



INTERNATIONAL  
FOOD POLICY  
RESEARCH  
INSTITUTE

**IFPRI Discussion Paper 01397**

**December 2014**

**Aligning Public Expenditure for Agricultural  
Development Priorities under Rapid Transformation**

The Case of China

**Bingxin Yu**

**Kevin Chen**

**Haisen Zhang**

**Development Strategy and Governance Division**

## INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

The International Food Policy Research Institute (IFPRI), established in 1975, provides evidence-based policy solutions to sustainably end hunger and malnutrition and reduce poverty. The institute conducts research, communicates results, optimizes partnerships, and builds capacity to ensure sustainable food production, promote healthy food systems, improve markets and trade, transform agriculture, build resilience, and strengthen institutions and governance. Gender is considered in all of the institute's work. IFPRI collaborates with partners around the world, including development implementers, public institutions, the private sector, and farmers' organizations, to ensure that local, national, regional, and global food policies are based on evidence. IFPRI is a member of the CGIAR Consortium.

## AUTHORS

**Bingxin Yu** ([b.yu@cgiar.org](mailto:b.yu@cgiar.org)) is a research fellow in the Development Strategy and Governance Division of the International Food Policy Research Institute (IFPRI), Washington, DC.

**Kevin Chen** ([k.chen@cgiar.org](mailto:k.chen@cgiar.org)) is a senior research fellow in the Development Strategy and Governance Division of IFPRI, Beijing.

**Haisen Zhang** ([haisenzhang@hotmail.com](mailto:haisenzhang@hotmail.com)) is the director of the Center for International Agricultural Cooperation and Development at the University of International Business and Economics, Beijing.

## Notices

<sup>1</sup> IFPRI Discussion Papers contain preliminary material and research results and are circulated in order to stimulate discussion and critical comment. They have not been subject to a formal external review via IFPRI's Publications Review Committee. Any opinions stated herein are those of the author(s) and are not necessarily representative of or endorsed by the International Food Policy Research Institute.

<sup>2</sup> The boundaries and names shown and the designations used on the map(s) herein do not imply official endorsement or acceptance by the International Food Policy Research Institute (IFPRI) or its partners and contributors.

Copyright 2014 International Food Policy Research Institute. All rights reserved. Sections of this material may be reproduced for personal and not-for-profit use without the express written permission of but with acknowledgment to IFPRI. To reproduce the material contained herein for profit or commercial use requires express written permission. To obtain permission, contact the Communications Division at [ifpri-copyright@cgiar.org](mailto:ifpri-copyright@cgiar.org).

## Contents

Abstract	vi
Acknowledgements	vii
1. Introduction	1
2. Agricultural and Rural Policy in China	3
3. Challenges in Chinese Agriculture	5
4. Literature	7
5. International Perspective	8
6. Public Agricultural Expenditure in China	10
7. Conclusion and Policy Implications	20
Appendix: Supplementary Table	22
References	23

## Tables

6.1 Components of different definitions of public expenditure in agriculture	10
6.2 Structural of national government expenditure in China	12
6.3 Structure of agricultural expenditure	15
6.4 Share of expenditures in environment sustainability, food safety, and rural infrastructure in total expenditure (%)	18
6.5 Share of expenditure to reduce inequality in total expenditure (%)	19
A.1 Contents of the “No. 1 Document”	22

## Figures

1.1 Agricultural output and input growth, 1988 = 100	1
3.2 China’s aging population and the share of people at age 65 and above	5
6.1 Different definitions of public expenditure in agriculture, billion Yuan	12
6.2a The level of agricultural spending in Asia, 1980 = 100	13
6.2b Per capita agricultural spending in Asia, 2005 constant US\$	14
6.3 Agricultural R&D expenditure, billions of Yuan at 2010 constant price	16

## ABSTRACT

Public expenditure in agriculture is one of the most important policy instruments for government in developing countries to address food security and poverty reduction. This paper provides a comprehensive review of agricultural policy and public agricultural expenditure (PAE) in China. China shifted away from taxing agriculture to supporting agriculture in the mid-2000s, but the sector faces mounting demographic, biophysical, and trade challenges. PAE in China is outpacing that of other developing economies in Asia, but its composition does not align perfectly with the development challenges and priorities the sector faces. In 2012, approximately one-fifth of government PAE was allocated to subsidies, mostly for agricultural inputs. Spending on agricultural research and development (R&D) is insufficient, and its intensity falls below the global average for developing countries. Resources allocated to environmental and food safety issues remain extremely low, negatively affecting the country's long-term sustainability and external trade position. To promote more equitable growth, China allocated about 18 percent of the 2012 national budget to reduce inequality, but the expenditure favors urban residents. The government also implemented policies to improve rural infrastructure and services. Redistributive transfers like subsidies help to close the rural–urban income gap. Policy recommendations are drawn from the analysis.

**Keywords:** government expenditure, China, composition, agriculture, food safety, environment, agricultural R&D, inequality

*JEL code: Q18, Q16, Q10, H5, H7*

## **ACKNOWLEDGMENTS**

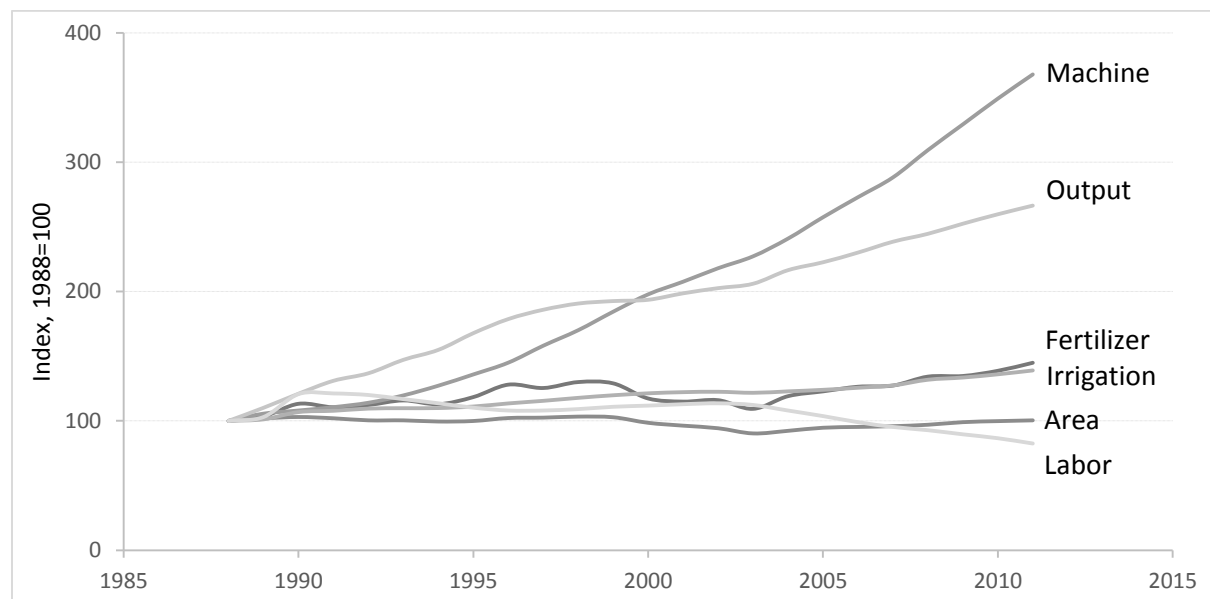
This paper is undertaken as part of the CGIAR Research Program on Policies, Institutions, and Markets (PIM) led by the International Food Policy Research Institute (IFPRI). Funding support for this study was provided by the Asian Development Bank (ADB) technical assistance (PATA 7306: People's Republic of China: Policy Study on Government Public Expenditure in Agricultural Production) and the National Natural Science Foundation of China (NSFC)-CGIAR International Cooperation Project 71261140371.

# 1. INTRODUCTION

China's economy has experienced a rapid and fundamental transformation. Between 1980 and 2012, gross domestic product (GDP) expanded by 21 times and GDP per capita grew at 9 percent annually. On the other hand, the demographic structure also shifted dramatically due to urbanization, an aging population, and massive migration. During this period of fast growth, China has transformed from an agriculture-based economy to one mainly based on manufacturing and services, with the share of agriculture in the economy, employment, and trade declining steadily.

It has been widely recognized that the rapid agricultural growth in the 1980s triggered China's subsequent economic growth and poverty reduction (Fan, Zhang, and Zhang 2004; Montalvo and Ravallion 2010). Since then, the structure of agricultural production has shifted along with China's economic transformation, driven mainly by intensified use of modern inputs like machinery, fertilizer, and irrigation (Figure 1.1); however, the agricultural sector faces many challenges despite this impressive growth in the course of economic and social transformation. Swift urbanization and an emerging middle-income class increase the demand for more nutritious and protein-based diets. China's current agricultural policies and the practice of intensified production are increasingly being tested by many factors on the supply side, including demographic change, biophysical constraints, and external trade conditions.

**Figure 1.1 Agricultural output and input growth, 1988 = 100**



Source: Authors' compilation from China Statistical Yearbook (NBS various years [a]).

The strategic importance of national food security and income equality has prompted the Chinese government to modernize its agriculture sector. Public expenditure is one of the most important instruments the government uses to implement its development goals. There is rich literature suggesting agricultural expenditure is crucial for economic growth, food security, and poverty reduction in developing economies (Fan and Brzeska 2010; Mogues 2012). Expenditures on agricultural research and development (R&D), rural infrastructure, and education are generally found most effective in promoting agricultural growth and alleviating poverty. This paper provides a comprehensive review of public agricultural expenditure (PAE) in China and its alignment with development goals, contributing to the formulation of an effective policy for the agriculture sector.

We find that PAE has increased steadily in China; however, the composition of agricultural spending does not perfectly line up with the development challenges and priorities the sector faces. Whereas total funding received by agricultural research institutes has trended upward, the ratio between agricultural R&D and the size of agricultural sector, agricultural GDP (the intensity of agricultural R&D) remains below the global average for developing countries. Despite the urgency posed by the scarcity of natural resources, government spending on environmental sustainability is far from sufficient to support agricultural sustainability. Expenditure for food monitoring and inspection is also negligible, making it difficult for the agricultural sector to meet growing domestic and international standards for food safety. There are also encouraging signs. In recent years, rural infrastructure spending grew steadily, reflecting increasing attention to the promotion of rural development. The government's pursuit of a harmonious society has led to a surge in redistributive expenditure to reduce inequality, but the expenditure comes with an urban bias.

