in promoting agro-companies from their province to invest in the twinned African country (MOC and MOA, 2011). On the recipient side, various counterpart government agencies are involved in the implementation of the ATDC, which vary in the different African countries.

Mechanisms

Each ATDC has three operational stages: Project Construction Stage, Technical Cooperation Stage and Business Operation Stage⁴. The Project Construction Stage normally takes about one year. While the host government provides logistical support such as providing land, electricity and water, the Chinese side is in charge of the construction of infrastructure and the provision of agro-equipment and materials. The construction is executed by Chinese companies, but in most cases involves, to different degrees, employment of local workers in the host countries. The majority of the fees incurred in this stage are underwritten by the Chinese government, which averages about 40 million RMB (approximately \$660,000) for each of the Centres. (MOC and MOA, 2011; the authors' fieldwork)

Once the construction is completed, the ATDC is transferred to the host government and becomes a state asset of the latter. This also usually indicates the commencement of the three-year Technical Cooperation Stage. The main tasks for the ATDC in this stage are to perform the four 'pub-

⁴ Prior to the commencement of any stages, an exchange letter is signed between the two respective governments. The letter typically sets out the respective roles and responsibilities of the governments and implementing companies, particularly in the Project Construction Stage and the Technical Cooperation Stage.

lic-interest functions' mentioned earlier: agro-technology research, demonstration and extension, training and display. A Chinese technical team is assigned to the Centre to undertake these tasks. Moreover, in fulfilment of the 'business introduction' objective, the Centre also acts as a platform for Chinese agro-companies, who are seeking agribusiness opportunities into the host country. This latter dimension is fundamental because through it the Centre starts planning and setting the basis for the succeeding Business Operation Stage. To do that, many of the ATDCs set up small-scale agribusinesses based on the Centre in preparation for the business-oriented operation in the future (MOC and MOA, 2011; the authors' fieldwork).

In the Technical Operation Stage, in terms of the management, the Chinese implementing company runs the Centre on the daily basis. Financially, the Chinese government covers most of the Centre's daily operations, including the funds needed to carry out the routine activities such as agro-research, demonstration and training, as well as the salary of the Chinese staff. The host government plays the role of a facilitator, assisting to varying degrees with the technical and managerial issues and also sharing a small part of the financing responsibility related to this (MOC and MOA, 2011; the authors' fieldwork).

When the three-year technical cooperation ends, the ATDC enters the Business Operation Stage⁵. In this stage, the Centre is expected to be able to establish a market-oriented, integrated agribusiness value chain. Meanwhile, the original 'public-interest functions' are supposed to remain and even to be expanded and diversified. As far as it was designed in the ATDC Guidance, the Chinese companies will continue taking full charge of the Centre's management at the Business Operation Stage. Financially, the Chinese government only covers the operational fees of the ATDCs for the first three years of technical cooperation; afterwards, the Centre should try to fund itself through incomes from the business operation (Xu and Qin, 2011). The

⁵ Different from the description of the former two stages that is combined by both policy documents survey and the authors' fieldwork, the description of the Business Operation Stage is mostly based on policy documents (esp. the ATDC Guidance); that is, more from a policy design point of view. This is because by early 2015 when the last-time fieldwork was conducted, most of the first 14 ATDCs had just entered or were about to enter this stage (Table 1), thus little empirical evidence was available at that moment.

specific roles and responsibilities of the local partners were not specified in the ATDC Guidance and thus need to be further negotiated on the ground on a case-specific basis (MOC and MOA, 2011).

While this stage is also in line with the ‘business introduction’ objective, the primary purpose of having a prolonged cooperation period and adopting the business model is to ensure the sustainable development of the ATDC. Again, this has much to do with China’s aid reforms since the 1980s. One of the important reform measures that aimed to improve the aid sustainability was to strengthen ‘management cooperation’ in the post-construction phase. The management cooperation may take different forms such as sole management by the Chinese side on a entrustment or lease term (given that after transfer the project is part of the host country’s assets), or co-management through joint venture created by both sides (Shi 1989; State Council 2011)⁶. Either a Chinese-led or joint venture way of management could be applied to the ATDC project. It could also be, in theory, an independent management by the recipient side as long as the recipient country is capable of operating the Centre on their own. The specific cooperation model, particularly the unspecified responsibilities of the local partners, is to be negotiated between the two sides as the Technical Cooperation Stage nears the end. The original plan as seen in the ATDC Guidance, however, seems to suggest a Chinese-led management model.

In the following sections, the case studies will be focusing particularly on technology transfer, business introduction and sustainable development, the three aspects that have been identified earlier (as highlighted in Part I) as the core goals of the ATDCs.

SECTION II. CASE STUDY: ATDC IN MOZAMBIQUE

The China-Mozambique Agriculture Technology Demonstration Centre (‘the Mozambican ATDC’ or ‘the centre’ hereinafter) was one of the first 14 ATDCs that were put into practice (Table 1). It was launched by the then

⁶ Also see footnote 2.

