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Technological innovation in agricultural co-operatives in China: Implications for agro-food innovation policies

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ABSTRACT

Technological innovation has become a major source of farmer co-operatives' competitive advantage, however empirical research on co-operatives innovation in a developing country context is rare. We adopt an ethnographic case study method collecting data from 32 co-operatives managers of four exemplar co-operative cases and agricultural experts in China and collected much archival data. In addition, a Delphi study was conducted to collect data on the innovation performance. Based on the distinctive characteristics of co-operatives, we found that *first* knowledge spillovers and technology acquisition modes are two constructs which best capture the dynamic of technological innovation in co-operatives and develop a typology based on them. *Second*, grassroots and social innovation in a Chinese co-operative context have their own characters and indeed a hybrid of capitalism (e.g., agribusiness) and New Rural Re-structuring principles (i.e., similar to ICA ones). Third and finally, we provide detailed agro-food policy implications for each of the four types of co-op innovation. The results of the research may be learned by co-ops and policy makers in other developing economies who face similar challenges as in China.

1. Introduction

Technological innovation has been found to be critical for agricultural co-operatives' scaling up, and even survival in developing countries (Garnevska et al., 2011; Li and Gao, 2009; Luo, 2011). A co-operative is defined as "an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise" (International Cooperative Alliance, 1995). Co-operatives are established to achieve economies of scale and to realize economic benefits for farmers, by improving their bargaining power in the marketplace, reducing costs by pooling capital and resources through co-operative enterprises (Schram, 2010).

Co-operatives are very different from traditional investor-owned firms (henceforth "IOF") in terms of their aims, governance and finance structures and hence ways of innovation management (Drivas and Giannakas, 2006, 2007; Giannakas and Fulton, 2005; Giannakas et al., 2003; Murray and Giannakas, 2001; Novkovic, 2007), although they share some characteristics of traditional firms (Ariyaratne et al., 1997; Luo, 2010). First, co-operatives are run by and for their members, while IOFs are owned by capitalists. Second, co-operatives are democratic organizations controlled by their members, who actively participate in setting their policies and making decisions with equal voting rights (one member, one vote). Firms are governed by board of directors (Liang et al., 2015).

To date most of the technological innovation related literature has focused on traditional investor owned firms. Those that have focused on co-operatives have done so in a context of the developed world with few exceptions (Drivas and Giannakas, 2006, 2007; Giannakas and Fulton, 2005). Hence, we have little understanding as to factors affecting the way in which and how farmers' co-operatives in developing countries innovate. In this study, we intend to explore how agricultural co-operatives innovate in China. The justification of selecting China will be provided in Section 2.1.

This study has both theoretical and practical implications. *First*, to address the question of how to innovate, we develop a typology of co-operatives' innovation based on two constructs: technology acquisition modes and knowledge spillovers which best capture the nature of co-operatives innovation. *Second*, we identify a number of factors affecting the ways in which co-operatives innovate. *Third*, theoretically the innovation performance for co-operatives is difficult to measure. We then take into consideration (empirically) economic, environmental and

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social aspects when evaluating co-operatives' technological innovation performance, creating a performance index. *Finally*, based on the different impact/performance of each type of innovation, we propose some policy interventions to support innovation by co-operatives.

2. Theoretical background

In this section, we first introduce the background of agricultural co-operatives in China. Due to the social enterprise and grassroots nature of many co-operatives, two innovation 'umbrella terms' (Rip and Voß, 2013) are highly relevant to innovation in co-operatives and the two constructs of capturing co-operatives innovation i.e., knowledge spillovers and technology acquisition modes: social and grassroots innovation (Curl, 2010; Roelants, 2009) in a way that the spillovers effects are a key qualifying factor for social innovation and grassroots innovation tends to be carried out by grassroots innovators themselves (internal innovation). We briefly introduce these concepts here.

2.1. Agricultural co-operatives in China

The importance of farmer' co-operatives in rural areas in emerging economies is recognized by many researchers and practitioners (Jia et al., 2012; Zhao, 2012). While in the developed world, 78% of population live in urban area (United-Nations, 2014), in developing countries such as China about half of the people, most of whom engage with agricultural related businesses, live in rural areas (Statistics, 2011). Day (2016) claim that China is now moving into the "post-taxation-fee era" (hou shuifei shidai), in which primitive accumulation from agriculture ends and sees this as an opening for a third co-operative movement as peasants gain control over local resources. The third co-operative movement, therefore, is a form of social protection of vulnerable and atomized social groups against the privatization and marketization of society (Day, 2008). The co-operative movement takes place in a backdrop of New Rural Reconstruction (NRR) movement in China, in which activists and pioneers experiment different organisational forms deviating from both state socialism and the capitalism or economic logic, which dominated rural China between 1980s and when the NRR movement started (Hale, 2013).