The paper is organized as follows. China's agricultural policy reform is described in Section 2, followed by a summary of major challenges the agricultural sector faces. Section 4 reviews literature on agricultural expenditure in growth and poverty reduction in developing countries and China. Section 5 defines PAE and identifies its sources. Section 6 examines the pattern and composition of government expenditure in agriculture at the various government levels, and then discusses the alignment of expenditure with challenges and policy priorities. In the final section, we summarize our findings and propose strategies for government spending in agriculture.



## 2. AGRICULTURAL AND RURAL POLICY IN CHINA

Agricultural reform has triggered and supported China's phenomenal economic growth. Agricultural policy remains a central part of the reform, resulting in a gradual transition from a centrally planned economy toward a market economy (Fan, Zhang, and Zhang 2004; Zhang and Brümmer 2011). Increasing agricultural production and ensuring food security have been the principal goals of agricultural policy since the start of reform. In the early 1980s, the Household Production Responsibility System replaced the tightly controlled commune system, and individual farmers obtained the freedom to farm and responsibility for the profits or losses from their operations. In the late 1980s, government promoted the growth of rural nonagricultural industries, commonly known as township and village enterprises, to employ workers leaving agriculture and to avoid mass migration to the cities. Such enterprises were the main vehicle for absorbing workers leaving agriculture, which is necessary for China's growth and development. It was China's unique experience in the late 1980s and the 1990s that the bulk of the shift in employment took place within the rural economy rather than through migration from rural to urban areas, which is essential in closing the rural–urban income gap (OECD 2009).

Up until the late 1990s, China's principal agricultural policy objective was to increase agricultural production, especially of food grains. But in the mid-1990s, rural–urban and regional inequality began rising at an alarming rate, and the government shifted its policy focus to promote rural development and close the growing income gap between urban and rural populations, while encouraging food production to ensure grain self-sufficiency. The country gradually adopted a series of policies aimed at raising agricultural incomes with a fundamental shift from taxing agriculture to supporting it. Beginning in the mid-2000s the long-established agricultural tax was abolished and agricultural subsidies were increased substantially.

Starting in 2004 China further strengthened its income support policies through the adoption of the “No. 1 Document,” the highest-priority document of the central authorities. This policy document put forward a set of agricultural policy measures as key channels for providing support to China's agriculture with the multiple objectives of shrinking the urban–rural income gap, encouraging food production, and ensuring grain self-sufficiency. Each year the central authorities' “No. 1 Document” has focused on various aspects of agricultural and rural development issues, such as water conservation to achieve sustainable use of water resources and investment in agricultural science and technology to boost agricultural production and farmers' incomes (Table A.1).

In addition, China has introduced many new initiatives to expand the coverage of the social safety net and improve social services in rural areas. The government views building a New Socialist Countryside as a top strategy to promote rural development. It serves the multiple purposes of increasing rural incomes, transforming the countryside, and mitigating rural–urban disparity through agricultural modernization, accelerated urbanization, infrastructure investment, and public services expansion in rural areas. In 2003, China adopted the New Cooperative Medical Scheme—a voluntary health insurance program for rural residents, jointly funded by enrollee contributions and subsidies from the central and local governments. Within a decade, the New Cooperative Medical Scheme has been expanded to almost all counties. Another health-expense safety-net program, Medical Assistance, was launched in 2003 to help specified vulnerable groups with New Cooperative Medical Scheme contributions and copayments. The government also focuses on the implementation of nine-year compulsory education by enforcing the waiving of tuition fees in rural areas. There are other rural safety-net programs including a minimum living stipend and support for disadvantaged households.

The evolution of the agricultural expenditure policy reflects the shifts in policy priorities since the reform in China. In 1979–1993, agricultural expenditure was slanted toward ensuring the domestic supply of agricultural products through subsidies for productive inputs and reduction of agricultural taxes. However, investment in agricultural infrastructure plummeted due to the shifted focus to nonagricultural development. The level of agricultural expenditure increased steadily during the period 1994–2002, supported by brisk economic growth. The Rural Tax and Fee Reform, started in 2001, is the most important fiscal system reform and was designed to significantly reduce the overall burden on farmers through adjustments to the tax-sharing system, fiscal management reform, and other rural fiscal reforms.

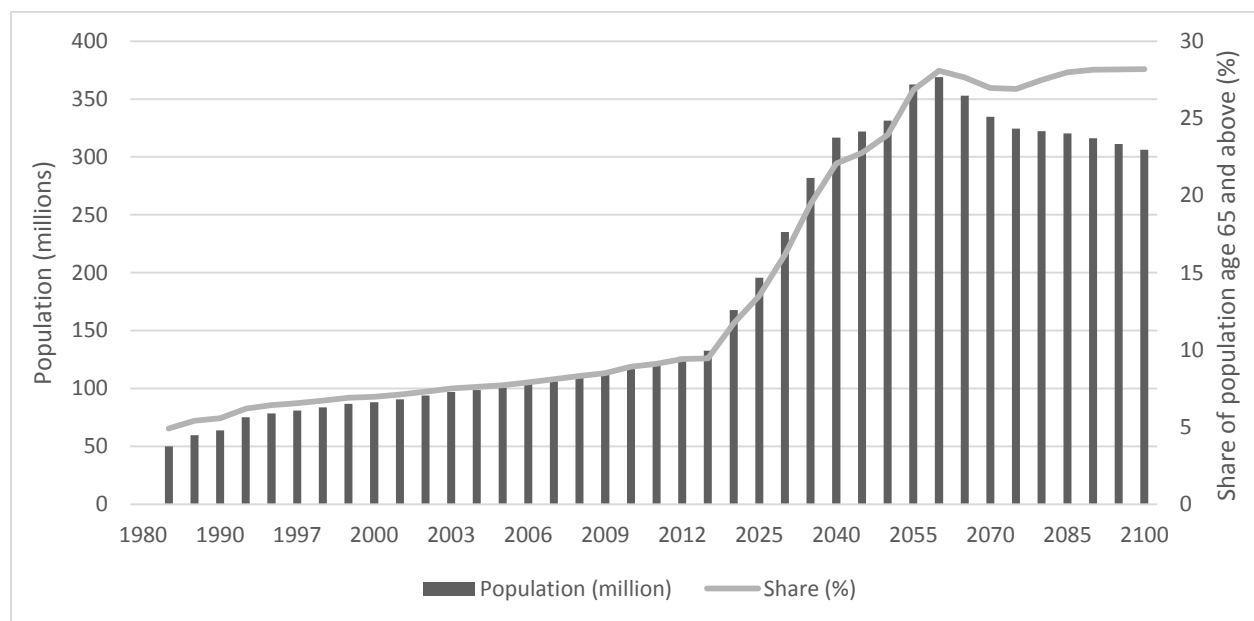
In recent years, China's expenditure exhibits tremendous increases to promote equality, improve infrastructure, provide better delivery of social services, intensify support to the agricultural sector, and promote rural development and equality.

### 3. CHALLENGES IN CHINESE AGRICULTURE

Chinese society is undergoing a rapid and unprecedented reconfiguration. First, urbanization has moved millions of rural residents into cities, as the share of the urban population surged from 20 percent in 1980 to 53 percent in 2013 (World Bank 2014). This trend is expected to continue as China maintains its pursuit of urbanization with a target of increasing the urban population by 400 million people in the coming decade.

Second, China's demographics will shift to an older society as a result of advances in healthcare and nutrition combined with the one-child policy. In 2012, 127 million people (9.4 percent of the national population) were at age 65 and above in China. By 2030 that number is expected to soar to 235 million (16.2 percent of the national population) according to the United Nations estimation (2010). By 2050, nearly a quarter of the population will be over 65 years old (Figure 3.2).

**Figure 3.2 China's aging population and the share of people at age 65 and above**



Source: China Statistical Yearbook (NBS various years [a]) and United Nations (2010).

Third, national policies on industrialization, marketization, and urbanization have triggered an extensive rural–urban migration. By the end of 2012 the number of rural migrants had grown exponentially, reaching 263 million, almost 20 percent of the total population (MOHRSS 2013). Most migrants are seeking higher wages and better opportunities. This is illustrated by the predominantly rural–urban and inland-to-coastal labor flow: around 70 percent of migrant workers are employed in China's eastern areas with two-thirds of them working in large or medium size cities (MOHRSS and ILO 2011). Most migrants are young males with secondary education, mainly working in the manufacturing and construction sectors.

These demographic changes have a profound impact on the Chinese economy. The agricultural sector in particular has witnessed a net loss of productive male labor, and it is expected that the aging of the agricultural labor force will speed up. This will result in rapidly rising rural wages and further declines in the total agricultural labor force in the near future. The labor shortage may reduce overall agricultural productivity when farmers cope with the absence and aging of family members by reducing their agricultural investment and inputs (de Brauw et al. 2012). However, agricultural production does not necessarily suffer when household members move away, as recent developments in the labor market have induced changes in farm structure through capitalization and mechanization (Christiaensen 2012).

Another big challenge for Chinese agriculture is environmental sustainability as resources shrink and decline in quality. Accelerated industrialization and urbanization unquestionably lead to irreversible losses of agricultural area mainly in areas with high agricultural potential and concentrated in densely populated eastern China (Chen 2007). Soil fertility has been significantly reduced by land degradation from production diversification, soil erosion, salinization, and desertification, as well as pollution and acidification, further undermining the productive capacity of land. Dietary changes, population growth, and urbanization imply additional water needs and a reduction of water for agricultural purposes. The stress on China's lake and groundwater systems from industrialization is exacerbated by pollution from excessive fertilizer and pesticide use. The agricultural sector is also especially vulnerable to the risks posed by meteorological disasters. Climate change is expected to change temperature and precipitation patterns in China, with alarming increases in the frequency and intensity of extreme weather events. Insufficient investment in agricultural infrastructure, including deteriorated irrigation facilities due to poor maintenance and years of neglect, weakens the sector's resilience to extreme weather events.

