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YIDA JIAO
Visiting Research fellow

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Yida Jiao

More than twenty Agricultural Technology Demonstration Centers (ATDCs), funded by the Chinese government, are spread across the African continent to share advanced Chinese farming technology and experience since 2006 (Jiang 2016; Mgendi 2021; Zhang 2019). This model tries to surpass previous failures of unsustainability through combining technology transfer with commercial incentive, but still accompany with its own problems. Agricultural investment doesn't always involve the transfer of agricultural technologies. However, in many cases, including Chinese overseas agricultural investment, technology transfer accompanies investment since Foreign Direct Investment (FDI) entails the movement of capital, information, people, their knowledge, skills, and experience. Contemporary China's agricultural technology cooperation involves utilizing technology transfer to drive commercial investment. Chinese central authorities employ two primary approaches to achieve this mode. The first approach is inviting foreigners to come to China and attend training courses, and the second approach is sending Chinese actors abroad to carry out technology cooperation programs. I will discuss the second approach in detail later through the ATDC model in Africa. Tugendhat and Alemu provide a thorough account of how Chinese agricultural training courses for African officials work. These courses and tourism successfully convey China's image of modernization and soft power, and Chinese agricultural machinery companies distribute marketing materials and USB sticks after classes. If the host institutions are private groups, training courses for senior-level officials focus on commercial opportunities for selling goods connected with the course. However, there is scant evidence that this model influences the participants' technology practices back home (Tugendhat 2016).

The ATDC model receives more attention from researchers, but it is only the latest model of China's engagement in African agriculture. Since the 1960s, agricultural technical assistance has played an essential role in China's overall aid in Africa, taking hybrid forms in the Mao era, such as dispatching experts to provide training in rice, tea, and sugarcane cultivation, building state farms with processing capacities, constructing irrigation projects, and establishing demonstration farms that introduce new technologies for plant breeding and management (Alden 2013; Baker 1985; Brautigam 2009; Scoones 2013). During this period, China never directly exported its revolutionary socialist model (Brautigam 1993). These aids received praise for achieving increased yields with low-cost techniques, but they had problems of poor integration into national agricultural services, heavy dependence on Chinese technicians' supervision, and provision of inputs from China (Amanor 2016; Brautigam 2009). Tang traces the changing forms of China's

agricultural aid in Africa and asserts that these transitions correspond to China's marketization states and its experiences of managing agriculture. During the planned economy era, assistance was politically-centered, and expenses were neglected, leading to unsustainability. When family contract farming was popularized in China in the 1980s, aid in Africa also encouraged local farmers to farm and contract by themselves with Chinese assistance. Now that China's agriculture is approaching industrialization and capitalization, technology training platforms such as the ATDC are supposed to be integrated with commercial models to address the previous problem of unsustainability (Tang 2013).

The ATDC model, as a specific form of Chinese overseas agricultural investment, is a repair of the previous aid framework (Nalwimba 2019), but it incurs controversial effects because of the inherent hardship of technology transfer and its salient internal contradiction of aid and business. The ATDC model was first proposed at the Beijing Summit of the 3rd FOCAC (Forum on China-African Cooperation) in 2006, and by 2012 there were at least 23 ATDCs across the continent (Jiang 2016). The three main functions of these ATDCs are experimental studies, technology training, and promotion through demonstration (Zhang 2019). According to the official narrative, the ADTC project's mission is to "support African countries to build up an agricultural technology extension system, to promote Africa's agricultural development, and to strengthen their food security" (Tang 2018). The official discourse of boosting productivity and improving food security of the beneficiary countries through sharing the experience of the technology-driven modernization in China's agriculture (Chichava 2013; Makundi 2017) is supplemented by the diplomatic goals of promoting bilateral relations and manifesting China's soft power, as well as the economic consideration of providing a platform for Chinese companies to develop in Africa (Jiang 2016). Someone further argues that China's long tradition of intensive small-scale farming, and its many similarities with other developing countries such as technological capacity, agro-ecological conditions, and recent experiences of development make its agricultural technology and management method more in line with the real needs of African countries (Buckley 2013; Jiang 2019).