Table 1 Chinese Agriculture Technology Demonstration Centres in Africa

No	Host Country	Chinese Implementing Agent(s)		Area (Ha)	Cooperation Fields
The 14 ATDCs that have been transferred to the host governments					
1	Benin	China National Agricultural Development Group	C: 2009–2010 T: 2010–2013 B: 2014–	51.6	Grains (e.g. maize), vegetables, livestock (e.g. chicken)
2	Cameroon	Shanxi province Shanxi State Farms and Land Reclamation Group [TS: Northwest Agriculture and Forestry Technology University]	C: 2009–2010 T: 2013–2016 B: 2016–	100	Rice
3	Republic of Congo	Chinese Academy of Tropical Agricultural Sciences	C: 2009–2011 T: 2012–2015 B: 2015–	59	Grains (e.g. maize, cassava), vegetables, livestock (e.g. chicken); fodder production and processing; agricultural mechanisation
4	Ethiopia	Guangxi province Guangxi Bagui Agricultural Science and Technology [TS: Guangxi Agricultural Vocational College]	C: 2010–2012 T: 2012–2015 B: 2015–	52	Grains, vegetables and livestock (e.g. pigs, cows and chicken)
5	Liberia	Hunan province Longping High-tech Agriculture	C: 2009–2010 T: 2010–2014 B: 2014–	32.6	Hybrid rice
6	Mozambique	Hubei province Lianfeng Overseas Agricultural Development	C: 2009–2010 T: 2012–2015 B: 2015–	52	Grains (e.g. maize)
7	Rwanda	Fujian province Fujian Agriculture and Forestry University	C: 2009–2011 T: 2011–2014 B: 2014–	22.6	Grains, mulberry plantation and silkworm keeping, jun-cao cultivation, water-conservancy
8	South Africa	China National Agricultural Development Group [TS: Chinese Academy of Fishery Sciences]	C: 2009–2011 T: 2014–2017 B: 2017–	0.47	Freshwater aquaculture
9	Sudan	Shandong province Shandong International Economic and Technical Cooperation Group [TS: Shandong Academy of Agricultural Sciences]	C: 2009–2011 T: 2012–2015 B: 2015–	65	Grains (e.g. wheat, maize), vegetables, cotton, peanuts; water-conservancy
10	Tanzania	Chongqing Municipality Chongqing Seed Group [TS: Chongqing Academy of Agricultural Sciences]	C: 2009–2010 T: 2011–2014 B: 2015–	62	Grains (e.g. rice, maize, soybeans), vegetables, flowers, livestock (e.g. chicken)
11	Togo	Jiangxi province Huachang International Economic and Technical Corporation	C: 2009–2011 T: 2012–2015 B: 2015–	10	Rice, maize
12	Uganda	Sichuan province HuaqiaoFenghuang Group	C: 2009–2010 T: 2011–2014 B: 2015–	0.3	Freshwater aquaculture
The 14 ATDCs that have been transferred to the host governments					
13	Zambia	Jilin province Jilin Agriculture University	C: 2010–2011 T: 2012–2015 B: 2015–	120	Grains (e.g. wheat, maize, soybeans), vegetables; agricultural mechanisation
14	Zimbabwe	Chinese Academy of Agricultural Mechanization Sciences (Menoble)	C: 2009–2011 T: 2012–2015 B: 2015–	109	Agricultural mechanisation and irrigation
The 9 ATDCs that are still under negotiation or construction					
15	Angola	Xinjiang Production and Construction Corps	MOU signed in 2012		
16	Central Africa Republic	TBC	MOU signed in 2012		
17	Cote d'Ivoire	TBC	Feasibility study conducted in 2012		
18	Democratic Republic of the Congo	ZTE Energy	Foundation ceremony held in 2012		
19	Equatorial Guinea	Ganliang	Feasibility study conducted in 2011		
20	Eritrea	Shanghai Foreign Economic and Technological Cooperation Group	Feasibility study conducted in 2012		
21	Malawi	China Africa Cotton	Foundation ceremony held in 2012		
22	Mali	Zijinhua	Agreement signed in 2012		
23	Mauritania	Mudanjiang Yanlinzhuan Yuan Technology	Foundation ceremony held in 2012		

Source: Made by the authors based on media reports and fieldwork. (C: Project Construction, T: Technology Cooperation, B: Business Operation, TS: Technical Support)

Chinese president Hu Jintao during his state visit to Mozambique in 2007. A Chinese delegation was then assigned by the Chinese MOA to conduct a feasibility study. With the assistance of the Ministério de Agricultura (MINAG) and Ministério de Ciência e Tecnologia (MCT) of Mozambique, both sides finally chose a location for the centre in Boane, 23km southeast of Maputo.