On the demand side, rising incomes and a burgeoning middle-income class have resulted in a rapid shift in dietary patterns with a dramatic increase in the demand for protein-rich (meat and dairy) and diversified (fruits and vegetables) products, implying a considerable shuffle in agricultural outputs. Christiaensen (2012) suggested some possible opportunities associated with food demand dynamics. Falling demand for staple grains implies less pressure on agricultural land for cereal production, allowing for the future possibility of reallocating agricultural land for alternative use. A diversified diet demands more high-value products, which requires more labor and less land and water. Plus, animal-based products require fast-growing feed grains, which can be substituted for root crops like cassava and potatoes, adding flexibility in agricultural trade and production.

Accelerated industrialization and urbanization presents additional food safety challenges as larger quantities of food need to be transported across long distances to reach urban centers across different regions, increasing the risk of contamination. Despite the enormous efforts of the government, China has been rocked by frequent food safety scandals in recent years, caused by many factors in various stages from production to food processing and preservation. Food safety scandals not only affect public health but also erode consumer confidence in Chinese agricultural produce. This prevents the agricultural sector from fully exploiting the opportunities from high demand for high-value and labor-intensive products (Christiaensen 2012).

In addition, rising income inequality poses a difficult policy challenge for agricultural development in China since agricultural revenue still dominates rural household operation income (World Bank 2009). Although the economy is expanding rapidly as a whole, inequality has increased among the population. Urban-rural inequality, a gap that is enlarging over time, is the most important dimension of inequality in China, and contributes substantially to overall inequality. The economic reform used to heavily channeled investments toward the urban and industrial sectors at the expense of the rural and agricultural sectors in the 1980s and 1990s, resulting in declining agricultural investment incentives. The institutional barriers preventing rural migrants from accessing social services have also widened the urban-rural income gap and persistently limited migrants' opportunities.

The regional dimension of inequality is also significant in China, especially the disparity between coastal and inland regions (Fan, Kanbur, and Zhang 2009). In 2012, the ratio of per capita income of the average urban household to that of the average rural household was 3.1, and the ratio between the eastern coastal and western inland regions was 1.7, quite high according to global standards. This regional disparity can be mostly attributed to the inequality in nonagricultural income (Li, Sato, and Sicular 2013). As rural nonfarm enterprises develop rapidly, nonagricultural income has become an important, even dominant, source of rural income and hence enlarges the income gap. Agricultural revenue still dominates rural household income in most inland regions, while dynamic economic transformation has turned coastal provinces into economies whose rural growth is coming from nonfarm activities and migration. If the bias against agriculture is not removed and the income gap not bridged, the well-being of farmers will evaporate and the agricultural sector will become stagnant, jeopardizing long-term development.

## 4. LITERATURE

The rationale for the allocation of public resources to agriculture lies in its nature as a public good. The social benefits from agricultural expenditure are far greater than the private-producer benefits, and private producers cannot extract compensation for the use of agricultural spending from all who benefit from it. Hence the amount the private sector spends tends to be less than the socially optimal level, and that underprovision creates a rationale for the public provision of such goods. In the agricultural sector, a good example of a public good is agricultural R&D.

A huge body of literature extolls the positive impact of public expenditures on agriculture production, rural development, and poverty reduction in developing economies, as reviewed by Fan (2008), Fan and Brzeska (2010), and Mogues (2012). The consensus from international comparison is that investment in agriculture is the key to achieving the dual objective of growth and poverty reduction. Lipton and Zhang (2007) point out that rapid growth of land and water productivity in agriculture has been the key to regional progress out of poverty, mostly through technology adoption, spending on R&D, reduced taxes and fees, and relaxed migration policies. Within the agricultural sector, R&D proves always to have the biggest impact in improving productivity and promoting modern input use, followed by rural infrastructure, education, and irrigation (Mogues 2012). Unlike expenditures in the form of subsidies, the law of diminishing returns does not apply to agricultural research and extension because high returns to public spending on agricultural research and extension appear robust over time.

Economic theory and empirical evidence suggest that increased agricultural productivity is important in development because it frees up resources through resource reallocation and provides raw material for the development of other sectors. It also contributes to higher incomes and hence higher demand by the rural population for inputs, goods, and services produced by the spillover effects to nonagricultural sectors. Compelling evidence suggests that productivity is the major driver of agricultural growth in China, and a large proportion of agricultural growth in China can be attributed to productivity improvement (Fan, Zhang, and Zhang 2004; Nin-Pratt, Yu, and Fan 2010; Yu, Liao, and Sheng 2014). Growth in total factor productivity is mostly propelled by technical progress, which in turn comes primarily from new technologies released by the national agricultural research system. Among different types of public spending, agricultural R&D gives the highest rate of return in agricultural productivity, far above any other types of public expenditure. In addition to technical progress, public expenditure contributes to agricultural growth through efficiency gains, achieved by increased public investment in infrastructure and social service delivery. Empirical evidence has demonstrated that the highest return is reported for expenditure in agricultural R&D, followed by rural education, infrastructure, and rural social services.

Promoting agricultural and rural development through public investment can lead to poverty reduction (World Bank 2009). Fan et al. (2005) note that crop research has helped reduce large numbers of rural poor. They estimated that every \$1 million invested at the International Rice Research Institute in 1999 would lead to at least 800 and 15,000 rural poor people lifted above the poverty line in China and India, respectively. Agricultural research also has contributed to a large drop in urban poverty through lower food prices because people often spend more than half of their income on food (Fan, Zhang, and Zhang 2004). The poverty effects may differ by country but investments in infrastructure and agricultural R&D generally far exceed other types of expenditure if poverty reduction is the paramount policy goal.

Government production-enhancing investments are also key instruments by which governments seek to reduce regional inequality. Growth in agriculture has proven to be more effective at reducing poverty and inequality than similar growth in other sectors for China (Ravallion and Chen 2007; Fan, Zhang, and Zhang 2004). Studies further argue that investment in agricultural research and rural roads has the largest and most favorable impacts in reducing inequality in the lagging western region of China (Zhang and Fan 2004; Fan, Kanbur, and Zhang 2009).

In summary, a rich array of literature suggests that public spending on agricultural R&D is key for agricultural growth and poverty reduction, implying underinvestment in this area. Compelling evidence also suggests that technological progress is the main driver of productivity and production growth in China. The impact of other types of agricultural investment can vary according to individual development goals, which suggests that policymakers should prioritize different agricultural investments judiciously.

## 5. INTERNATIONAL PERSPECTIVE

China is at a critical point of transition, where trends associated with economic transformation, such as rapidly increasing inequality, can be reversed through further inclusive growth, development, and economic integration. The challenge for the Chinese government lies in moving up to high-income status and avoiding the “middle-income trap” of failing to continue to advance into the ranks of high-income countries (Aiyar et al. 2013). Agriculture is the key in managing these challenges and directly addressing issues such as sustainability and inequality. This is because the sector serves multiple development goals for Chinese society: ensuring food security and food self-sufficiency through investing in rural productivity improvement; encouraging sustainable agriculture through natural resource conservation and climate change adaptation; and closing inequality through agricultural transformation and rural development.

China is not alone in its transformation and in dealing with associated demographic, environmental, and socioeconomic challenges. Policymakers in many countries that underwent economic transformation faced similar problems in the process, and their experiences in using agricultural policies before and during the early stages of rapid industrial expansion can be very helpful in China’s transformation.

Schultz (1953; 1978) identified different agricultural problems faced by countries at both ends of the wealth spectrum. Low-income economies with high population growth and threatened by food shortages are inclined to tax agriculture to push down food prices for nonfarm workers. On the other hand, protecting and subsidizing agriculture to achieve income parity are the principal policy instruments in high-income economies with low population growth and stagnant food demand growth. Hayami (2007) further extended the concept by adding another agricultural problem faced by countries advancing from low-income to middle-income status. He identified a shift of government policy objectives in the process of economic development, and highlighted the need for agriculture to balance the policy goals of providing incentives for food security and increasing farm income to reduce inequality in the transition process.

Several Asian economies, including South Korea, Taiwan, and Japan, have succeeded in maintaining growth momentum after attaining middle-income status. Japan reached the middle-income stage by the first decade of the 20th century through the promotion of labor-intensive manufacturing. During that time the objective of agricultural policy was to ensure an adequate supply of cheap food to support low wages for the industrial sector. The Japanese government promoted productivity-enhancing investments in improved seed and agronomic practices, mechanization, extension, and irrigation. The policy was successful in securing a food supply but failed in equality as farm incomes relative to nonfarm incomes dropped sharply. In response to the exacerbating inequality, the focus of agricultural policy shifted to protect agricultural production through price supports (rice import duties and procurement), rural infrastructure construction (roads and rice storage), credit, and tax reduction. Denison and Chung (1976) concluded that Japan’s growth is partially attributable to upgraded human capital through health and education for workers. Only after the 1970s, when Japan reached the high-income class, was the country able to afford a widespread farm price support program to improve the terms of trade between agriculture and nonagriculture and reverse farm income decline.

Thailand faced a similar issue of growing income inequality during very rapid growth based on labor-intensive industrialization. Amidst the political instability of the mid-1970s, the Thai government changed its policy stance from taxing to supporting the agricultural sector, which included the reduction of rice export taxes, and provision of credit and fertilizer subsidy to farmers, and the construction and upgrade of rural roads. Those policies were parallel to what the Japanese government adopted but had limited impact in closing the rural–urban income gap, resulting in the persistent concentration of poverty in the agricultural sector (Dixon 1999; Hayami 2007).

In addition to agricultural development, strategic industrial development provides another modality for improving agricultural labor productivity. Taiwan is illustrative of a successful example of small- and medium-scale enterprises spread across rural areas, which gives farmers easy access to nonfarm employment and cuts the cost of intersectoral labor reallocation. In the case of the United States,

the construction of canals, railways, and the telegraph system linked the West to the rest of the country in the 1800s, facilitating the exchange of commodities and information and hence accelerating the urbanization process.

Experiences in other countries suggest that the shrinkage of the agricultural labor force and widening inequality are common among developing economies transiting from the low-income to the middle-income stage due to the loss of agriculture's comparative advantages. Weakening terms of trade for agriculture and rising inequality can be mitigated or completely offset if agricultural productivity could grow at a speed parallel to that of the nonagricultural sectors (Hayami 2007). General policy prescriptions to address these issues center on intensified investment in agricultural R&D, improved access to rural infrastructure and services, mechanization to increase capital intensity, enhanced human capital through health and education, supportive agricultural policy, and increased social protection and transfers for rural residents. These policy recommendations are consistent with the findings in the literature and lend support to their effectiveness to attain the dual objectives of food security and equality through enhanced agricultural productivity. Next, we compare the policy recommendations with the current pattern of PAE in China, and examine the alignment of expenditure with challenges and priorities stated in government documents.