Here I will first introduce how the ATDC works, and the ideologies buttressing it, and then show the controversies around this model. After the bilateral negotiations between the two central governments, the Ministry of Commerce and Ministry of Agriculture of China will assign the execution works to provincial governments. The provincial government will initiate a bidding process to select an enterprise to run the ATDC. This "Public-Private Partnership (PPP)" model doesn't repel private companies, but it must have strong financial, managerial, and technological competency, so it's usually national or provincial leading agro-companies that win the bidding. Jiang has a detailed description of the three operational stages of the ATDC. The first stage is the project construction, which usually takes one year and is funded with 40 million RMB (around $5.7 million) by the Chinese central government. The Chinese side carries on the construction of infrastructure and supplies agro-equipment and materials, while the host countries provide land, electricity, and water. After the completion of construction, the center will transfer to the host government and become state assets. Then follows the second stage, a three-year technical cooperation stage where the Chinese government covers most expenses too. A

technical team is assigned to the center to perform four "public interest functions" of agro-technology research, demonstration and extension, training, and display. Many executive enterprises also set up small-scale agribusinesses in the ATDC in preparation for the third stage, the business operation stage. The ATDC in this stage is supposed to establish a "market-oriented, integrated agribusiness value chain" while expanding the diversify the original functions (Jiang 2016). The types of research and extension are heavily related to the professions of the Chinese implementing agents, which could be seen in the table below (Jiang 2016). In Zimbabwe, the Chinese Academy of Agricultural Mechanization Sciences imports agricultural machines from China for farming operations in the field or simply for display (Tang 2018). In Tanzania, the Chongqing Seed Group carries out experiments on high-yielding rice varieties and small-scale vegetable species planting, and they also cooperate with the seeding laboratory of the local university (Zhang 2019). However, there are discrepancies about the domains of research. For example, on the Mozambican side, they wish the ATDC could test more local varieties of maize, but Chinese experts insist on introducing high-yield Chinese varieties (Jiang 2016). Diverse forms of training, such as presentations, guided tours, video-teaching, and hands-on teaching, are applied to mainly three groups of trainees: farmers, agricultural officials and technicians, and students and researchers (Jiang 2016; Makundi 2017; Zhang 2019). The Chinese state sets 120 trainees per year as the minimum number and requests mandatory submission of monthly and annual reports as monitoring and evaluation procedures (Tang 2018).

Some scholars realize that the ways of practice and ideologies of the ATDC are deeply rooted in China's own experiences. Qi sees the mark of extension work in China in the organization arrangement and management regulations of the ATDC in Ethiopia (Qi 2015). "Experimentalism" and anti-universalism are another dimension that can be seen in the state leader Deng's words to Ghana's president Rawlings in 1985: "Please don't copy our model. If there is any experience on our part, it is to formulate policies in light of one's own national conditions" (Alden 2007), and the reform era proverb of "crossing the river by touching stones" (Nalwimba 2019). This development philosophy is embodied in the ATDC's basic functions of research, experiment, and extension. Buckley and Xu emphasize the technocratic rationality and technological optimism of Chinese experts who try to combine "hard" technologies of irrigation, varieties, and equipment with "soft" technologies of capacity building and skills transfer, which are apparently from China's own routes of using technology and market for development (Buckley 2013; Xu 2016). Tang further illustrates this point through comparison with the western aid model, whose workers have little practical agricultural knowledge, but the institution would pay a lot to international and domestic consultants and experts. She also suggests that the dual functions of political and commercial task of the implementing agents are aligned with the Chinese management framework of "one identical institution under two different names," which are the party and the government institutions. Here in ATDC, the agents use the center's name for public service functions and the company's name for commercial activities (Tang 2018).

