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Review

Water management and crop production for food security in China: A review

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ABSTRACT

Food security is a high priority issue on the Chinese political agenda. China's food security is challenged by several anthropogenic, sociopolitical and policy factors, including: population growth; urbanization and industrialization; land use changes and water scarcity; income growth and nutritional transition; and turbulence in global energy and food markets. Sustained growth in agricultural productivity and stable relations with global food suppliers are the twin anchors of food security. Shortfalls in domestic food production can take their toll on international food markets. Turbulence in global energy markets can affect food prices and supply costs, affecting food security and poverty. Policy safeguards are needed to shield food supply against such forces. China must make unremitting policy responses to address the loss of its fertile land for true progress towards the goal of national food security, by investing in infrastructure such as irrigation, drainage, storage, transport, and agricultural research and institutional reforms such as tenure security and land market liberalization. The links between water and other development-related sectors such as population, energy, food, and environment, and the interactions among them require reckoning, as they together will determine future food security and poverty reduction in China. Climate change is creating a new level of uncertainty in water governance, requiring accelerated research to avoid water-related stresses.

Contents

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'Agriculture is the base of China' and 'Food is the first necessity'.

"农业是中国的基础" "粮食是根本"
Historic Chinese maxims

1. Introduction

Despite a step-down in growth in 2008, real GDP in the East Asia and Pacific region is projected to grow at about 10% to 2009, compared with the world average of about 3.6% (World Bank, 2008). Growth in China is expected to exceed 11%, putting pressure on food prices. Increasing urbanization and affluence will put further pressure on food demand (Pingali, 2007). China's increasing appetite for energy and the surging demand for biofuel crops worldwide will worsen the situation. For instance, crude oil prices reached the $100 per barrel mark in early 2008. The surge in oil prices and government subsidies in several countries have stimulated the use of food crops for biofuels, increasing fertilizer and irrigation costs. There were unprecedented increases in the prices of maize (33%) and vegetable oils (50%) during 2007, and these price shocks were transmitted to other food cereals. Global wheat production fell below consumption as much wheat area was displaced by maize. Wheat stocks reached historic lows and wheat prices increased by about 30% (World Bank, 2008). Structural changes in global grain markets also increased rice prices, by around 40% between December 2005 and 2007, and thus endangered food security (EPW, 2008).

Turbulence in global energy and food markets can impact food security and poverty reduction in China (Diao et al., 2003). Sudden increases in food prices can greatly impact urban and non-agricultural households, and farmers in lagging rural areas and affect rural households in several ways (Huang et al., 2004b). Price changes can have diverse impacts across household types and regions due to heterogeneity in consumption behaviour and income sources, with possible implications for compensatory policies (Chen and Ravallion, 2004). The cost of protecting the livelihood and food security of these vulnerable households can be daunting, requiring as much as 0.5% of GDP in developing countries (World Bank, 2008).

Population growth, urbanization, industrialization, income and consumption growth, and changes in lifestyle brought about by global forces and market integration will pose ever greater challenges to maintaining food security in China. Biofuel projects will require more land and water resources, with impacts regarding resource allocation to food production (de Fraiture et al., 2007). Pro-poor agricultural technologies and transgenic food and cash crops might provide opportunities to enhance food security and benefit the poor farmers (Spielman, 2007).

Investments in infrastructure, and new policies and institutions are needed in China to achieve national food security goals and sustain the reductions in poverty that have been achieved in recent years. Water security must be assured and efforts must be made to limit the loss of fertile land to urbanization and industrialization. Given these issues and challenges, we review the role of land and water resources, and policies and institutions in promoting food security and reducing poverty in China.

2. Economic reform and food security

China embarked on its economic reform program more than 20 years ago when the government introduced the household responsibility system in agriculture. Price distortions were reduced and key land rights were reallocated from collective farms to rural households. Bold policies and institutional reforms were implemented to motivate greater production by rural households (Fan et al., 2004). The impacts on agricultural production, food security, and poverty reduction have been dramatic (Zhang and Kanbur, 2001). The reforms, which have lifted hundreds of millions of rural residents out of extreme poverty, stand as the "biggest antipoverty program the world has ever seen" and are claimed to have led to the "greatest increase in economic wellbeing [and food security] within a 15-year period in all of human history" (Sachs et al., 1994: 131).

Prior to implementing the reforms, much of China was a peasant agricultural society. Rapid economic growth was possible because the large agricultural sector contained vast surplus labour. China's reallocation of labour allowed all groups to gain, in contrast with reforms that have occurred in other former socialist economies (Donaldson, 2007). Economic reform often generates major gains and losses, and the distribution of impacts varies among social groups, with implications for social equity and the course of reform. Chinese peasants were a particularly important group from the perspective of food security and equity, and also from the perspective of economic reform.

During the 1980s and 1990s, agricultural productivity rose steadily and per capita grain output reached a level similar to that in developed countries. Many farmers shifted to higher valued crops and food exports grew significantly (FAO, 2003). With sustained growth in agriculture, rural incomes rose dramatically, lifting millions of people out of poverty permanently (Hussain and Hanjra, 2003, 2004). Despite these notable achievements, more than 100 million farmers and their families still live in poverty. The gap in rural and urban incomes remains wide and inequality in the rural economy