## 6. PUBLIC AGRICULTURAL EXPENDITURE IN CHINA

### Definition

*Public expenditure* is defined as government spending at the central, provincial, and local levels. *Public agricultural expenditure, or PAE*, refers to spending by public authorities for the development of the agricultural sector, covering all parts of the government's expenditures that are related to agriculture. Hence a precise assessment of public resources allocated to the agricultural sector hinges on the definition of the agricultural sector.

In the context of China, four definitions have been widely used to measure PAE: (1) government expenditure that supports agricultural production and the departmental operating costs related to agriculture, forestry, water, and meteorology; (2) government expenditure in agriculture; (3) government expenditure in agriculture, forestry, and water; and (4) government expenditure for “*San Nong*” (the three rural issues of agriculture, rural areas, and farmers). Table 6.1 shows the components included in each definition.

**Table 6.1 Components of different definitions of public expenditure in agriculture**

Item	Definition 1 (1978–2006)	Definition 2 (1949–2006)	Definition 3 (2007–2011)	Definition 4 (2008–2011)
Agriculture	X	X	X	X
Extension	X	X	X	X
Grain and oil reserve				X
Farm subsidy	X	X	X	X
Local specialization	X	X	X	X
Agricultural co-op	X	X	X	X
Agricultural R&D		X		X
Forestry	X	X	X	X
Water	X	X	X	
Irrigation	X	X	X	X
Rural drinking water	X	X	X	X
Flood and drought	X	X	X	
Meteorology	X	X		
South-to-North water diversion			X	X
Integrated agricultural development	X	X	X	X
Poverty reduction			X	X
Natural resource conservation	X	X	X	
Rural infrastructure		X	X	
Rural welfare		X	X	X
Rural social development				X
Other	X	X	X	X

Source: Authors' compilation.

Note: “X” indicates that the item is included in the definition, and a blank cell indicates that the item is excluded from the definition.



Definitions 1 and 2 were used prior to 2006 based on a fiscal classification system originally developed by the Soviet Union, with definition 2 encompassing definition 1 and thereby entailing a larger statistical scope. The Chinese government adopted a new budget classification system with reference to the United Nations Classification of the Functions of Government (COFOG) in 2007, resulting in a substantial change in the definition and coverage of PAE over time and across different contexts. Definition 2 was replaced with definition 3, and the switch resulted in some significant changes. First, definition 3 includes all expenditure on water such as dam construction, irrigation, and rural drinking water. This could inflate PAE as expenditure on irrigation and rural water supply are the only expenditure items that are closely related to agriculture, accounting for less than one-third of total expenditure associated with water. Although agriculture benefits from multiple-purpose water-related projects like the construction and maintenance of dams, such projects are mostly for nonagricultural purposes. Second, some expenditure items were reclassified during the coding system change, causing changes in the caliber of PAE measurement. For example, forest protection used to fall under agricultural expenditure but was moved to environmental protection, and meteorological spending went into a new category called “land, resources, and meteorology.”

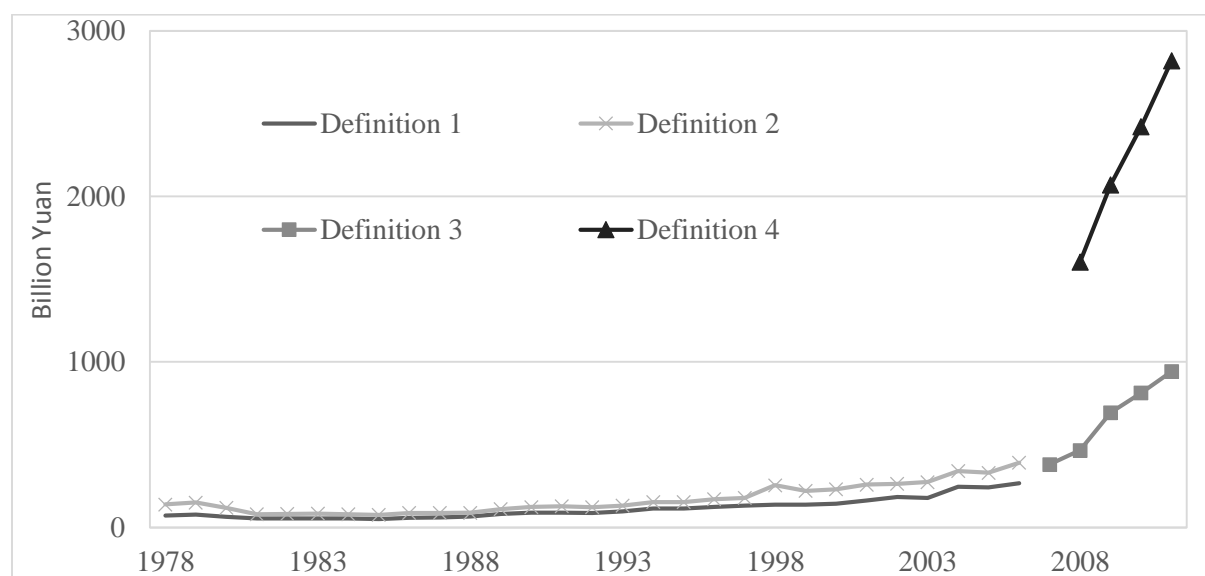
The concept of “*San Nong*” spending (definition 4) is a popular indicator of government support to the agricultural and rural sector. It is not a separate budget item and is aggregated from a number of expenditure items across various functions, which consist of expenditures in agricultural production (support for agricultural production, farm subsidy), rural social welfare (health, education, sanitation, and social protection), and grain and oil reserves.

Data on PAE used in this paper were collected from government expenditure tables in published government documents, including the *China Statistical Yearbook*, the *Finance Yearbook of China*, the *China Rural Statistical Yearbook*, the annual issue of *The Basic Situation of China's Finance* by the Ministry of Finance, the provincial *Statistical Yearbook*, and other government reports. These documents provide expenditure information at different administrative levels. Agricultural R&D expenditure is obtained from the *China Statistical Yearbook on Science and Technology*. All expenditure data are converted to 2010 constant prices to ensure comparability.

## **Trend of National Expenditure in Agriculture**

Figure 6.1 compares PAE under the four definitions from 1978 to 2012. Expenditure under definition 2 is consistently higher than under definition 1 as the former includes spending on agricultural infrastructure and rural welfare. The adoption of definition 3 in 2007 slightly increased the expenditure figures, which expanded to include South-to-North water diversion and poverty reduction. Definition 4 was about 27 percent of the total national budget in 2011, far larger than other definitions of PAE as it also takes into account expenditure on social services and welfare in rural areas. Due to differences in components of these definitions, it is impossible to extract a consistent series of PAE over three decades. Therefore, the discussion of PAE will be mainly based on definitions 2 and 3 for their similar (but not exactly matching) coverages.

**Figure 6.1 Different definitions of public expenditure in agriculture, billion Yuan**



Source: Authors' compilation.

Regardless of definition, it is clear that China's PAE expanded rapidly in the 2000s. PAE grew by 10.9 percent per year in 2003–2006 (definition 2) and 24.3 percent in 2007–2012 (definition 3), far exceeding the growth rate of total government expenditure over the same period. Total government expenditure more than doubled from 2007 to 2012, reaching 11.6 trillion Yuan or \$1.7 trillion measured in 2010 constant term (Table 6.2). Agriculture, along with transport and health, observed remarkable development, and the share of agriculture in total expenditure increased from 6.8 percent to 9.5 percent annually. That growth rate is far greater than the growth of expenditures in many other functions, like industry and commerce.

**Table 6.2 Structural of national government expenditure in China**

Variable	2007	2008	2009	2010	2011	2012	Growth rate (%)	Share of central government in total expenditure in 2012 (%)
Total expenditure (trillion 2000 Yuan)	5.6	6.4	7.9	9.0	10.4	11.6	16.2	14.9
Share in total expenditure (%)								
General public services	17.1	15.7	12.0	11.9	11.5	11.4	6.7	90.2
Foreign affairs	0.4	0.4	0.3	0.3	0.3	0.3	5.3	99.6
Defense	7.1	6.7	6.5	5.9	5.5	5.3	9.3	96.9
Public security	7.0	6.5	6.2	6.1	5.8	5.6	11.5	16.6
<b>Economic affairs</b>								
Agriculture, forestry, and water	6.8	7.3	8.8	9.0	9.1	9.5	24.3	4.2
Industry, commerce, and finance	8.6	9.9	10.0	10.1	10.2	9.6	18.5	11.3
Science and technology	3.6	3.4	3.6	3.6	3.5	3.5	16.3	49.6
Transport	3.8	3.8	6.1	6.1	6.9	6.5	31.9	10.5