Meanwhile, the Chinese company, Lianfeng Overseas Agricultural Development Company ('Lianfeng' hereinafter) was selected as the implementing agent to take full charge of the centre's construction and management. Lianfeng is a provincial-level state farming company affiliated with the Bureau of State Farms and Land Reclamation (BSFLR) under the Hubei provincial government of China. The construction of the centre started in 2009 and finished in 2010. In July 2011, the ATDC was formally transferred to the Mozambican government. From April 2012, the centre entered into the Technical Cooperation Stage.

On the Mozambican side, MCT was the designated authority in charge of assisting in technical and managerial issues of the centre on the daily basis. In addition, the MINAG and IIAM, Instituto de Investigação Agrária de Mozambique, also played an assisting role (Interview, 14 Nov 2013).⁷ According to one performance evaluation conducted by the Chinese MOC in 2013, the Mozambican ATDC was ranked the first among 15 ATDCs that were in operation (Zhang and Zhang, 2015).

Technology Transfer

Agro-technology transfer occurred in two main areas, crop farming (e.g. rice, maize, vegetables) and animal husbandry (e.g. pig farming), which were decided based on the local conditions and bilateral negotiation (Interviews, 4 Nov 2013-b and 8 Nov 2013). Trainees were selected from the ten provinces across the country by the Mozambican MCT and MINAG⁸, and

⁷ For more detail on the mechanisms and problems regarding the government actors on the Mozambican side, see Chichava, Durán and Jiang, 2014.

⁸ Most of the trainees were selected by the local branches of the MCT and MINAG in different provinces from farmers who were registered with the local agricultural associations. In some other cases, independent farmers who were not registered may also be selected. There were no specific selection criteria, as responded by the interviewee, apart from the trainees' health conditions (Interview, 14 Nov 2013).

fell into three categories: farmers, technicians and officials. Among them, ordinary smallholder farmers were given the greatest emphasis: around 6-7 training sessions are arranged per year for them with each session lasting for 10 days. They were taught basic and practical farming techniques, which are easily implemented. For the technicians, 3 one-month training sessions were organised every year, with courses designed at a higher level covering rice breeding techniques and field management, amongst others. The centre also trained agricultural officials, at a lower frequency, with only three to five day sessions per year, which revolved mostly around management matters. In addition, the centre provided study and internship opportunities to college students, lasting from several weeks up to 6 months (Interviews, 18 Oct 2013, 4 Nov 2013-a, and 14 Nov 2013).

The training adopted a combined method of in-class teaching and field-work. However, courses remained flexible to counteract various challenges experienced in providing the training. One of the biggest challenges was the language barrier that existed between the Chinese agro-experts and the trainees. To overcome this, various alternative teaching methods had been developed, including providing bilingual (English/Portuguese) hand-outs and picture illustrations as well as involving the staff from MCT or IIAM in the teaching process. In addition, given that the farmers often had little agro-technology experience or low levels of education, the experts faced difficulties in explaining some of the agro-technologies, especially when accompanied by theoretical contents. To counter this, they had, for instance, re-adjusted the courses by reducing theoretical content while strengthening the in-field training (Interviews, 4 Nov 2013-a and 14 Nov 2013).

The funding for the training was mainly provided by the Chinese government, with the Mozambican government playing a minor role (e.g. the transportation and accommodation costs of the trainees) (Interview 14 Nov 2013). During the first two years of the technical cooperation stage, between 2012 and 2013, more than 700 Mozambican farmers, technicians and officials received training at the centre (Interview 18 Oct 2013). A formal follow-up or feedback mechanism did not exist, mainly due to the lack of finance (Interview, 14 Nov 2013). However, basic feedback from the farmer trainees showed that their production had increased and in some cases more

than doubled, due to the knowledge gained from the courses (Interviews, 4 Nov 2013-a and 14 Nov 2013).

The Mozambican ATDC also conducted basic research activities, primarily on seed testing, during the Technical Cooperation Stage. By 2013 the centre had tested more than 100 different crop varieties, both Chinese and local types (Interview, 8 Nov 2013). However, there were some disagreements around the seed testing. The Mozambican side hoped that the centre could test more local varieties (Interview, 14 Nov 2013; Chichava et al., 2014). On the other hand, the Chinese experts believed that their main responsibility was to introduce more good, high-yield Chinese varieties into the host country as the technology transfer objective suggests. Also, they expressed the difficulty to gain the local seeds given the fact that there were very few seed suppliers on the market, and they did not think their Mozambican partners had done enough in terms of providing, or facilitating the access to local varieties for testing (Interviews, 4 Nov 2013-a and 8 Nov 2013). Considering this, it did not seem to be adequate communication between the two sides around this issue.

