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Incentives for promoting agricultural clean production technologies in China

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ABSTRACT

Since the start of this century Chinese agricultural priorities have greatly changed. Food security is no longer the sole target of agricultural development, and increased attention is now focused on environmental protection and stable growth of farmers' incomes. However, implementation of agricultural clean production practices has been slow, despite their official promotion, at least partly because of farmers' hesitancy to adopt them due to fears that they would lose income. In various countries subsidies have successfully countered such hesitation. Therefore, we have surveyed Chinese farmers' willingness to pay for environmental protection and accept compensation for potential losses of net income in relation to identified characteristics, subsidies and other incentives to encourage agricultural clean production in China. The results indicate that financial support from government at all levels is essential for its effective promotion in the long term, although farmers are willing to adopt environmental protection measures, and make some contribution to their costs as responsible citizens. Subsidizing farmers who voluntarily participate in agricultural insurance and adopt cleaner production practices is regarded as fair and equitable to avoid unacceptable reductions in their profits and life quality. The results also show that reasonable and targeted incentives could make broad contributions to cleaner agricultural production in China.

1. Introduction

Agricultural clean production (ACP) is a sustainable agricultural production mode that is widely advocated. Notably, the OECD (1995) has recommended that agriculture should be one of four prioritized industries (the others being energy, manufacture and transport) for the implementation of clean production techniques. However, agriculture-related environmental problems do not receive the same level of attention from policy-makers as pollution and have been relatively neglected in environmental protection policies around the world (Engström et al., 2008).

China has been no exception in this respect, largely because economic development and the provision of adequate food and clothing were the major priorities of Chinese national policies until the turn of this century. However, there has been a major shift in policies since then. As food and clothing provision is now adequate, intense efforts are being made to build a moderately prosperous society and enhance the population's quality of life. Economic development continues to be an important objective, but other goals are to ensure the quality and safety of food, and effectively address environmental problems. Relevant policy initiatives include a formal proposal to promote ACP, stemming from Article 22 of the Cleaner Production Promotion Law of the People's Republic of China promulgated on January 1, 2003. Although it only outlines ACP, this established the legal status of ACP for the first time in China; a highly important development in Chinese history as it guides the direction of Chinese agricultural development in the new era. Ecological protection and promotion of agricultural technology have been written into the annual central government No. 1 Document on Rural Work since 2004. Further, construction of an ecologically sustainable civilization (by measures including promotion of ACP) has been included as a strategic objective in the Report of the 18th National Congress of the Communist Party of China, held in Beijing on November 12, 2012. Some environmentally-friendly agricultural practices or so-called agricultural clean production technologies (ACPTs), such as soil testing and fertilizer recommendation, conservation tillage and organic matter enhancement, have been tested and verified in

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demonstration projects in China, but these projects did not lead to widespread implementation. This was partly due to a lack of effective long-term policies to meet national environmental goals and requirements, and partly to a lack of guarantees to safeguard the farmers' interests. Numerous tests have shown that these ACPTs have win–win qualities; safeguarding farmers' income while ensuring environmental quality, grain and food security (Chen et al., 2009; Cui et al., 2010; Kazuyuki and Yasukazu, 2008; Li et al., 2011; Liu et al., 2011; Pan et al., 2009; Sun and Huang, 2012; Zhang et al., 2009, 2011a,b, 2012, 2013). However, farmers generally believe that abandoning traditional agricultural production techniques and adopting recommended ACPTs may increase input requirements, raise risks associated with unproven practices, and threaten the marketability of their products (and thus their income). Hence, they are generally hesitant to adopt ACPTs and adopt a wait-and-see attitude, which is seriously restricting the development of ACP in China.

Subsidies and similar incentive policy mechanisms can accelerate (or retard) rates of environmental change through changing the behavior of producers (Lingard, 2002), and when tailored to meet farmers' demands they have been successfully applied to promote ACPTs in developed countries. Thus, Chinese farmers' hesitancy to adopt ACPTs could be potentially countered by using appropriately tailored subsidies and/or other incentives. Therefore this paper briefly outlines international successes (in the USA, Japan and South Korea) using this approach and the implementation of ACP in China. In addition, it presents results of a survey of Chinese farmers' knowledge of and attitudes towards ACP and environmental problems, their willingness to adopt environmentally-friendly practices, the contributions they would be prepared to make as responsible citizens, and the incentives they may require. The overall goal is to formulate a simple, practical compensation scheme and incentive policy to boost the farmers' adoption of ACPTs in line with the environmental objectives stated in the government's "Eleventh Five-Year Plan" based on a synthesis of international experiences, Chinese farmers' needs and the allocation of pollution control responsibilities with available finance from government at all levels.