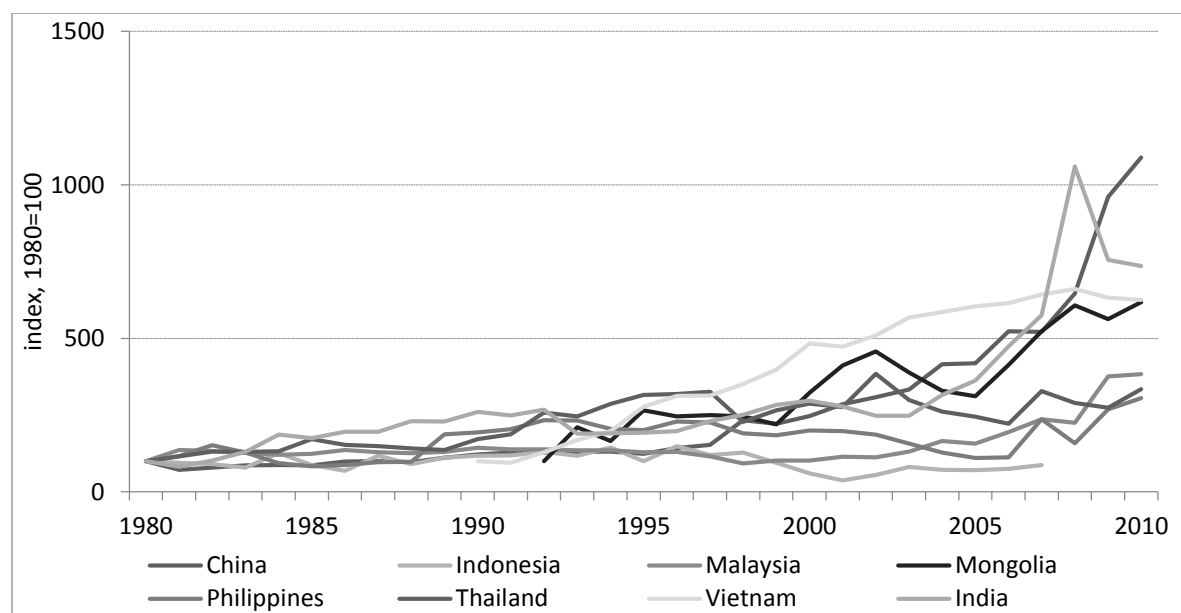
**Table 6.2 Continued**

Variable	2007	2008	2009	2010	2011	2012	Growth rate (%)	Share of cen. gov. in total exp. in 2012 (%)
<b>Social services</b>								
Education	14.3	14.4	13.7	14.0	15.1	16.9	19.5	5.2
Health	4.0	4.4	5.2	5.3	5.9	5.8	25.6	1.0
Culture, sport, and media	1.8	1.8	1.8	1.7	1.7	1.8	15.9	8.5
Community affairs	6.5	6.7	6.7	6.7	7.0	7.2	18.3	0.2
Environment protection	2.0	2.3	2.5	2.7	2.4	2.4	19.6	2.1
Social protection and employment	10.9	10.9	10.0	10.2	10.2	10.0	14.1	4.7
Housing			2.1	2.6	3.5	3.6	36.7	9.2
Other	5.9	6.0	6.5	6.3	5.0	4.2	-6.2	1.5

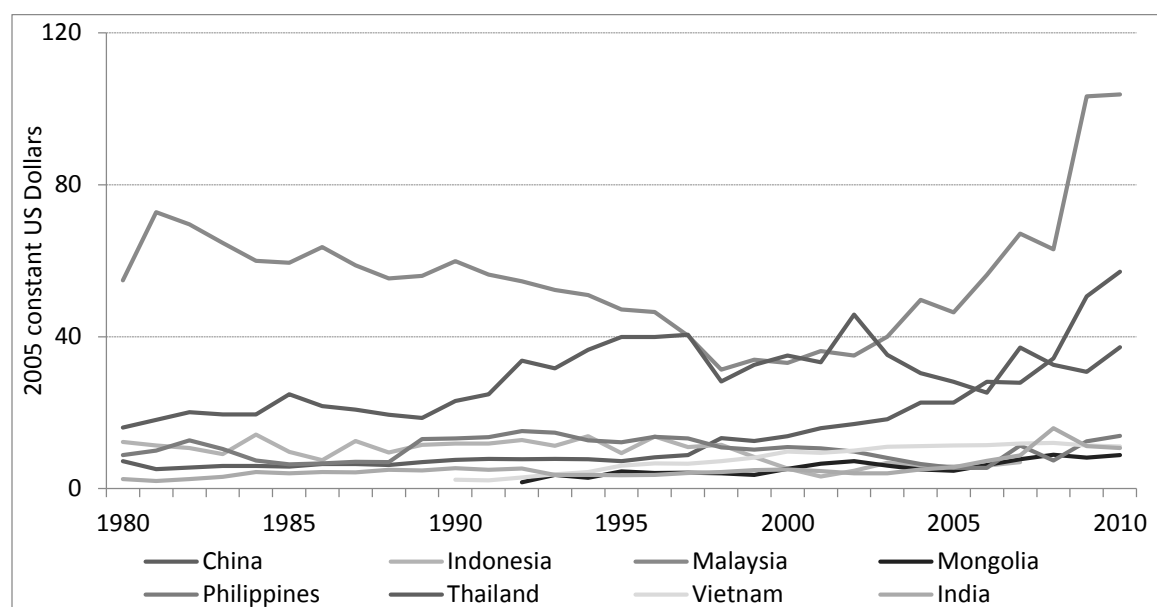
Source: Authors' compilation from National Finance Final Account (MOF various years).

The growth of Chinese PAE accelerated, especially after 2007, outpacing that of other major developing economies in Asia (Figure 6.2a). Even after the size of the country is taken into consideration, the growth of agricultural expenditure in China is very impressive as per capita agricultural expenditure rose steadily since the 1990s, surpassing many countries in the region (Figure 6.2b). Despite the rapid increase and its sheer size, agricultural spending in China is low when compared with such spending in developed economies. Per capita agricultural expenditure was about \$57 in 2010, far below the level of developed Asian countries, such as Japan (\$126) and Korea (\$226).

**Figure 6.2a The level of agricultural spending in Asia, 1980 = 100**



**Figure 6.2b Per capita agricultural spending in Asia, 2005 constant US\$**



Source: IFPRI (2013).

Note: The definition of agricultural spending follows the COFOG definition in other countries (United Nations 2013), and agricultural spending in China is defined as expenditure in agriculture in 1978–2006 and expenditure in agriculture, forestry, and water conservancy in 2007–2010.

The Chinese government intensified its emphasis on improving agricultural productivity and promoting rural development beginning in 2000. The ratio of agricultural spending to agricultural GDP was hovering between 5 and 6 percent in the 1980s; then in the late 1990s it started to rise steadily—to 21 percent in 2012, ranking China top among its developing peers. Agriculture is a mainstay in Chinese public expenditure. The share of agriculture in the total government budget dropped from 12 percent in 1980 to 8–9 percent in recent years, still a high ratio when compared with the rest of developing Asia. We observe this pattern in many developing countries as they advance through different stages of development. At the early stage of development, a country is largely agrarian and government allocates more resources to agriculture in proportion to total public expenditure. As the country develops and industrializes, the share of agriculture in total expenditure falls but the ratio of agricultural expenditure to agricultural GDP increases (Fan 2008).

## Composition of PAE

Within definition 3, agricultural expenditure is grouped according to line ministries, departments, and agencies, namely, agriculture, forestry, water management, poverty reduction, agricultural comprehensive development, rural reform, and other agricultural expenditure. Many government agencies are involved in the decisionmaking of agricultural development. Agriculture expenditure refers to expenditure made under or related to the Ministry of Agriculture, while forestry spending is expenditure by the State Forestry Administration. The State Council Leading Group Office of Poverty Alleviation and Development is in charge of poverty reduction–related activities, and the Ministry of Water Resources handles water management and irrigation. Managed under the Ministry of Finance, agricultural comprehensive development involves land upgrade, technology improvement, and diversification. Rural reform is managed by another department under the Ministry of Finance, which mainly works on rural governance–related issues. Expenditures in agriculture and water management are the two major PAE categories, accounting for 42 and 27 percent of agricultural expenditure in 2012, respectively. The rapid increase in PAE can be partly attributed to the explosive surge in water management spending, which saw large amounts of capital investment for infrastructure construction.

Instead of the administrative structure, we rearrange the items of PAE under definition 3 according to their functions. Spending related directly to agricultural production, including extension, agricultural infrastructure (land, irrigation, and drought), and sector development, made up about 16 percent of PAE (Table 6.3). Around \$30.3 billion, one-fifth of government expenditure on agriculture, forestry, and water, was allocated to subsidies, and more than half of that was subsidies for agricultural inputs, seeds, and machinery. The amount of agricultural subsidies climbed exponentially from 2004, when they were implemented, until 2008; they have stabilized since 2009, suggesting that the government is beginning to recognize the inefficiency of direct subsidies for farmers and is tapering down resources allocated to farm subsidies.

**Table 6.3 Structure of agricultural expenditure**

Variable	2010	2011	2012	Share of cen. gov. in total exp. in 2012 (%)
Agriculture, forestry, and water (billion 2010 Yuan)	813.0	942.8	1107.3	4.2
Share in public agricultural expenditure (%)				
Extension and pest control	4.9	4.2	4.0	4.2
Agricultural infrastructure	7.2	8.2	8.2	1.4
Irrigation	3.8	4.6	4.9	0.4
Drought	0.3	0.6	0.3	0.4
Land improvement	3.1	2.9	3.0	3.2
Sector development	5.1	3.3	3.4	0.9
Subsidies	20.8	19.9	20.0	2.1
Input subsidy	14.4	12.5	12.9	1.2
Subsidies to rural government	3.2	2.8	2.6	0.0
Rural infrastructure and service	13.6	14.2	14.1	2.1
Rural relief	1.5	1.7	1.5	69.7
Resource conservation	0.8	1.7	1.6	3.2
Forestry	8.2	8.8	8.5	3.8
Multipurpose water management	19.7	19.3	19.9	4.4
General services	18.1	18.6	18.8	4.9

Source: Authors' compilation from National Finance Final Account (MOF various years).

About 5 percent of PAE was used for irrigation. This is in sharp contrast with other multipurpose water management projects, such as South-to-North water diversion and construction and maintenance of dams, which constitute about 20 percent of PAE. As one of the most important types of agricultural infrastructure, irrigation spending used to enjoy a modest growth of 5 percent per year while expenditure for water management declined from 1996 to 2007 (*China Water Conservancy Yearbook* [MWR various years]). That growth was dwarfed by a skyrocketing expansion in 2008–2010, when expenditures for water management and irrigation almost doubled in three years as part of the stimulus package following the economic slowdown. This growth rate reduced to 25 to 30 percent in 2010–2012.

The Chinese fiscal system is highly decentralized. Local government is responsible for many vital functions like public safety, economic development, provision of social services and social welfare. Agricultural development is also largely managed by local government, as only 4.2 percent of PAE was apportioned to central government. Almost all functions within agricultural sector are overwhelmingly supported by local government except for rural relief to help cope with natural disasters (The last column in Table 6.3).

However, it is important to note that PAE under definition 3 is not an accurate measurement of government expenditure in agriculture. First, irrigation expenditure is a small part of the total expenditure on water resource management, and hence clearly there is an overestimate of agricultural irrigation related expenditure. Instead of irrigation and rural water supply, all water management activities are counted as expenditure used for agriculture. Additionally, about 14 percent of PAE under definition 3 was dedicated to expenditure not directly related to agricultural production but contributes to rural access to services and improved living conditions, such as rural roads, fuel, and sanitation. On the other hand, other expenditures are associated with rural development but are not captured under the current definition of PAE: for instance, agricultural R&D falls under “science and technology.”