Business introduction

The Mozambican ATDC had to a large extent achieved the business introduction objective. This can be seen from three main aspects. First, Lianfeng, the project-implementing company, started an agribusiness based on the centre. It developed crop and animal production by using the land of the centre (approximately 50 ha) and distributed the output into the local market. Lianfeng also identified seed production, both Chinese and Mozambican varieties, as a potential viable business opportunity due to the insufficient supply on the local market, as well as Lianfeng's expertise in seed production (Interviews, 18 Oct 2013 and 8 Nov 2013). In addition, the company have planned to provide paid agro-technical extension services once the three-year Technical Cooperation Stage is over⁹ (Interview, 18 Oct

⁹ However, Lianfeng clearly realised that, for that to happen, support from the Mozambican government, for example, in the form of giving agro-subsidies to the farmers, is required, as it is envisaged that these services would be uneconomical to the majority of the local farmers (Interview, 18 Oct 2013).

2013). Second, apart from the business enterprises based on the ATDC, Lianfeng also participated in a couple of agribusiness projects in other provinces of Mozambique, in collaboration with private agro-companies from Hubei.

Third, the Mozambican ATDC worked closely with other Chinese agro-companies and individuals, providing information and technical support that facilitates their investment. An individual agro-investor from Shandong province of China, for instance, visited the centre regularly to seek technical guidance on his 300 ha rice field near Maputo (Interviews, 29 Dec 2014-a and 14 Jan 2015). Wanbao, another Hubei company producing rice in the Gaza province of Mozambique, also gained from the centre's assistance, particularly in its initial period of investment, including such as the selection of the project site and the rice variety (Interview, 4 Nov 2013-b). As commented by the manager of a state-owned agricultural enterprise, 'If we find our investment works a bit easier here, this should be attributed to the ATDC' (Interview, 10 Jan 2015).

Sustainable development

The three-year Technical Cooperation Stage for the Mozambican ATDC was due to end in May 2015. Future development plans, specifically concerning the Business Operation Stage, for the centre had yet to be finalised between the two governments by the time the fieldwork was conducted in early 2015. The general feeling from the Chinese side, however, was that the Mozambican counterpart was probably not capable of operating the centre independently. A very likely scenario seemed to be that the Mozambican ATDC would have an extension of the Technical Cooperation Stage for another three years, as already requested by the Mozambican government. In this case, Lianfeng would continue to run and manage the centre (Interview 29 Dec 2014-b).

Financially, although the centre had been able to earn economic profits on its own terms and had a business expansion plan for the future, the profits which had been and would be gained from the commercial operation were not sufficient to cover the running costs of the centre. This is primarily

due to the limited resources the centre has – only around 50 hectares of land and a handful of staff (Interview 29 Dec 2014-b).

From the managerial point of view, although the Mozambican side had contributed greatly in the centre's training activities, they had not fully participated in the management process. Despite the fact that positions and offices were made available to the Mozambicans, they only worked part-time¹⁰ and, in fact, went to the centre only when they had specific problems that needed to be addressed. Partly in response to the 'lack of transparency' criticism by the Mozambican side (Interview, 14 Nov 2013), the Chinese had negotiated with the Mozambican government several times and finally managed to persuade them to dispatch at least three staff to the centre. However, due to a number of bureaucratic reasons, there were still no Mozambican staff working at the centre (Interview, 4 Nov 2013-a). The lack of local participation made it challenging for the Mozambican side to operate the centre independently.

SECTION III. CASE STUDY: ATDC IN SOUTH AFRICA

The China-South Africa Agriculture Technology Demonstration Centre ('the South African ATDC' or 'the centre' hereinafter) was also one of the first 14 ATDCs (Table 1). In 2007, the feasibility study was completed and the site of the centre was chosen by the South African government at Gariep Dam in the central province of the Free State. The construction of the centre commenced in 2009 and finished in 2011. In October 2013, the final exchange letter¹¹ was signed between the two sides, signifying all the preparation work for was complete (Harding, 2014). From February 2014, the ATDC formally entered the Technical Cooperation Stage (Interview, 29 Jan 2015).

China National Agricultural Development Corporation (CNADC) was the implementing agent designated by the Chinese government to man-

¹⁰ For they also need to work for the MCT.

¹¹ See footnote 4.

age the centre in the Technical Cooperation Stage¹². CNADC is a leading agro-company in China and one of the 112 Chinese central-level SOEs (State-owned Enterprises). More specifically, it is China Agriculture International Development Co Ltd. (CAIDC), one of CNADC's subsidiaries, that took the actual responsibility of running the centre. CAIDC also worked closely with FFRC, China Freshwater Fish Research Centre, with the latter dispatching aqua-experts and providing technical support to the centre.

On the South African side, the most relevant actors are the Free State Department of Agriculture and Rural Development (FSDARD), the South African National Department of Agriculture, and the Forestry and Fisheries (DAFF). During the Technical Cooperation Stage (now in execution), these actors play a supportive role. Once this stage ends in 2017, these actors are expected to run the centre independently.

