24. China's 40 years of agricultural development and reform

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Since the founding of the People's Republic of China (PRC) more than seven decades ago, agriculture has experienced a roller-coaster development path (Lardy 1983). The first challenge began with the implementation of bold (but not always neat) land reform in which farmland and livestock were confiscated from landlords. The means of farm production were then distributed to villagers. The nation's planners then (mostly) successfully implemented the first 'five-year plan', in 1952–57. The next plan, however, during the Great Leap Forward, was more difficult. Growth slowed and China struggled to manage its land—and its people—through large communes. After experiencing the world's largest famine in the late 1950s and early 1960s, China's farm sector began to recover between 1962 and the mid-1960s. However, the political chaos of the Cultural Revolution spilled over into agriculture, which slowed that sector's growth and stymied rural development. This slowdown stretched through to the late 1970s.

So where did China's farming sector find itself in the late 1970s? Between 1952 and 1978, agricultural gross domestic product (GDP) grew at an average of 2 per cent annually. The average annual growth of per capita net income (inflation adjusted) in the countryside was even lower—only 1.75 per cent (NBS various years). Given that rural areas were mired in extreme poverty in the early 1950s, such anaemic growth meant the countryside was still impoverished when reformers took power in the late 1970s.

The past 40 years of development and reform have profoundly changed the landscape of China's agricultural and rural areas (Huang and Rozelle 2010). Despite limited natural resources, China has been able to meet its growing demand for food largely through its own agricultural production. Annual growth of real agricultural GDP averaged 4.5 per cent over the four decades. While the average annual population growth rate was only 1 per cent per annum, per capita GDP nearly quadrupled between 1978 and 2018 (NBS 2010, various years). China, with nearly 20 per cent of the world's population, but only 5 per cent of the world's fresh water and 8 per cent of its arable land, met 95 per cent of its own food demand in 2015 (Huang and Yang 2017).

China's agriculture has experienced rapid structural transformation during the past 40 years. Grain production dominated farm output in 1978, and in the late 1970s nearly the entire rural economy was engaged in on-farm employment. Agriculture has since diversified dramatically. The farm economy is now highly commercialised and tens of millions of farms produce high-value commodities. Where off-farm employment was once rare, today, a majority of rural household income is earned off-farm.

Growth in agriculture and rising off-farm employment have dramatically reduced rural poverty. The number of people in rural China in extreme poverty fell from 250 million in 1978 to less than 15 million in 2007 (NBS various years). The rural poverty rate fell from 32 per cent to less than 3 per cent. Even with a higher poverty threshold—RMB2,300 a day in 2010 prices, or slightly more than \$2 a day in purchasing power parity (PPP) terms—rural poverty levels decreased from 166 million people (17.2 per cent) in 2010 to 30 million (3.1 per cent) in 2017 (NBS various years). China was the first developing country to meet the Millennium Development Goals target of reducing its population living in poverty by more than half, and accomplished this far ahead of the 2015 deadline. Today, the goal of China's government is the elimination of rural poverty by 2020.

While these achievements are impressive, the agricultural sector is facing great challenges. Food production has risen at the expense of the environment, creating tremendous challenges to achieving sustainable rural development (Zhang et al. 2013; Lu et al. 2015). Rising wages have increased the cost of food production and lowered China's agricultural competitiveness in global markets, while concerns about national food security are as high as ever (Huang 2013a; Han 2014). Despite steady growth in rural incomes, the rural–urban income gap remains high. In recent years, the government has sought to raise farmer incomes in part through a number of market and policy interventions (using its procurement system to support prices). While incomes did rise incrementally, the interventions created structural problems in agricultural commodity markets (Chen 2016; Huang and Yang 2017). In coming years, China's policymakers will have no option but to deal with issues of national food security, higher farmer incomes and sustainable agricultural development.

In 2017, China launched the multidimensional Rural Revitalisation Development Strategy, which will require China to harness lessons from its past development and policymaking. Reviewing the past 40 years will also provide lessons for the development of agriculture in other developing countries.