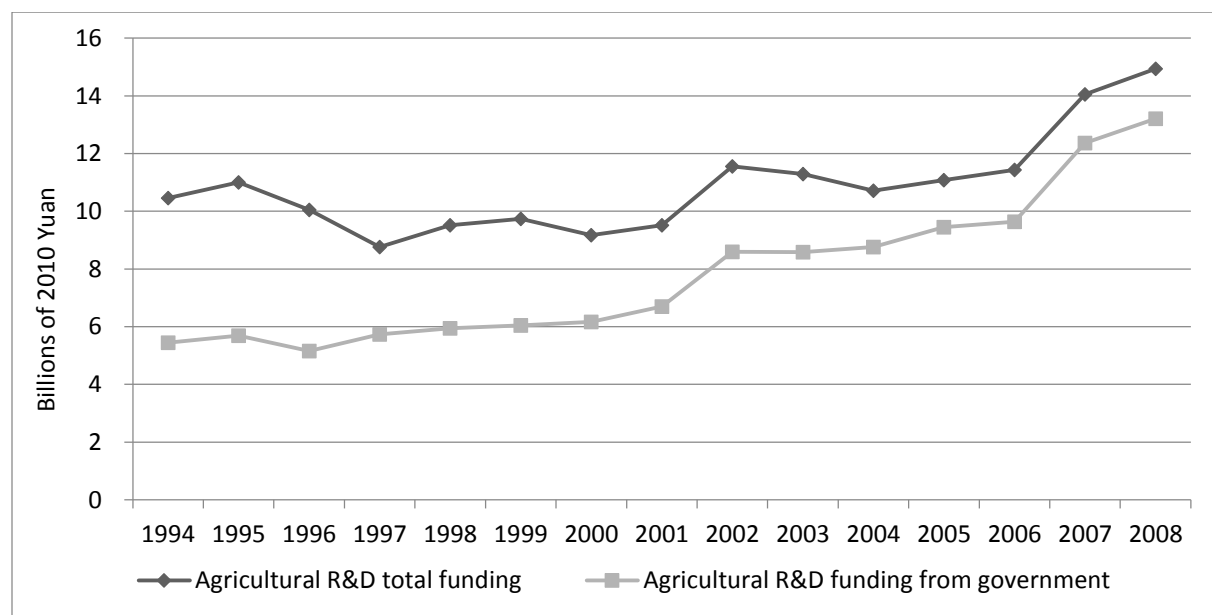
## Alignment of Agricultural Expenditure with Policy

Earlier we outlined major challenges faced by the agricultural sector—including environmental sustainability, food safety, and enlarging inequality. Policy priorities delineated in government documents also put emphasis on income inequality, rural infrastructure, water conservancy, and agricultural R&D, which is consistent with the experiences of other countries during transition. Expenditure line items allow us to compare public resources with the stated policy priorities.

### Agricultural R&D

China now has the largest agricultural R&D system in the world in terms of expenditure and number of employees (IFPRI 2014). Government investment in agricultural R&D stagnated in the 1990s, but growth sped up in the 2000s with an annual real growth rate of above 10 percent (Figure 6.3). Agricultural R&D accounted for about 10 percent of the total research expenditure during the last decade (*China Statistical Yearbook on Science and Technology* [NBS various years (b)]). Total funding received by agricultural research institutes was \$2.2 billion in 2010, of which the vast majority (89 percent) is from the government. Despite its size, the intensity of agricultural R&D stayed low at only around 0.4 in China. That rate could increase to 0.5–0.6 percent if agricultural research by academia is counted. Still, agricultural R&D intensity is much lower than the world average of 1 percent for developing countries (Alston 2010). More than half of public agricultural research is used to improve crop productivity, while other commodities and natural resource conservation receive little attention.

**Figure 6.3 Agricultural R&D expenditure, billions of Yuan at 2010 constant price**



Source: China Statistical Yearbook on Science and Technology (NBS various years [b]).

## ***Rural Infrastructure***

The literature has identified rural infrastructure, such as roads, electricity, water supply, and sanitation, as an effective tool to encourage agricultural production and reduce poverty and inequality. In 2012 China devoted about 2 percent of total expenditure to the construction and maintenance of rural infrastructure, both for augmenting agricultural production and for improving living conditions in rural areas (according to National Finance Final Account). The share of infrastructure in PAE increases marginally to 2.8 percent if irrigation and drought and flood control are included. Although government investment in water-related projects has soared in recent years, it is biased toward the construction of large-scale facilities and major water systems. More than 40 percent of government spending on water management was assigned to large water development, while farmers are responsible for irrigation and water supply schemes at the village level. Due to data constraints, it is not feasible to completely distinguish investment to boost productivity, such as in rural roads, from investment to improve rural living conditions, such as in fuel and sanitation.

## ***Environmental Sustainability***

It is widely recognized that the accelerated urbanization puts pressure on increasingly scarce resources of land and water, which will threaten national food security and environmental sustainability through shrinking available natural resources, declining soil fertility, depleted water tables, and rampant pollution. Environmental sustainability is maintained through environmental resources management and protection. Expenditure related to this issue mostly falls under two functions in the national budget: environmental protection and agriculture, forestry, and water. Irrigation and water management is also included as one of the commonly used instruments to cope with climate change. In spite of deteriorating soil and water quality caused by serious pollution, resources allocated to environmental sustainability are far from sufficient to fulfil the massive task of restoration, recovery, and conservation of natural resources for sustainable agricultural production. From 2010 to 2012, the country spent only about 3 percent of the national budget on environmental protection, mainly in the form of pollution abatement, energy conservation, and natural resource conservation (Table 6.4). Less than 1 percent of the national budget was used on activities directly associated with agricultural sustainability, such as conservation and irrigation. Irrigation represents only 5 percent of PAE or 0.4–0.5 percent of total expenditure. Together with drought and flood control, it made up a mere 0.6 percent of total national expenditure, rendering the agricultural sector vulnerable to weather shocks and changing climate.

**Table 6.4 Share of expenditures in environment sustainability, food safety, and rural infrastructure in total expenditure (%)**

<b>Variable</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
<i>Environment sustainability</i>	<i>3.21</i>	<i>3.03</i>	<i>3.08</i>
Agricultural resource conservation and use	0.06	0.15	0.15
Water and soil conservation	0.09	0.09	0.10
Flood control	0.07	0.08	0.09
Drought	0.03	0.05	0.03
Irrigation	0.34	0.42	0.47
Natural ecology conservation	0.34	0.41	0.40
Grain for grain	0.41	0.28	0.23
Grass for green	0.05	0.02	0.02
Desertification control	0.04	0.04	0.04
Pollution abatement	1.14	0.93	0.93
Energy conservation	0.63	0.55	0.62
<i>Food safety</i>	<i>0.18</i>	<i>0.16</i>	<i>0.16</i>
Food and drug supervision	0.14	0.12	0.12
Food , drug, and medical equipment examination	0.02	0.02	0.02
Food and drug evaluation	0.00	0.00	0.00
Food and drug safety	0.01	0.02	0.02
Agricultural products quality	0.04	0.04	0.04
Food distribution safety subsidy	0.00	0.00	0.00
Administration for Industry and Commerce	0.47	0.41	0.38
Quality supervision, inspection, and quarantine	0.35	0.34	0.34
<i>Rural service and infrastructure</i>	<i>1.77</i>	<i>2.08</i>	<i>2.29</i>
Rural school construction	0.02	0.17	0.17
Rural electricity grid	0.15	0.15	0.12
Rural water supply	0.28	0.21	0.25
Rural road	0.15	0.12	0.14
Agricultural infrastructure	0.28	0.27	0.28
Rural infrastructure	0.89	1.16	1.34

Source: Authors' calculation.

### **Food Safety**

Food safety comprises the whole process of growing, handling, preparing, storing, and distributing food while preventing foodborne illness. Several ministerial-level government agencies are involved in overseeing food production and regulation, but not a single agency is in charge of all food safety regulation and enforcement, leading to fragmentation in supervision and difficulty in enforcing food safety standards. The Ministry of Agriculture manages food safety at the farm level, including agricultural production and animal-borne disease; the Ministry of Science and Technology oversees food manufacturing and processing; the Ministry of Commerce is in charge of food distribution; and the Ministry of Health handles food poisoning and administers food safety inspection. In 2012, expenditure items explicitly related to food safety from agriculture, health, and commerce make up merely 0.2 percent of the national budget (Table 6.4). Even after the total expenditure for processing and inspection for all commodities (food is only a small portion) is included, food safety related expenditure remains insignificant in the budget. Undeniably, this crude estimate could be greatly improved if more information were available on total government spending in overseeing and tracking food through the whole supply chain from the producer to the consumer.



## ***Inequality***

Empirical evidence suggests high payoffs from investment in rural education and health when compared with other types of agricultural spending. Under recent policy directions, China has broadened the scope of its agricultural policy, aiming to solve inequality through policy instruments like agricultural subsidy, social welfare transfers, poverty reduction programs, and improved delivery of rural services (Table 6.5). Near one-fifth of the government's budget was allocated to reduce inequality, especially urban–rural inequality, in 2012. About 8.8 percent of total national expenditure was assigned to various social protection programs, but only a small part (1.5 percent) was explicitly earmarked for rural residents. The government also implemented an extensive set of policies to improve access to infrastructure and services in rural areas, including health, education, finance, and transport. Expenditure on human capital (health and education) in rural areas represented 2.3 percent of the national budget in 2011 and 2012, mainly through the New Cooperative Medical Scheme. Combined with rural finance and transportation, these redistributive programs to improve rural services delivery made up 2.8 percent of total expenditure. The scale of agricultural subsidies cannot be neglected as about 2 percent of the national budget was used to provide subsidized inputs and maintain rural government. The redistributive expenditure has a clear urban bias: less than half of the redistributive fund was used for rural development, although the majority of the poor live in rural areas.