Technology Transfer

The focus of the South African ATDC is on freshwater aquaculture. The FSDARD selected the trainees based on three categories: smallholder farmers, technicians or extension officers and government officials (Harding, 2014). During 2014, the first year of the Technical Cooperation Stage, nine training sessions were held, with 165 trainees attending the courses. The majority of the trainees (100) were smallholder farmers working for six government-backed fish farms in the Free State. The extension officers and technicians (65), from different districts of the Free State, were trained prior to the farmers. These officers had played an important role in assisting the Chinese experts with technology extension. In addition, the centre also formed a cooperation programme with the University of Free State, with the objective of giving lectures and providing training courses to college students (Interview, 29 Jan 2015).

The training courses combined both in-class teaching and fieldwork. In the case of the smallholder farmers, the experts also went to the fish farms to give assistance on practical issues, such as adjusting water temperature in the ponds and feeding schedule, or in the case of those government-backed

¹² The construction of the centre was contracted to another Chinese company.

farms, assisting in substantiating smallholder claims for improved technology to local government.

In general, based on the feedback from the smallholder farmers, the training provided was well received. Through it, for instance, recipients became aware of the importance of water temperature and quality, and the effects of these factors on the growth rate of the fish (Interview, 30 Jan 2015-c). However, the training process faced certain difficulties. First, the farmers did not have access to the technologies used in the centre, in their farms. Therefore, the techniques could not be implemented on their own fish farms. Second, there was a communication barrier between the Chinese aqua-experts and the local trainees. In addition, the experts had difficulties explaining the technicalities of fish farming. This was a challenge especially in the cases where the recipients had no previous experience or broad knowledge of fish farming.

The centre also begun with some preliminary research activities with the view of scaling up in 2015-16. Research topics ranged from feeds and nutrition, fish health and disease, water quality, breeding and genetics to production systems, market analysis and transportation. The plan was to incorporate local institutes, such as the University of Free State and the Agricultural Research Council of South Africa, into the research agenda, to provide them access to the facilities of the centre (Interview, 30 Jan 2015-b).

Business Introduction

Different from the general design for ATDCs by the Chinese government, the business operation was not one of the chief concerns for the centre in South Africa (Interview, 8 Mar 2015) because no business plans for the centre were developed in the exchange letters¹³. However, plans still needed to be developed in order to deal with the output of the centre. Considering this, few options were proposed by the South African ATDC. For instance, the fish could be sold on the open markets, but mainly to the Chinese com-

¹³ This may have something to do with the plan of transferring the management to South Africa after the Technical Cooperation Stage. Hence, there was no urgent need for the centre to develop commercial activities with an aim to finance itself in the long run.

munities in Bloemfontein, Johannesburg and Pretoria, given that Chinese citizens have the dietary habit of eating freshwater fish (Interview, 29 Jan 2015). Moreover, a private South African company had plans to open a fish processing plant near the centre, and the fish output from the ATDC and the government-backed fish farms could then feed into the fish processing plant. The output from the plant could supply the hospitals, schools and police stations within the country or be exported overseas, particularly to China (Harding, 2014). Although there was not an explicit business plan based on the centre itself, the Chinese staff, from the CAIDC, had been collecting information on the local investment environment and keeping their Beijing-based headquarter regularly updated (Interview, 8 Mar 2015), which may help smooth the way for their future investment in South Africa.

Sustainable Development

There was not yet a final agreement as to the future development after the three-year technical cooperation by early 2015, but according to the preliminary exchange letters, the ATDC will be handed over to the FSDARD in February 2017. The management team from the CAIDC will be replaced by the South Africans, while the Chinese technical team may stay if requested by the South African side until February 2020. Financially, the FSDARD will be responsible for all costs relating to the centre once Technical Cooperation Stage ends (South African ATDC, 2013).

The centre had five full-time positions for South Africans. At least two of these local staff, one research assistant and one freshwater scientist, lived in the centre and worked closely with the Chinese concerning both administrative and technical issues. The Chinese also kept in contact with several government officials from the FSAARD for the daily operation of the centre (Interview, 30 Jan 2015-a). This should help to some extent assure the management and technical sustainability of the centre after the handover. However, as seen in Table 2, all major positions were filled by the Chinese, with the South African staff playing a supportive role. Moreover, the majority of the staff were yet to be employed permanently at the centre by the time of

the fieldwork in early 2015. These aspects represented a relevant risk for the managerial sustainability of the centre.

Table 2 Governance Structure for the South African ATDC

Human Resources	Nationality	Responsibilities
Project Manager	Chinese	Overall operation and management of the Centre
Deputy Project Manager	South African	Manage and arrange the facility, strategic planning, assistance to project manager
Technology Officer	Chinese	Oversee hatchery related issues: in charge of fry production, technology demonstration and personnel training
Deputy Technology Officer	South African	Assist with hatchery related activities
Financial Officer	Chinese	Financial planning and monitoring of expenses
Administrative Officer	South African	Ensure all administrative work is completed

Source: Made by authors from interviews.