In the next section, we summarise 40 years of China's agricultural development. In section three, we discuss agricultural growth and the reform experience in the first three decades of China's reforms, while section four extends our analysis to today by focusing on the challenges of agricultural development and policy evolution since the early 2000s. The conclusion provides a discussion of policy implications.

Forty years of agricultural development

Agricultural growth

In the past four decades, agricultural output value in real terms has grown at an average rate of 5.4 per cent annually (Table 24.1), while annual growth of grain production was 2.1 per cent. China's cropping economy has steadily changed from a priority on grain to the production of higher-value cash crops and horticultural goods. The average annual growth rate for cotton reached 3.8 per cent, 5.3 per cent for sugarcane, 6.4 per cent for edible oils and 11.5 per cent for fruit over the 40 years. Livestock and aquaculture products have been growing even faster. Annual meat production rose by an average of 5.9 per cent and fish by 7.3 per cent per annum. Dairy increased most rapidly, at 9 per cent annually.

Table 24.1 Average annual growth rate of agriculture and national population in China, 1952–2016 (per cent)

	Pre-reform	Reform period ^a					
	1952–78	1978–84	1984–2000	2000–05	2005–10	2010–16	Average
Agricultural GDP	2.2	6.9	3.8	3.9	4.5	4.0	4.5
Agricultural gross output value	3.4	5.9	5.9	5.3	4.8	4.2	5.4
Grain	2.5	5.5	0.9	1.0	2.5	2.0	2.1
Cotton	4.0	17.9	–0.6	6.4	2.0	–1.7	3.8
Edible oil crops	1.4	17.6	6.4	0.9	1.5	2.0	6.4
Sugar crops	7.8	13.6	3.7	4.8	5.3	0.5	5.3
Fruits	4.0	8.5	12.5	26.2	5.8	4.8	11.5
Vegetables ^b	n.a.	4.6	8.3	3.1	1.5	2.2	5.2
Meat	n.a.	7.8	9.1	2.9	2.7	1.3	6.0
Pork, beef and mutton	4.4	11.4	7.5	2.9	2.4	1.0	5.9
Poultry	n.a.	n.a.	14.9	2.9	4.2	2.3	8.8
Dairy	n.a.	n.a.	8.2	25.6	5.7	–0.1	9.0
Fish	4.7	4.2	12.1	3.6	4.0	4.3	7.3
Population	2.0	1.4	1.2	0.6	0.5	0.5	1.0

n.a. data not available.

^a Meat production data are available from 1979; poultry production data are available from 1985.

^b Vegetables are measured in sown area; data are available from 1979. Notes: Except for vegetables, the growth rates of individual and groups of commodities are based on production data. Agricultural GDP and gross value refer to values in real terms.

Sources: Authors' estimations based on data from NBS (various years, 2010).

The average annual growth of real per capita gross agricultural output increased from 1.4 per cent during the period 1952–78 to 4.4 per cent during the period 1978–2016 (Table 24.1).

Changes in agricultural structure and rural employment

Both supply- and demand-side factors affected the trends in the transformation of farming. Overall economic growth, urbanisation and market development have fundamentally changed Chinese food consumption, and driven changes in the structure of agricultural production. Within the cropping sector, the share of area under nongrain cash crops increased from 20 per cent in 1978 to 32 per cent in 2016. Over the same period, the share of the noncrop sector (mainly livestock and fisheries) in total agricultural output value grew from 20 per cent to 47 per cent (NBS 2010, various years). These changes mainly reflect the gradual shift from staple food production towards more diverse, intensive and commercial agriculture.

Following the 1949 Communist revolution, the government focused on the increasing demand for grain to meet the consumption needs of its growing population. China used 89 per cent of its cultivated land for grain production in 1950. In 1980, more than 80 per cent of farmland was being used to produce grain (NBS 2010).