**Table 6.5 Share of expenditure to reduce inequality in total expenditure (%)**

<b>Variable</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
<b><i>Equality</i></b>	<b>16.2</b>	<b>18.2</b>	<b>18.2</b>
<i>Social welfare transfer</i>	9.0	9.0	8.8
Subsidy for social insurance fund	2.6	2.9	3.0
Subsidy for rural social insurance fund	0.3	0.6	0.7
Subsidy for social security fund	0.1	0.1	0.2
Pension	2.6	2.5	2.3
Subsidy for enterprise reform	0.3	0.2	0.1
Subsidy for employment	0.7	0.6	0.6
Veterans benefits	0.7	0.7	0.7
Social welfare	0.2	0.2	0.2
Disability welfare	0.1	0.1	0.1
Urban residents welfare	0.7	0.7	0.6
Rural residents welfare	0.7	0.8	0.7
Natural disaster relief	0.4	0.2	0.2
Red cross	0.0	0.0	0.0
<i>Agricultural subsidy</i>	1.9	1.8	1.9
<i>Poverty reduction</i>	0.5	0.6	0.8
<i>Access to services</i>	3.5	4.4	4.3
Rural education	0.1	0.3	0.2
Rural clinic	0.3	0.3	0.4
Medicare	2.5	3.0	2.9
New Cooperative Medical Scheme	1.2	1.6	1.6
Rural Medical Assistance	0.1	0.1	0.1
Urban medical insurance and assistance	0.3	0.4	0.4
Rural finance	0.0	0.1	0.1
Subsidy to urban public transportation	0.1	0.3	0.3
Subsidy to rural transportation	0.5	0.5	0.4
<i>Low-income housing</i>	1.4	2.4	2.5

Source: Authors' calculation.

## 7. CONCLUSION AND POLICY IMPLICATIONS

The paper first reviews agricultural policy and current production conditions in China. Agricultural policies shifted from taxing to supporting agriculture in the mid-2000s, but the agricultural sector faces mounting challenges of demographic change, environmental sustainability, food safety, and enlarged inequality. The literature and international experience suggest general policy interventions during the economic transformation: intensified investment in agricultural R&D, improved access to rural infrastructure and services, mechanization to increase capital intensity, development of human capital through health and education, supportive agricultural policy, and increased social protections and transfers for rural residents. Chinese government has given agriculture strategic importance and has defined policy priorities on income inequality, rural infrastructure, water conservancy, and agricultural R&D. This policy prescription is consistent with that of other economies undergoing structural transformation in the last century.

Agricultural expenditure in China declined in the 1980s but has quickly recovered, outpacing that of other major developing economies in Asia. The composition of PAE is examined against existing challenges and policy priorities articulated in government documents. In 2012, around one-fifth of government PAE was allocated to subsidies, mostly subsidies for agricultural inputs. Agricultural research institutes received \$2.2 billion in funding in 2010, but the intensity of agricultural R&D remained below the global average for developing countries. Resources allocated to maintain and improve environmental sustainability are quite low despite the urgency of land and water shortages. The importance of food safety has not been fully appreciated and expenditure for food inspection and regulation is extremely low, hindering the agricultural sector from meeting growing domestic and international food safety standards.

To promote more equitable growth, China has allocated about 18 percent of the total national budget to reduce inequality in the society, of which about half was assigned to various social protection programs, largely benefiting urban residents. The government has also implemented an extensive set of policies to improve access to infrastructure and services in rural areas, including health, education, finance, and transport. In recent years, rural infrastructure received increased attention as infrastructure spending reached more than 2 percent of total expenditure. Redistributive transfers in the form of agricultural subsidy also play a role in closing the rural–urban income gap.

Given the formidable challenges in improving the effectiveness of agricultural expenditure, it is recognized that the reform will be a long-term effort to improve public-sector performance and balance multiple development objectives for agriculture and rural development, and the government budget should reflect both national and local development strategies and address constraints in sectoral growth. Several policy recommendations can be drawn from this study.

First, fiscal resources needed to be prioritized across activities to ensure the optimal use of public funds. The agricultural subsidy policy should be reconsidered to effectively achieve the policy objectives of ensuring a strategic supply, cutting out inefficiencies, and maintaining economic and environmental sustainability. One option is to scale down input subsidies with better targeting, and to expand income support programs that are decoupled from production decisions. Yu and Jensen (2010) have suggested that decoupled payment is a better policy option because it is a uniform payment to supplement farmers' income regardless of the crop choice, essentially becoming an income transfer to land users. Unlike input subsidies, decoupled payment is considered nondistortive because it does not cause inefficient resource allocation across agricultural activities by diverting scarce public resources from better uses. The application of decoupled payment will not change agricultural output, trade, rural employment, or relative prices, but it will result in larger farm income increases when compared with input subsidy.

Second, given the challenges posed by demographic change, income growth, and climate change, productivity growth will be the key to fostering long-term production growth and improving smallholder competitiveness in agriculture. Historically, agricultural technology has been considered a key factor in driving the remarkable achievement in Chinese agriculture through improved productivity, which in turn calls for the rapid expansion of agricultural R&D to support future growth. Investment in agricultural R&D includes the development of new technologies for climate-resilient and high-yield varieties, labor-

saving technology and mechanization, sustainable land management, and water and energy conservation. The investment gap in agricultural R&D is considerably large, and considerable new funds are required to meet the policy objective of poverty reduction and food security.

Third, the country needs to continuously increase its investment in agricultural infrastructure with a particular emphasis on small rural infrastructure. The increased government investment in water-related projects is biased toward large-scale facilities and major water systems and generally neglects small-scale and village-level water management projects. Measures need to be in place to ensure that an adequate share of water expenditure goes to small infrastructure such as field irrigation to benefit agriculture and farmers directly.

Fourth, urbanization and agricultural transformation requires investment in human capital and rural infrastructure to facilitate the shift of agricultural labor to nonagricultural employment. Such investment will fundamentally increase agricultural productivity and hence improve the terms of trade of the agricultural sector. Expenditures on rural education and health exhibited an upward trend and represent 2.3 percent of total expenditure in 2012. Analysis has suggested that distributional outcomes can be improved by addressing inefficiencies in the design, targeting, and implementation of these programs (Li, Sato, and Sicular 2013). Given such a massive amount of resources (\$351 billion), it is important to have a clearly delineated monitoring and evaluation mechanism to measure and evaluate the efficiency, effectiveness, and impact of social welfare projects. Unfortunately such a mechanism (if it does indeed exist) is not reflected in the national budget, and the lack of awareness and understanding of policy impact could prevent the formulation of an effective policy and its integration into the planning of government expenditures.

Fifth, substantial resources need to be devoted to ensuring that as the economy and population expand China does not sacrifice its food safety. Serious sector fragmentation leads to inefficiencies as many food safety programs are created and managed in an ad hoc and unsystematic manner from above, resulting in overlapping responsibilities, partial or inefficient implementation, and the underprovision of food safety regulation, inspection, and enforcement. A centralized mechanism is needed to comprehensively oversee food safety programs and ensure that different ministerial plans affecting the agricultural and food sectors are coordinated to reflect coherent strategies to ensure food safety. Institutional innovations and coordination can help monitor smallholder farmers' compliance with food safety standards by enhancing the capacity of related agencies and developing tools to keep up with increasingly complex food production systems. The government also should play the lead role in promoting understanding of agriculture-related disease transmission to help farmers mitigate losses and cut down on excessive use of pesticide.

China's budget reform is far from finished, and it is recognized that the reform and its implementation will be a long-term effort to improve public-sector performance and balance multiple development objectives for agriculture and rural areas. There is a huge knowledge gap in the systematic recording of public investment data related to agricultural and rural development. To improve the availability, accessibility, and timeliness of information, China must improve transparency in tracking and monitoring government expenditure with disaggregated details. China's current definition of agricultural spending is not a precise measurement of resources allocated to agricultural production, and that is further complicated by data limitations, the lack of systematic expenditure classification, and the application of different definitions of public spending in agriculture by various statistical sources. The popular term of "*San Nong*" is a questionable and misleading measure due to the vagueness of the definitions involved, and it significantly overestimates the government's fiscal contribution to agriculture (World Bank 2007). Policy analysis at the subnational level is also compromised by the lack of detailed expenditure data and inconsistent reporting in key areas.

## APPENDIX: SUPPLEMENTARY TABLE

**Table A.1 Contents of the “No. 1 Document”**

<b>Year</b>	<b>Theme</b>
2004	Boost farmers' income.
2005	Strengthen rural work and improve agricultural production capacity.
2006	Construct a New Socialist Countryside.
2007	Develop modern agriculture and promote the construction of a New Socialist Countryside.
2008	Fortify the foundation of agriculture.
2009	Achieve steady agricultural development and sustained income increases for farmers.
2010	Speed up coordinated development between urban and rural areas and further cement foundation of agricultural and rural area development.
2011	Accelerate development of water conservancy.
2012	Invest in agricultural science and technology for sustained agricultural growth.
2013	Accelerate agriculture modernization and strengthen the vitality of rural areas.

Source: Xinhua News Agency (2013).