SECTION IV. INTEGRATED ANALYSIS

Technology Transfer

Overall, the Chinese agro-technology transfer through the ATDCs proves to be beneficial to the local communities in the host countries. The training courses were designed by the Chinese agro-experts according to the specific needs of the different types of trainees, and tailored to the actual abilities of the latter due to the knowledge gap between the trainers and trainees. Moreover, the participation of the local partners helped overcome language barrier limitations, and improved the effects of the technology transfer. Also, from the feedback perspective, the farmer trainees, for instance, confirmed that the Chinese agro-techniques were useful and could

help increase the outputs, as seen in both the cases of Mozambique and South Africa.

Nevertheless, the impacts of the technology transfer are to some extent limited, mainly for three reasons. The first problem concerns the design of the training model. In both cases, the majority of the trainees are the smallholder farmers. This is surely sensible in that by transferring farming techniques to the actual agricultural producers, it would have the most direct results. However, the potential benefits are reduced, both in quality and quantity terms, as the technology transfer is largely not connected to the host country's agro-technology extension system. Indeed, by training more local agro-extension officers, they could better digest the Chinese techniques given their professional backgrounds and have a greater impact on disseminating the information to farmers due to the elimination of communication barriers (between the extension officers and local farmers) and the links to their broader extension networks, including follow-up extension and support services.

In the case of South Africa, there were a handful of local extension officers and technicians trained at the centre who turned out to play a positive role in coordinating the technology transfer between the Chinese and local farmers. In contrast, in Mozambique, where a long-standing national agricultural extension system does exist, the Chinese ATDC did not seem to be linked to an extension system in any meaningful way. This is because no extension officers had been involved in the training (Interview, 14 Nov 2013), and even the 'agro-technicians' who received the training were mostly office staff without a mandate to work in the fields (Interview, 18 Oct 2013). The detachment with the country's extension systems implies that the effects the centre has might be only moderate and less durable, despite the fact that hundreds of small farmers were being trained each year.

Another problem concerns the post-training application. Even if the technology transfer process per se could be successful, it may not necessarily change the livelihood of the farmers, unless they have enabling environment whereby they can put the techniques into application. In Mozambique, although we did not manage to interview the farmer trainees of the ATDC (as they were scattered all over the country), a reference example of another

er Chinese firm engaged in transferring Chinese rice-farming techniques to the locals, can be provided. In this case, the techniques taught by the Chinese experts could not be implemented due to a lack of tools and irrigation equipment, thus the training courses had no sustainable effects on the farmers' livelihood (Interview, 18 Nov 2013). Similarly, in the case of South Africa, the heating systems on the six government-backed fish farms, which were fundamental to apply the techniques that were taught, were left broken for months, causing stunted growth of the fish and reduced profits (Interview, 30 Jan 2015-c).

A potential challenge also lies in the different farming cultures. It takes time for the African smallholder farmers to learn and get used to the Chinese/Asian way of intensive cultivation that emanates from the land constraints in the region (Interview, 18 Oct 2013). Furthermore, it could be difficult for the African farmers, who are used to an extensive way of farming, to stick to the more technically demanding and more time-consuming Chinese techniques on their own, reducing the potential effects of the technology transfer¹⁴.

Although the 'research' aspect of the technology transfer is not treated as the main focus of the ATDCs, there are still some problems worth noting. Take the seed testing for example, while the selected, more productive seed varieties would be able to increase the outputs, the suitability of those varieties to the local taste seemed to be neglected. This is the case in both ATDCs: in Mozambique where the seed testing was largely restricted to Chinese varieties due to the unavailability of local seeds, and in the South African case where the market for freshwater fish was relatively small and specialized.

Business Introduction

As seen in the cases of Mozambique and South Africa, apart from performing the core function of agro-technology transfer, both centres had started or planned to start market-oriented production activities. This can be seen as a form of business introduction, although the primary pur-

¹⁴ The dilapidation of the Chinese-aided farms in Sierra Leone during the 1970-80s provides a vivid illustration to this point (Bräutigam, 2009: 238).

pose of the commercialised operation of the centre was to maintain the project sustainability. More essentially, both Chinese companies, Lianfeng and CAIDC, had either set up separate agribusinesses or had been actively seeking external agro-investment opportunities by using the ATDC project as a springboard.

Indeed, available data suggests that at least eight out of the first batch of 14 Chinese-aided ATDCs in Africa, specifically in Uganda, Zambia, Sudan, Mozambique, Cameroon, Liberia, Malawi and Benin, have successfully established their independent agribusiness outside the ATDCs (Table 1). Furthermore, the Mozambican case has demonstrated a greater role of the ATDC as a business platform through providing information and technical support to Chinese companies and individuals, thus facilitating their local investment.

Considering the difficulties of first time entry into a foreign market, the ATDC project does seem to make it easier for the companies to enter and invest in the host countries, with the assistance and facilitation from both the Chinese and host country governments. It is also relatively easier for these companies to start separate agribusinesses due to their identity as the implementing agents for a government aid project, for instance, in terms of land lease or tax exemption. Moreover, it appears that the participation or intervention of the Chinese government agency could make a difference as to how much an ATDC can exert its influence. The provincial government of Hubei, for example, has definitely played a critical role in magnifying the platform function of the Mozambican ATDC by establishing contacts and forging cooperation between the centre and other companies from Hubei province.