Agricultural diversification began its slow march in the early 1980s. The first step was the granting of greater autonomy over production decisions in 1978. While in the 1980s households had an obligation to produce and sell grain to the state procurement system, once they met their production quotas, they could produce other crops, livestock and fish. Governments allocated large sums for irrigation and new technologies.

It is easy to illustrate the consequences of these policies. In the early reform period (1977–84), grain production rose by 34 per cent (NBS 2010). As a result, farmers were able to allocate more land, water, labour and capital to cash crop production. This effort to diversify agriculture helped the rural population raise their earnings in the early reform years. During this stage, agriculture was fuelled by not only the emergence of higher-value cash crops, but also the rise of livestock production and sales. The share of area planted to cash crops (mainly vegetables, fruits, edible oils and cotton) increased from less than 20 per cent before 1980 to about one-third in the early 2000s. In the meantime, the share of cropping in total agricultural production decreased from 80 per cent in 1978 to 56 per cent in 2000. The share of agricultural output from livestock rose from less than 17 per cent in 1978 to more than 40 per cent after 2000 (NBS 2010).

There were many implications of this shift. Because the production of nongrain commodities and livestock is more labour intensive, the diversification of China's agricultural economy helped address the underemployment that had plagued rural China during the entire PRC period. Diversification led to an increase in the number of days farmers could work and this raised their income.

Since the 1990s, agriculture has steadily become more specialised and, in recent years, mechanisation has begun. Nonfarm employment has increased significantly. The rise in agricultural productivity and diversification and the booming growth of the national economy (in industry, construction and so on) have led to a fundamental shift in the rural economy. Since the early 1990s, there has been a strong rise in the movement of rural labour from agriculture to off-farm employment. Initially, this shift occurred mainly in rural areas when farmers gained employment in township and village enterprises (TVEs). This was an ideal stepping stone for what was to follow, because it allowed farmers to work part-time on the farm and part-time in the off-farm market (Rozelle et al. 1999).

As economic reforms expanded in the 1990s, the rise of urbanisation and China's move to promote labour-intensive manufacturing and construction provided an even stronger impetus to move off the farm. Farmers were working in rural and urban areas both as wage earners and in the self-employed business sector (Wang et al. 2011). With these new opportunities came an increase in the intensity of off-farm work (a rise in the number of months per year, days per month and hours per day), and such activities provided a huge boost to farmers' incomes.

In recent years, China's economic rise finally absorbed most of the available rural labour. Since the mid-2000s, off-farm wages have been rising and the rural economy has become even more specialised—with farmers specialising on-farm and large numbers of rural individuals specialising in nonfarm activities (Wang et al. 2017). These changes have, of course, affected the nature of farming. As more households began to work full-time off the farm, they also began to rent out their land (Gao et al. 2012). Those who stayed are the ones renting this land, which is behind a steady increase in farm size and increasing pressure to mechanise (Zhang et al. 2013; Huang and Ding 2016; Wang et al. 2016).

Major drivers of agricultural growth and reform experiences

Numerous studies have tried to examine the many factors contributing to China's agricultural growth. Our studies, which are consistent with many others, show that rural institutional innovation, technological change, market reform, trade liberalisation and investment in agriculture are among the major enabling factors of China's agricultural growth and transformation.

Institutional innovations

China's first rural reform, the household responsibility system (HRS), was implemented during the period 1978–84. This dismantled the people's communes and contracted cultivated land to individual households, mostly on the basis of the number of people and/or labourers in the household. Although the ownership of land remained collective, control and income rights belonged to individuals under the HRS. The first land contract term was 15 years. When this ended in the late 1990s, it was extended to 30 years for the second term. The government today is struggling with what to do when this contract period finishes.