## REFERENCES

- Aiyar, S., R. Duval, D. Puy, Y. Wu, and L. Zhang. 2013. *Growth Slowdowns and the Middle-Income Trap*. Working Paper WP/13/71. Washington, DC: International Monetary Fund.
- Alston, J. 2010. *The Benefits from Agricultural Research and Development, Innovation, and Productivity Growth*. OECD Food, Agriculture, and Fisheries Working Paper 31. Paris: Organisation for Economic Co-operation and Development Publishing.
- Chen, J. 2007. "Rapid Urbanization in China: A Real Challenge to Soil Protection and Food Security." *Catena* 69: 1–15.
- NBS (National Bureau of Statistics of the People's Republic of China). Various years (a). *China Statistical Yearbook*. Beijing: China Statistics Press.
- . Various years (b). *China Statistical Yearbook on Science and Technology*. Beijing: China Statistics Press.
- MWR (Ministry of Water Resources of the People's Republic of China). Various years. *China Water Conservancy Yearbook*. Beijing: Waterpower Press.
- Christiaensen, L. 2012. *The Role of Agriculture in a Modernizing Society: Food, Farms, and Fields in China 2030*. Discussion Paper 77367. Washington, DC: World Bank.
- Denison, E., and W. Chung. 1976. "Economic Growth and Its Sources." In *Asia's Next Giant: How the Japanese Economy Works*, edited by H. Patrick and H. Rosovsky. Washington, DC: Brookings Institution.
- Dixon, C. 1999. *The Thai Economy: Uneven Development and Internationalisation*. London: Routledge.
- Fan, S., ed. 2008. *Public Expenditures, Growth, and Poverty*. Baltimore: Johns Hopkins University Press.
- Fan, S., and J. Brzeska. 2010. "Production, Productivity, and Public Investment East Asian Agriculture." In *Handbook of Agricultural Economics*, vol. 4, edited by P. Pingali and R. Evenson. Amsterdam: North-Holland.
- Fan, S., C. Chan-Kang, K. Qian, and K. Krishnaiah. 2005. "National and International Agricultural Research and Rural Poverty: The Case of Rice in India and China." *Agricultural Economics* 33 (s3): 369–379.
- Fan, S., R. Kanbur, and X. Zhang, eds. 2009. *Regional Inequality in China: Trends, Explanations, and Policy Responses*. London and New York: Routledge, Taylor and Francis Group.
- Fan, S., L. Zhang, and X. Zhang. 2004. "Reforms, Investment, and Poverty in Rural China." *Economic Development and Cultural Change* 52 (2): 395–421.
- Hayami, Y. 2007. *An Emerging Agricultural Problem in High-Performing Asian Economies*. Policy Research Working Paper 4312. Washington, DC: World Bank.
- IFPRI (International Food Policy Research Institute). 2013. "Statistics of Public Expenditure for Economic Development (SPEED)" database. Washington, DC.
- . 2014. *Agricultural Science and Technology Indicators*. Washington, DC.
- Li, S., H. Sato, and T. Sicular, eds. 2013. *Rising Inequality in China: Challenges to a Harmonious Society*. New York: Cambridge University Press.
- Lipton, M., and Q. Zhang. 2007. "Reducing Inequality and Poverty during Liberalisation in China: Rural and Agricultural Experiences and Policy Options." In *Changing Contours of Asian Agriculture: Essays in Honour of Vijay Vyas*, edited by S. Singh and R. Reddy. Sussex University: Poverty Research Unit.
- Mogues, T. 2012. *What Determines Public Expenditure Allocations? A Review of Theories, and Implications for Agricultural Public Investment*. Discussion Paper 01216. Washington, DC: International Food Policy Research Institute.
- MOF (Ministry of Finance of the People's Republic of China). Various years. The National Finance Final Account. [http://www.mof.gov.cn/zhengwuxinxi/caizhengshuju/index\\_1.htm](http://www.mof.gov.cn/zhengwuxinxi/caizhengshuju/index_1.htm).

- MOHRSS (Ministry of Human Resources and Social Security of the People's Republic of China). 2013. *2012 Annual Human Resources and Social Security Development Statistics Bulletin*. Accessed June 2014. [http://www.mohrss.gov.cn/SYrlzyhshbzb/dongtaixinwen/shizhengyaowen/201305/t20130528\\_103939.htm](http://www.mohrss.gov.cn/SYrlzyhshbzb/dongtaixinwen/shizhengyaowen/201305/t20130528_103939.htm).
- MOHRSS and ILO (International Labor Organization). 2011. *Employment Policies Report—China: Promoting Decent Employment for Rural Migrant Workers*. Beijing: ILO.
- Montalvo, J. G., and M. Ravallion. 2010. "The Pattern of Growth and Poverty Reduction in China." *Journal of Comparative Economics* 38 (1): 2–16.
- Nin-Pratt, A., B. Yu, and S. Fan. 2010. "Comparisons of Agricultural Productivity Growth in China and India." *Journal of Productivity Analysis* 33 (3): 209–223.
- . 2009. OECD Rural Policy Reviews: China. Accessed May 2013. <http://www.oecd.org/gov/oecd-rural-policy-review-china.htm>.
- Ravallion, M., and S. Chen. 2007. "China's (Uneven) Progress against Poverty." *Journal of Development Economics* 82 (1): 1–42.
- Schultz, T. 1953. *The Economic Organization of Agriculture*. New York: McGraw-Hill.
- , ed. 1978. *Distortion of Agricultural Incentives*. Bloomington, IN, US: Indiana University Press.
- United Nations. 2010. *World Population Prospects, the 2012 Revision*. Department of Economic and Social Affairs, Population Division, Population Estimates and Projections Section. Accessed June 2013. <http://esa.un.org/wpp/Excel-Data/population.htm>.
- . 2013. "Detailed Structure and Explanatory Notes. COFOG (Classification of the Functions of Government)." <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=4>.
- World Bank. 2007. China: Public Services for Building the New Socialist Countryside. Report No. 40221-CN. Washington, DC: The World Bank.
- . 2009. *From Poor Areas to Poor People: China's Evolving Poverty Reduction Agenda. An Assessment of Poverty and Inequality in China*. Report 47349-CN. Washington, DC: World Bank.
- . 2014. World Development Indicators. Accessed June 2014. <http://data.worldbank.org/data-catalog/world-development-indicators>.
- Xinhua News Agency. 2013. China Targets Rural Issues in Central Document. Accessed June 2013. [http://www.china.org.cn/china/2013-01/31/content\\_27853344.htm](http://www.china.org.cn/china/2013-01/31/content_27853344.htm).
- Yu, B., X. Liao, and H. Sheng. 2014. "Parametric Decomposition of the Malmquist Index in Output-Oriented Distance Function: Productivity in Chinese Agriculture." *Modern Economy* 5 (1): 70–85.
- Yu, W., and H. G. Jensen. 2010. "China's Agricultural Policy Transition: Impacts of Recent Reforms and Future Scenarios." *Journal of Agricultural Economics* 61 (2): 343–368.
- Zhang, X., and S. Fan. 2004. "Public Investment and Regional Inequality in Rural China." *Agricultural Economics* 30 (2): 89–100.
- Zhang, Y., and B. Brümmer. 2011. "Productivity Change and the Effects of Policy Reform in China's Agriculture since 1979." *Asian-Pacific Economic Literature* 25 (2): 131–150.

## RECENT IFPRI DISCUSSION PAPERS

For earlier discussion papers, please go to [www.ifpri.org/pubs/pubs.htm#dp](http://www.ifpri.org/pubs/pubs.htm#dp).  
All discussion papers can be downloaded free of charge.

1396. *Public account and coding system in Kenya: The trend and pattern of agricultural expenditure*. Bingxin Yu, 2014.
1395. *Analysis of agricultural public expenditures in Nigeria: Examination at the federal, state, and local government levels*. Aderibigbe Olomola, Tewodaj Mogues, Tolulope Olofinbiyi, Chinedum Nwoko, Edet Udoh, Reuben Alabi, Justice Onu, Sileshi Woldeyohannes, 2014.
1394. *International rice trade and security stocks: Prospects for an expanded Asian international rice reserve*. Paul A. Dorosh and Abigail Childs, 2014.
1393. *The US agricultural act of 2014: Overview and analysis*. Carl Zulauf and David Orden, 2014.
1392. *The changing landscape of agriculture in Ghana: Drivers of farm mechanization and its impacts on cropland expansion and intensification*. Nazaire Houssou and Antony Chapoto, 2014.
1391. *Beyond agriculture versus nonagriculture: Decomposing sectoral growth–poverty linkages in five African countries*. Paul Dorosh and James Thurlow, 2014.
1390. *Agriculture, incomes, and gender in Latin America by 2050: An assessment of climate change impacts and household resilience for Brazil, Mexico, and Peru*. Lykke E. Andersen, Clemens Breisinger, Daniel Mason-D'Croz, Luis Carlos Jemio, Claudia Ringler, Richard Robertson, Dorte Verner, and Manfred Wiebelt, 2014.
1389. *Does rice farming shape individualism and innovation?: A response to Talhelm et al. (2014)*. Jianqing Ruan, Zhuan Xie, and Xiaobo Zhang, 2014.
1388. *On food security stocks, peace clauses, and permanent solutions after Bali*. Eugenio Diaz-Bonilla, 2014.
1387. *Economics of tractor ownership under rainfed agriculture with applications in Ghana*. Nazaire Houssou, Xinshen Diao, and Shashidhara Kolavalli, 2014.
1386. *Land rights knowledge and conservation in rural Ethiopia: Mind the gender gap*. Agnes R. Quisumbing and Neha Kumar, 2014.
1385. *The patterns of patents in China*. Zhuan Xie and Xiaobo Zhang, 2014.
1384. *Understanding the rapid reduction of undernutrition in Nepal, 2001–2011*. Derek D. Headey and John Hoddinott.
1383. *Two-tier asymmetric information as a motive for trade, trade policies, and inefficient trade agreements*. Antoine Bouët, David Laborde, and David Martimort, 2014.
1382. *The tide that does not raise all boats: An assessment of EU preferential trade policies*. Maria Cipollina, David Laborde, and Luca Salvatici, 2014.
1381. *The impact of India's rural employment guarantee on demand for agricultural technology*. Anil K. Bhargava, 2014.
1380. *Towards understanding economic growth in Africa: A reinterpretation of the Lewis Model*. Xinshen Diao and Margaret McMillan, 2014.
1379. *The nutritional returns to parental education*. Harold Alderman and Derek D. Headey, 2014.
1378. *Evidence-based research and its effect on policymaking*. Nurul Islam, 2014.
1377. *The development push of refugees: Evidence from Tanzania*. Jean-François Maystadt and Gilles Duranton, 2014.
1376. *Food safety and developing markets: Research findings and research gaps*. Laurian Unnevehr and Loraine Ronchi, 2014.
1375. *Costing alternative transfer modalities*. Amy Margolies and John Hoddinott, 2014.
1374. *Do girls pay the price of civil war?: Violence and infant mortality in Congo*. Olivier Dagnelie, Giacomo De Luca, and Jean-François Maystadt, 2014.
1373. *Variable returns to fertilizer use and its relationship to poverty: Experimental and simulation evidence from Malawi*. Aurélie Harou, Yanyan Liu, Christopher B. Barrett, and Liangzhi You, 2014.
1372. *Drought risk reduction in agriculture: A review of adaptive strategies in East Africa and the Indo-Gangetic Plain of South Asia*. Nicola Cenacchi, 2014.

**INTERNATIONAL FOOD POLICY  
RESEARCH INSTITUTE**

**[www.ifpri.org](http://www.ifpri.org)**

**IFPRI HEADQUARTERS**

2033 K Street, NW  
Washington, DC 20006-1002 USA  
Tel.: +1-202-862-5600  
Fax: +1-202-467-4439  
Email: [ifpri@cgiar.org](mailto:ifpri@cgiar.org)

**IFPRI BEIJING OFFICE**

Institute of Agricultural Economics, CAAS  
No. 176 mail box  
No. 12, Zhongguancun Nandajie  
Beijing, 10081 China  
Email: [ifpri-Beijing@cgiar.org](mailto:ifpri-Beijing@cgiar.org)