2. International ACP promotion and its implementation in China

ACP has been continuously promoted since intense efforts to prevent and mitigate nonpoint source pollution in agriculture were initiated around the world in the 1980s. The promotion of ACP in three developed countries (USA, Japan and South Korea, selected as illustrative examples) and its implementation in China are briefly outlined in the following desktop review.

2.1. USA

As early as the 1980s, a policy to promote agricultural environmental protection through subsidies was incorporated in the Farm Bill of the United States (USDA, 1985). It required farmers who accepted subsidies to purchase crop insurance through compulsory measures, so that further subsidies could be obtained by farmers or continued in the future (USDA, 1996). Under this policy, the number of farmers adopting best management practices (BMPs) increased continuously and there was a commensurate improvement in environmental conditions in agricultural crop production (Antle and Houston, 2013; USDA FSA, 2009; USEPA, 1999). This was related to continuous policy orientation of "clean water action plans" proposed by federal authorities to reduce nonpoint source pollution (Legge et al., 2013; USDA FSA, 2009; USEPA, 1998; USEPA, 2011), and various conservation programs like the Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP) and Nonpoint Source Management Program (NPSMP) launched by the federal, state and local county authorities with matching incentives (Malik et al., 1994; Gilley et al., 2001; Nyaupane and Gillespie, 2011; Richardson et al., 2008; USDA FSA, 2009). Funding for nonpoint source pollution control varied among authorities and fiscal years, but the main sources were federal, followed by state and county funds. Sometimes, the farmer or landowners contributed a minor proportion of the required funds (IEPA, 2012; USDA, 2009).

2.2. Japan

Japan has formulated sets of ACPTs and legally enshrined Agricultural Environmental Codes designed to encourage their implementation by providing government subsidies and other incentives for agricultural practitioners who comply with them (Jin, 2010; Sasaki, 2010; MAFF, 2009). The subsidies and incentives offered by the Japanese government mainly depend on the environmental protection measures adopted by farmers. The scale of the subsidies depends on the crops grown, but on average Japanese farmers enjoy an overall subsidy of 50,000 yen/ha if they implement ACPTs. These subsidies are equally funded by central and provincial government (MAFF, 2009). Furthermore, the Japanese government has also imposed mandatory requirements for all farmers enjoying subsidies to purchase agro-insurance with a governmental subsidy equivalent to 70% of its cost and reinsurance by a three-level reinsurance system (Tang, 2009).

2.3. South Korea

The South Korean government has promoted ACP by passing a Pro-environment Agriculture Law and developing a series of five-year plans (Kim, 2010). An objective of the 3rd Five-Year Plan (2011–2015) is to promote further development of environmentally friendly agriculture through measures such as a direct payment system, a biological pest and disease control program, and subsidies for buying green manure seeds. Direct payments are mainly provided to farmers, farmer groups and agricultural cooperatives that have obtained certification in line with the Pro-environment Agriculture Law by applying environmentally-friendly agriculture practices to compensate for their initial reduction in income and increases in production costs. Usually, the central government, local government and practitioners are responsible for 20%, 30% and 50% of the funding, respectively. The level of subsidy support depends on the agricultural activities of the participants, e.g. the crops grown (OECD, 2012).

2.4. China

Although the implementation of ACP in China only formally started following promulgation of the Cleaner Production Promotion Law of the People's Republic of China in 2003, it has developed very rapidly. Encouragement and support for ACPTs in China is mainly provided through subsidies linked to national projects such as the conservation tillage project (He et al., 2010), soil testing and fertilizer recommendation (STFR) project (MOA, 2005), and soil organic matter enhancement project (MOA, 2012; PAOF, 2011). As yet, no direct cash subsidy has been provided to farmers who have adopted STFR, but they have been able to buy formulated fertilizers at discount prices. Furthermore, the government also encourages non-governmental organizations, enterprises and individuals that engage in related practices, such as organic agriculture, green agriculture and pollution-free agriculture (MOA, 2006). Subsidizing

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