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Science, Technology, and the Politics of Knowledge: The Case of China's Agricultural Technology Demonstration Centers in Africa

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Summary. — Agricultural Technology Demonstration Centre (ATDC) has been considered as an alternative model to pursue sustainability of Chinese foreign aid to African countries in the new era. This paper attempts to examine the ATDC scheme, particularly focus on the knowledge construction at macro level of design and the knowledge encounter at micro level of daily operation based on the case studies in Tanzania, Ethiopia, Zimbabwe, and Mozambique. Our study finds multiple facets of the ATDC, i.e., the cleavage between the macro-level of policy design and micro level of implementation realities; the interplay between knowledge and politics, and appearance of possible alternative development pathways stimulated by ATDCs in African countries. The paper argues that even though the ATDC is a technology-centered scheme, it is inevitably a social and political process in implementation, resulting in the discontinuity of the policy results. With a whole set of ideas and imaginaries being delivered, frustrated, and negotiated, the ATDC creates a very different vision to the established CG system, or the western bilateral aid programs. As an embodiment of a "traveling technocratic rationality", the ATDCs are important sites for negotiations over knowledge and politics, and the meanings of aid, investment, and development, as part of the wider playing out of China's engagement in Africa.

Key words — aid, knowledge, encounter, technology, China, Africa

1. INTRODUCTION

China's increasing engagement in Africa has been widely commented on (Alden, 2013; Alden & Large, 2010; Brautigam, 2009, 2011; Kragelund, 2008; Monson, 2009; Reilly, 2012; Tan-Mullins, Mohan, & Power, 2010). Agriculture is a significant part of China's aid and investment program, with this sector highlighted as a priority (The State Council of China & Trade Cooperation, 2013). A central feature of China's agricultural engagement has been to undertake the transfer of technology, particularly through the 23 Agricultural Technology Demonstration Centers (ATDCs) across Africa. The ATDC has been developed as a new model of China's official agricultural technology aid to African countries since 2006. A central feature is to combine a business operation with the aid-funded project to ensure financial sustainability after the three-year technical cooperation period.

This paper focuses on the experience of these Centers as a lens through which to look at Chinese agricultural cooperation in Africa. Unlike other studies on China's agricultural cooperation that have focused on China's strategic objectives (Bautigam & Zhang, 2013; Hairong & Sautman, 2010; Ukaejiofo, 2014), this paper emphasizes the actual practice of implementation, and the dilemmas, challenges, and negotiations involved. The paper examines how certain narratives and perceptions of development and technology transfer are constructed, and how these emerge from a particular historical context in China. The paper also delves into the day-to-day experiences of project implementation, through the experiences—and what Long (2001, p. 243) terms "interface encounters"—of Chinese experts, their African counterparts and farmers involved in demonstration and training activities.

By switching from broad policy assessments to encounters, practices, and negotiations of knowledge (Lewis & Mosse, 2006a; Mosse, 2005), the paper contextualizes the politics of Chinese development cooperation, highlighting the dilemmas and pitfalls confronted. The paper is based on empirical data collected in Tanzania, Ethiopia, Zimbabwe, and Mozambique, involving extended stays in the Centers and close ethnographic observation of their operations during 2013–14.

The article begins by reviewing China's agricultural science and technology (S&T) regime; and then reviews how an S&T-centered ideology and the corresponding modalities have been embedded into the historical evolution of China's agricultural aid to African countries. We present narratives surrounding the construction of the ATDCs, and also reveal the politics of technology transfer in ATDC operations. We then empirically analyze three aspects of the knowledge encounter between Chinese and African. The paper examines how and why the Chinese perceptions of agriculture and technology, demonstration and extension, as well as aid and development, are understood, practiced, and negotiated with African colleagues during the daily operation of ATDCs. We conclude by highlighting the implications of our observations for Chinese technology transfer in Africa.

2. THE AGRICULTURAL S&T REGIME IN CHINA

China has a long history of promoting agricultural development through technical extension based on small farmers'

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"trial-and-error" experiences. Agricultural technology has been central to China's empire and nation building. "Farmer" was considered second only to "scholar" within the traditional Chinese social hierarchy, ever since the Spring and Autumn and Warring States Period (770—220 B.C.). Since the Han Dynasty (202—220 B.C.), hunger has been recognized as a cause of political turbulence, and the motto "food is the paramount necessity of the people" (*min yi shi wei tian* 民以食为天) has been taken as one of the major principles for governance (Wu & Zheng, 2004, p.79).

The first modern agricultural experimental farm was initiated in 1906. Soon afterward, each province set up its agricultural experiment farms for demonstrating and extending advanced "research-based" technologies (Yue, 1989, p. 425). Both Sun Yat-sen, the founder of the republic, and later Mao Zedong, paid high attention to food security through modern agricultural technology and firmly concluded that the fundamental reality of China is "a large population with relatively little (arable) land" (*ren duo di shao*人多地少). The most promising solution should therefore be to rely on modern technology. The "Eight-Word Agricultural Constitution" (*nongye bazi xianfa*农业八字宪法) was hence promoted by Mao via a strong central and command planning system (Jiang, 2013; Xu, 2004, p. 28).