The effects of the HRS on agricultural productivity, equitable distribution of land to farmers and rural poverty alleviation have been well documented. Most studies show the HRS accounted for 30–50 per cent of the total rise in agricultural output during the period 1978–84 (Fan 1991; Lin 1992; Huang and Rozelle 1996). Researchers also have revealed the empirical impacts that go beyond output. McMillan et al. (1989) demonstrate that the HRS raised total factor productivity (TFP), accounting for 90 per cent of its rise between 1978 and 1984. Jin et al. (2002) show that reform had a large effect on productivity, contributing to a rise in agricultural TFP. The significant positive impacts of the HRS on agricultural production and the equitable distribution of land were the major reasons for the massive reduction of rural poverty in the early 1980s. Rising agricultural productivity due to the HRS also facilitated China's transformation from grain-dominated to more diversified agriculture because farmers were able to shift their land and labour from grain to cash crops and livestock.

Over the past four decades, additional institutional changes targeted at raising agricultural productivity and facilitating rural transformation have been made. The major efforts in land use have been on stabilising the HRS in the late 1990s (Ji and Huang 2013) and developing institutional arrangements (such as township land rights transfers) to facilitate land consolidation since the mid-2000s (Huang and Ding 2016). Stabilising farmers' control and income from land contract rights is important because it provides incentives for farmers to invest in agriculture and land and stimulates land transfer among farmers, increasing farm size, which improves

agricultural efficiency, productivity and incomes (Gao et al. 2012; Huang and Ji 2012; Jin and Deininger 2009). Huang and Ding (2016) show that one-third of the land contracted by households through the HRS was transferred among farmers.

Another, recent innovation in land institutions is *San-quan-fen-zhi*, which separates three rights: village collective landowner rights, individual household land contract rights and land operation rights. By separating a farmer's land operation rights from contract rights, the former can be transferred through the rental market while the original contracted farmers continue to hold the contract rights. It is hoped this reform can achieve equity of land distribution and efficient use of currently cultivated land through operation rights transfers.

Institutional reforms have also occurred in many other areas, including the gradual relaxation of the household registration system (*hukou*). Although *hukou* is still a binding policy in many areas, there has been progress, which has stimulated rural–urban migration and off-farm employment since the mid-2000s (Cai et al. 2007). Since the late 2000s, a number of institutional reforms and new laws have been piloted and implemented to promote professional farmer cooperatives and help farmers to commercialise their activities (Deng et al. 2010).

Despite the successful institutional reforms discussed above, there is still substantial room to improve the institutional environment governing land, labour and capital, and further reform of land institutions is needed to facilitate land consolidation. There is a need for stronger, more flexible and farmer-friendly financial institutions, and room to integrate China's rural and urban labour markets.

Technology changes

Over the past 40 years, China's agricultural research and development (R&D) and extension system has been reformed, contributing significantly to agricultural productivity growth.

There have been four stages of development and reform (Huang et al. 2009; Hu and Huang 2011). In the very early reform era, the number of agricultural research institutes increased from 597 in 1979 to 1,428 in 1985. During the same period, the total agricultural research staff grew from 22,000 to 102,000.

In the next phase, 1986–98, China tried to commercialise agricultural R&D (Rozelle et al. 1999). Because of fiscal shortages for research support and low staff salaries, policymakers encouraged institutes to engage in income-generating activities. During this time, the government changed its system of budget allocation from a planned system to one based on competitive funding initiatives (Jin et al. 2005). However, under the pressure of competition (and with commercialisation), the number of researchers decreased, from 102,000 in 1985 to 65,000 in 1996.

The third phase of research reform covered 1999 to 2006, and can be called the period of twin shifts: the transformation of the public R&D system and the rise of enterprise-based R&D. Initially, public research institutes were grouped into three functional types, each of which was provided with different levels of government funding. Public R&D institutes were fully funded by the government. The science and technology (S&T) service institutes were partially government funded. The technology development institutes were incorporated into the commercialisation efforts. This reform phase had two main goals: it attempted to form a high-quality (globally competitive) and efficient public agricultural R&D system and sought to encourage a technology-focused system of innovation led by the private sector. It should be noted, this reform faced huge resistance from most research institutes. And, while improvements in the publicly supported research institutes proceeded smoothly, the effort to shift technology development to the private sector was eventually phased out.