The effects of the ATDC model are disputed, and much research depicts a complicated scene of the challenges and difficulties of technology transfer. Some studies show the

positive influences on yield increase and trainees' productive role brought by Chinese agricultural technology and training (Jiang 2016; Makundi 2017; Mukwereza 2013; Olasehinde 2023). Others question the effectiveness of technology transfer from various standpoints, such as Chinese workers not understanding Africa (Buckley 2013), new technology being resisted by agricultural producers (Mgendi 2019), or different outcomes resulting from access to irrigation (Mgendi 2021). Hurdles for technology transfer are multitudinous. Technology requires corresponding infrastructure and facilities, so advanced technologies such as "cropping+livestock+bio-gas, " mechanization, plastic mulching cultivation, industrial seeding, rational intensive planting and fertilizing, cannot find adequate irrigation and electricity systems, and more importantly, sustainable funding (Jiang 2016; Makundi 2017; Zhang 2019). Thus, the incompatibility with the local environment also comes from the inappropriate assumption that locals need the best (Qi 2015), as well as the inadaptability of Chinese varieties (Zhang 2019). Scholars also suspect whether the Chinese-style labor-intensive farming techniques, which are time-consuming and technique-demanding, are suitable for many African countryside areas where land is abundant but labor is scarce (Jiang 2016; Lei 2017). Even if the demand for Chinese techniques exists, patent protection of Chinese hybrid rice seed hinders collaborative research satisfying local demands (Tang 2013; Makundi 2017). The Chinese side's inability to understand the socio-cultural dimensions of local farming results in resentment (Nalwimba 2019) and even outright antagonism with local partners working for ATDC. Unable to fulfill technology with direct trainees, with the help of a local Senegalese NGO, the Chinese experts conduct training and demonstration for smallholder farmers outside the framework and achieve success (Buckley 2013).

Another crucial controversy of the ATDC is its blurring of aid and commerce. Sustainability is the justification widely used to argue for the introduction of profit-oriented companies in the operation of this project. Previous agricultural aid programs are characterized as an unsustainable vicious cycle of "build-transfer-suspend-reinvest-retransfer-resuspend" (Tang 2018) because once the Chinese experts left, the host countries usually lacked the financial, managerial, and technical resources to sustain the project (Jiang 2016). Combining aid and cooperation operation is supposed to generate profit for the persistent functioning of the center and even embed in the local economy to upgrade its industrial system, boost productivity, and create employment (Tang 2013). The commercial aspect of the ATDC casts the extension and training into the position of an instrument for commodity promotion, sales of agricultural machinery, inputs, and products (Makundi 2017). ATDC, as a platform, becomes a steppingstone for Chinese firms to comprehend the local market and formulate a systematic business plan (Zhang 2019) with a three-year buffer period funded by the state. The directors also have an incentive to earn profit because their bonuses and subsidies are coupled with business performance. However, some young Chinese staff would resist the center's leader's keenness on profit because they want to be professional aid workers (Tang 2018). This ambiguous identity also gets critiques from the African side, as the commercially-driven activities would engender problems. In Mozambique, agricultural extension services are usually provided for free by the state or international NGOs, but the ATDC charges fees (Chichava 2013). The commercial-aid model generates misperceptions and tensions, and the "substantial autonomy" of Chinese companies makes it difficult for host countries to

estimate the aid aspect (Nalwimba, 2019). Amanor argues that this model, in practice, still "operates within the dominant frameworks of global agribusiness and capital accumulation" (Amanor, 2016). Although the Chinese government hopes to help Chinese companies explore the African market, many countries explicitly express that they will take over the center and run it themselves after the three-year demonstration period (Tang, 2013).

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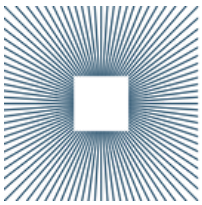
Institute for Advanced International Studies
at the University of World Economy and Diplomacy
54, Mustakillik Avenue
Tashkent 100007, Uzbekistan

+998 71 267 58 44
info@iais.uz
www.iais.uz



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