In this study, we don't intend to go down to the route of discussing the cultural regeneration of rural livelihood through peasant co-operation (He, 2007), but focus on the technological innovation conducted by agricultural co-operatives in China. According to Hale's ethnography study (2013), there were two type of tensions facing the new co-operative movement in China: between the capitalism logic and the NRR co-operative logic and between state socialism logic (intervention by the party) and NRR logic. The former is more intense than the latter. The Chinese government encourages state owned or collective form of capitalistic agribusinesses as the preferred mode of vertical integration in agricultural industries (Huang, 2011). Hale (2013) found NRR has gradually become an adapted or alternative capitalism which combined some NRR principles (e.g., community service) and capitalism logic (e.g., market orientation). The debate of 'real' or 'fake' co-operatives in China has been spelled out explicitly by Huang (2011), who argues that co-operative form of organisation in China is an alternative to capitalism form (large agribusiness) and contains elements of NRR logic (i.e., co-operative principles). He continues to claim that there is a lack of support to co-operatives from the Chinese government (ibid). This is echoed by Lammer (2012), who concludes that the non-capitalist ideals inspired by these NRR projects might have some degree of success, but they seem unlikely to achieve NRR ideals becoming totally anti-capitalist.

A similar debate takes place in the Chinese language literature but majority of the scholars have reached consensus that the key determent factor for a real co-operatives is the equal voting rights for patrons and investors (Deng et al., 2016; Pan, 2011) and the survival of the real co-operatives, to a large extent, depends on the policy of the Chinese government and the ways in which the government amends the Co-operatives law first enacted in 2007 (Deng and Xu, 2016; Pan, 2011). The law amendment is underway at the time of the study being carried out. Some categories of fake co-operatives as those registered as co-operatives but de facto being contract farming, small agribusiness, shell co-operative or those having some characters of co-operatives but don't follow the principle of homogeneity of members (i.e., same voting rights for patrons and inventors) and democratic governance (Deng and Wang, 2014; Deng and Xu, 2016).

Some explain why it is difficult for the real Chinese co-operatives to survive. Adopting a transaction cost economics perspective, Deng et al. (2016) claim that co-operatives can only be justified if transaction cost saved through the co-operative is greater than the administrative costs of the co-operative. They continue: due to the heterogeneity and fragmented nature of farmer-members in Chinese co-operatives, in many cases, transaction cost saved can't cover the administrative cost of the co-operative leading to the dissolving of the co-operatives. This is because the limited direct financial instruments of Chinese governments can't provide the support required by co-operatives but encourage the establishment of shell co-operatives (ibid).

Agricultural co-operatives in China are undergoing rapid growth after the enactment of Farmers' Professional Co-operatives Law in 2007[1] and play a key role in agricultural technology transfer, experimentation and demonstration of technology, and even research and development in China (Luo and Hu, 2015). Technological innovation has become a source of competitive advantage, which is linked to economic performance of farmers' co-operatives (Solomon, 2001) and therefore there is a growing interest in the use of systems of innovation theory to both understand and reform innovation processes within agriculture (Sumberg, 2005).

Agricultural sectors in China exist in a fragmented, disintegrated pattern with low competitiveness, and marginal increases in farmers' income, widening the gap between urban and rural areas (Jia and Huang, 2011). China is keen to accelerate technological innovation and scientific research in agriculture, a move to boost the country's modern agricultural development (Song and Chen, 2006). However, there are many obstacles in the implementation process of agricultural technological innovation, such as the gap between supply and demand, the slow diffusion of agricultural technology, and the uneven distribution of innovation income among farmers, customers and providers of agricultural resources (Luo and Hu, 2015).

Co-operatives have increasingly played important roles in agricultural innovation in addressing these obstacles (Guo, 2003a). *First*, co-operatives' participation in agricultural extension service can improve the efficiency of extension and reduce extension cost (Guo, 2003b). *Second*, regarding the technology acquisition modes, many co-operatives can introduce external technologies to improve agricultural productivity (Acosta et al., 2015). Some can even internalize the R & D capability for endogenous innovation (Luo and Zhong, 2009). *Third*, since co-operatives understand farmers' technology requirements, they can use this knowledge to deliver innovation that increases productivity (Li and Gao, 2009), achieved through 'learning by doing'; fourth, evidence suggests a mutually reinforcing relationship between innovation activities and exports of agro-food products (Alarcón and Sánchez, 2016; Karantininis et al., 2010).

2.2. Grassroots innovation

The term grassroots innovation is interpretively flexible, but in a developing world context three important framings can be distilled (Table 1). Li et al. (2013) emphasize innovators as the driving force of

[1] Up to November 2016, there were about.1.774 million farmer's cooperatives registered with the Administration for Industry and Commerce in China, about 44% farmers joining the cooperatives.

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