Sustainable Development

The sustainability issue derives from China's decades-long practice of agricultural aid on the continent. As has been widely observed by practitioners and scholars (Shi 1989; Cai 1992; Sun 1996; Zhou and Wang 1997; Yun 2000; Bräutigam, 2009), almost all the Chinese agro-aid projects cannot escape the following cycle: no matter how successful the initial period of

the project proved to be, once the Chinese experts left, the project would soon fall into disrepair¹⁵. In most cases, the reason for this resides in that the aid-recipient countries lacked the financial, managerial and technical capability to keep the projects going on their own (Shi 1989; Cai 1992; Sun 1996; Zhou and Wang 1997).

Against this background, the sustainability issue was brought to the fore in the designing process of the ATDCs (Xu and Qin 2011; Table 3). The emphasis on sustainability can be seen from the performance evaluation system of the ATDCs, in which the planning and realisation of sustainable development occupies 45% of the total scores, more than any other indicators.

Table 3 Evaluation Indicators of the ATDC

Diplomatic Influence	Improvement of the Agricultural Development and Food Security of the Host Country	Promotion of China's "Agriculture Going-out and Inviting-in" Policy	Sustainable Development
15%	25%	15%	45%

Source: Made by the authors based on the Evaluation Plan of the ATDC (MOC and MOA 2012).

The prescription provided by the Chinese government to ensure a sustainable development of the ATDCs is to incorporate company actors and to run the Centres as a business (see 'Mechanisms' in Part I). Financially, by developing a market-oriented production, based on the ATDCs, it is expected that the profits earned could be used to finance the daily operations, including the realisation of the public-interest functions. In addition, the existence of the Chinese company would help maintain the managerial and technical sustainability. From what we have seen from the practice, however, this plan is not always achievable.

As shown in the Mozambican case, although it did make some business attempts, the centre was still not able to achieve financial independence simply by selling the agro-products. This is despite the fact that the production

¹⁵ Few exceptions exist, for instance, in Mali and Sierra Leone, where the Chinese-aided agro-projects during the early years are still operational now. However, in these two countries, the projects have been managed by the Chinese whereas the host governments act only as shareholders (Jiang, 2016).

costs had been lowered since the land, water and electricity were provided by the host country during the Technical Cooperation Stage (Interview, 14 Nov 2013). In fact, most of the ATDCs are having the similar constraints: limited land, capital and human resources. Therefore, it does not seem very likely that the ATDCs will be able to sustain themselves financially through business operation, particularly considering the current production scale.

In order to achieve financial independence, an expansion of investment inputs and thus production scale is necessary, either based on the Centre or a separate business outside the Centre. This, however, may face challenges on two fronts.

First, how likely is it that the bolt-on investment will be successful? The question then is translated into another issue about the feasibility and profitability of conducting agribusiness in Africa. The thorniest problem affecting Chinese agro-investors seems to be the financing of investment, given their usually limited self-owned capital and difficulties to raise money in China (Jiang, 2015). Even if they could manage to raise the required money, they would encounter a range of practical problems in the agro-investment process in Africa, such as land ownership, labour regulations, market channels, government efficiencies, and natural disasters, among others. According to existing and potential Chinese agro-investors in Mozambique, the difficulties in operating in Africa were far beyond their expectations before they came to the continent, and none of the existing investors have managed to make any profits to date after years of operation. This may cast some doubts on the prospect of the ATDCs' commercial development in the host countries.

Second, even if the company could make good profits, to what extent would the company support the public-interest functions of the Centre financially? Although it is in essence the application of the PPP model in foreign aid area, or specifically government-company cooperation in the case of the Mozambique and South Africa ATDC, there has not been any concrete agreement between the Chinese government and companies, which clearly specifies each other's rights and obligations. It is thus unrealistic to expect the company actors to willingly and automatically fulfil the general public-interest functions of the ATDCs, especially given the generally

low profit margins. This leaves the situation uncertain as to whether the public-interest functions of the ATDCs would be fully performed in the Business Operation Stage as the designers hoped; or, whether it is likely that these aid-nature functions will gradually diminish while the ATDCs themselves transform into a pure commercial project in the future.

What could be done, then, if the original plan does not seem to be working? Potentially, the Chinese government could continue to fund the project, although it is obviously against the initial intentions of the ATDC design. Alternatively, a co-financing model could be adopted, whereby the Chinese government will still provide aid grants while the company makes up the rest through business expansion. The Mozambican ATDC, for instance, seems likely to take this solution (Interview, 29 Dec 2014-b).