An ideology of technocratic rationality, centered on technology-driven modernization has been central to China's policy stance from the beginning of the twentieth century, despite regime changes. It was reinforced at the end of the 1970s in Deng's era with the introduction of the private sector to diversify the public-financed S&T system. Reversing the bias against intellectuals during the Cultural Revolution period (1966–76), Deng Xiaoping enhanced the social and political status of intellectuals to pave the way for market-oriented reforms and a knowledge-based economy. He emphasized the key importance of S&T in pursuing agricultural development and national economic productivity: "the development of agriculture relies firstly on policy, and secondly on S&T. . ., but the solutions ultimately rely on science" (Deng, 1982, p. 17).

Accordingly, China has invested vigorously in an agricultural research and extension system, resulting in the biggest research system in the world in terms of staff members (Huang & Hu, 2004). It is highly concentrated on the high-productivity enhancement of staple-food varieties, including hybrid rice and farming instruments (Zhu, 1997).

China's agricultural development can thus be seen as a process of expanding technocratic rationality. The success of China's agriculture, often symbolized by feeding more than 20% of world population with less than 10% of the world's arable land and a quarter of its per-capita water availability (Huang & Hu, 2004), is perceived as the result of technology change by both politicians and the public.

This dominant approach emphasizes the central role of state-backed science, technology, and innovation in promoting productivity enhancement and thus economic growth. Technical solutions are deemed to be the ideal entry point to stimulate a national development agenda, supported by a state-led apparatus, which is central to nation building and developing a common national identity. Today China's S&T system—in agriculture as in other areas—is part of an increasingly diversified and dynamic system, especially following the introduction of market-oriented reforms. Given this rich and complex history, a key question is how this technocratic rationality, with its deeply embedded history and strong political associations, travel to Africa via China-Africa agricultural cooperation?

3. HISTORICAL EVOLUTION OF CHINA'S AGRICULTURAL AID TO AFRICA

China's agricultural aid to Africa was initiated at the end of the 1950s, and intensified during the 1970s and 1980s due to diplomatic competition with Taiwan (Amanor & Chichava, 2016; Brautigam & Tang, 2009). The Chinese government realized the critical role played by agricultural technical aid in reviving China-African friendship, particularly in those countries that had received Taiwanese aid, as well as increasing global impacts more broadly (Jiang, 2013).

In 1971, China started to expand its aid in Africa to 18 countries and dispatched agricultural experts (Tang & Li, 2014). The technical aid aimed to help African countries to achieve "self-reliance" (*duli zizhu* 独立自主) and solve food insecurity problems. The "*Eight-Word Agricultural Constitution*" and collective farming, "*Dazhai (*大寨*)*", both salient in domestic China during the 1950 to 1970s, were extended to African countries. Some African leaders visited *Dazhai* in China and adopted the model in their own countries; the most famous case being Julius Nyerere's promotion of the Ujamaa Movement in Tanzania from the Arusha Declaration of 1967. In this period, close relationships were struck between China and newly independent socialist countries in Africa, such as Tanzania, as well as liberation movements fighting colonial rule. However, during the 1980s, the quality of Chinese experts became a problem, as selection was based on political criteria, such as their family and individual political background. This was later reversed, and the Chinese government started to emphasize technical expertise and training (Tugendhat & Alemu, 2016).

During the 1980s and 1990s, China's agricultural aid to African countries stressed the technical and economic dimensions of the aid program and an emphasis on technocratic-centered operations emerged, although set within wider diplomatic and commercial objectives (Amanor & Chichava, 2016; Gu, Zhang, Vaz, & Mukwereza, 2016). This involved decentralizing and rationalizing the aid-governance structure, introducing feasibility studies and project management methodologies, inviting African co-funding, particularly for local operations, and promoting the participation of China's companies and finance institutions. These refined aid modalities highlighting technical transfer supported by an apprentice system and the rehabilitation of dozens of former aid projects with joint ventures and contracts.

In the 2000s, this technocratic perspective on agricultural aid and development was pushed further with the initiation of the ATDC (Agricultural Training and Development Center) program. This was announced at the 2006 Beijing summit of FOCAC (Forum on China-Africa Cooperation) as a flagship program. Li, Tang, Xu, Qi, and Wang (2013) argue that the low productivity of African agriculture, particularly of its smallholders, explains the paradox of abundant land available coexisting with food insecurity in Africa. Technology transfer should therefore be the key element of China-Africa agricultural cooperation, they argue.

This point is echoed both in China's key policy documents, such as "China's Policy Paper on Africa (2006)", as well as follow-up action papers of FOCAC, and African policy documents linked to the launch of the African Union's Comprehensive African Agricultural Development program (CAADP) in 2003. It is also reflected in other international development programs, such as Alliance for a Green Revolution in Africa (AGRA) and the Millennium Villages program (Nziguheba *et al.*, 2010).