In terms of managerial and technical sustainability, while the immediate danger of project failure does seem to be mitigated with the continuing stay of the Chinese team, potential problems are still visible. For instance, the lack of effective participation of the local partners in the daily management of the ATDCs (as seen in the Mozambican case), compounded by the typical Chinese-dominated structure of management (as seen in the South African case), generates the risk of leaving the local partners incapable of operating the Centres independently. Technically, the overwhelmingly farmer-centred training model also makes it less likely for the local agro-technicians to conduct the extension of Chinese farming techniques on their own.

SECTION V: CONCLUSION AND POLICY RECOMMENDATIONS

This paper has sought to investigate the objectives, modalities (actors and mechanisms) and actual operations of Chinese Agriculture Technology Demonstration Centres in Africa. Based on the cases of Mozambique and South Africa, the main findings are the following:

(1) The agro-technology transfer is beneficial but to a limited extent, which can be seen, for instance, in the training model, post-training appli-

cation and different farming cultures. (2) The commercial aim of business introduction has been largely achieved: A number of Chinese agro-firms, predominantly the project-implementing companies, have made use of the ATDCs as an investment platform into African countries and initiated/planned their agribusiness either based on or separate from the Centres. (3) Project sustainability is still a concern within the renewed aid structure. The ATDCs do not seem capable of achieving financial independence once the start-up capital is depleted. While the managerial and technical sustainability seems relatively less urgent, there is still the potential risk of handover failure if the Chinese implementing agents pull out prematurely.

The problems observed above can be largely explained by two aspects. First, the drawbacks of the ATDCs stem from a policy design point of view. For instance, while the multi-objectives (diplomatic/commercial/sustainable) of the ATDCs call for a more detailed and delicately designed action plan, the existing policy (e.g. ATDC Guidance) is deficient in specificity. Particularly pertinent to the point is the design of the Business Operation Stage, which is supposed to be the most innovative part of this new ATDC project but in reality has been full of ambiguities and uncertainties. In addition, full consideration of local conditions and adequate feasibility studies seem to be lacking in certain instances, as seen by the post-training application and farming cultural difference problems as well as the economically unviable prospect of the Business Operation Stage. Moreover, the government-company cooperation model remains unstructured, with the responsibilities and rights of the stakeholders largely unclear and thus a lack of effective control of the state over the companies in implementing a government aid project.

Second, bilateral interactions, both in terms of project planning and implementation, between the Chinese government/company actors and their African counterparts seems to be ineffective. It is almost impossible to devise a perfect policy before implementation; and even if it is possible, a given policy would still need to be adapted to the complex and ever-changing implementation environments – and this is where bilateral interactions may play a significant role. The detachment of the technology transfer from the host countries' broader extension systems and the seed-variety selection

issue, among others, all point to a lack of effective communications between the two sides. The sustainability problem can also be partially attributed to the lack of adequate participation of the local actors in the daily operation as well as the deficiency of joint efforts between the two governments in making plans for the ATDCs' future development.

Based on the observations and analyses above, a few policy recommendations for improving the ATDC performances could be provided. (1) The Chinese government may need to develop a more detailed and feasible action plans for the ATDCs' Business Operation Stage. It would be particularly helpful to examine a number of ATDCs that have already made their initial business attempts during the Technical Cooperation Stage, specifying the objective constraints and learning from the previous experiences. (2) A more solid arrangement as to the government-company cooperation model needs to be initiated, with a view to institutionalizing the companies' obligations in delivering government aid projects as well as the supportive measures that are meant to be taken by the government. (3) All through the planning and implementation of the ATDC project the Chinese government should encourage an active participation of their local African counterparts in the process, and make concrete measures to facilitate, for instance, a gradual change from the Chinese-dominated management model into a more co-operative or localized management model.

There are several limitations to this research. First, the comparative cases share the Chinese as instigating agent but the social and legal environments in Mozambique and South Africa are distinctively different; and while we account implicitly for this, we did not focus exclusively on these factors. In addition, we have attempted to draw some general trends from our case studies, but surely, only two cases cannot cover the complex dynamics of the Chinese ATDCs on the continent. While we did reference to other ATDCs and conduct preliminary research on them¹⁶, the depth of that research is limited and thus we may have omitted important aspects – merits or demerits – of the ATDCs. The authors have tried to continue and improve the research by incorporating more empirical cases, and also

¹⁶ Mostly based on secondary data and a few of them on informal interviews.

linking it closer to the theoretical debates in the circle of Public Policy and International Development.

In sum, the ATDC project has demonstrated a real effort of the Chinese government trying to deliver its agro-aid pledges in Africa in the FOCAC era (since the 2000s), and with a particular concern as to avoiding problems experienced in China's earlier agro-aid practice (1960-90s). Yet, given the difficulties identified in this paper, it remains to be seen to what extent this new programme could be able to overcome 'old problems' and thus virtually benefit the recipient countries. It's a promising sign for China, as an emerging power/donor, to start engaging with international development in a more active manner, but much still needs to be done to make this 'new business of development' work and possibly lead to a true win-win scenario.

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White Zimbabwe farmers and land grabbing in Shonga of Central Nigeria: development or dispossession?

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