In the fourth phase, China is trying to develop a system to support innovation in agricultural technologies. This phase began in 2007 and is still in progress, and has seen funding for agricultural research increase significantly and public research institutes expand. The Technology Innovation System, with 50 subsystems for agricultural commodities, has been established, and the National Transgenic Modified Variety Development Special Program was initiated in 2008. By 2010, the number of public sector agricultural researchers in China had reached 96,300 (Huang et al. 2012).

Reform of the agricultural extension system has also evolved over time, moving through five stages:

1. The rapid development of extension institutions from 1978 to 1988. By the end of the 1980s, all townships had established agricultural technical extension stations, and the number of personnel reached 450,000.
2. The commercialisation and reallocation of the 'three management rights' (for personnel, finance and assets) of township extension stations from 1989 to 1993. Due to local fiscal shortages, the government allowed extension stations to conduct commercial activities to generate additional income. County governments shifted responsibility for extension stations to township-level governments. During this time, the number of extension personnel fell to 300,000.
3. From 1993 to 2000, county governments took back responsibility and invested heavily in the system. The number of personnel increased to more than 1 million by 2000.
4. There was yet another policy reversal in 2001–03. Responsibility was again shifted down to the township level. Because of fiscal constraints at this level, the number of extension agents fell to 849,000.

5. The final phase began in 2003, with county governments responsible for the extension system since that time, and more than 700,000 personnel employed. Funding comes from county governments with additional support from upper-level governments.

Despite experiencing a twisting path of reform in agricultural research and extension, China has developed a strong agricultural S&T innovation system. Its agricultural R&D system is the largest in the world in terms of staff and covers nearly every discipline in agriculture and related fields (Huang 2013b). China has also developed the largest public agricultural extension system in the world (Babu et al. 2015). While China's agricultural R&D was underfunded in the early and mid-1990s, investment has since increased significantly (Shi et al. 2008). We estimate that government expenditure on agricultural S&T reached more than RMB55 billion in 2015; agricultural R&D expenditure exceeded RMB26 billion in 2015. Over the past decade, an increasing number of enterprises have engaged in agricultural S&T activities (Hu and Huang 2011; Babu et al. 2015).

This investment has translated directly into productivity gains. Agricultural technological change is a primary source of agricultural productivity growth in the long run for all systems (including China's), and empirical research shows it has facilitated China's agricultural growth over the past several decades. China was one of the first developing countries to develop and extend 'green revolution' technology, in the 1960s (Stone 1988). Chinese scientists developed hybrid rice in the late 1970s. Technological changes in wheat, maize, cash crops and animal production have also been impressive since the 1990s (Jin et al. 2010). Empirical studies show the average annual growth rate of TFP in the grain sector increased about 3 per cent before the mid-2000s (Fan 1991; Fan and Zhang 2002; Jin et al. 2008). Rising grain productivity has enabled the country to gradually release its limited land and water resources for cash crop and livestock production. While the grain sector recorded high TFP growth, annual TFP growth rates for cash crops and livestock were even higher, exceeding 3.5 per cent in the period 1995–2005 (Jin et al. 2010). Since the mid-1990s, China's agricultural productivity growth has also relied on innovation from plant biotechnology. 'Bt cotton' is an example of one of the most successful uses of genetic modification technology in the developing world—a technological change that has benefited millions of farmers (Huang et al. 2002).

Despite these many successes, reform of the agricultural S&T system is unfinished. The current system for providing incentives for those engaged in agricultural S&T has not been used to full advantage (Huang 2013b). And there is a need for further reform to provide appropriate incentives to extension agents to attract more young professionals—something that is desperately needed to enhance the system's capabilities.

Market reform

China's institutional reforms began in rural areas, while market reforms were also launched in the farming sector, moving from rural to urban areas and from agriculture to industry and services. China did not abolish the planned economic system outright, but instead regarded the market as a supplement to the planned economy (Perkins 1994). Over the reform period, however, it gradually moved from the system of state purchases and sales to rely mostly on private markets.

China also adopted a gradual market reform approach in agriculture (Sicular 1988; Rozelle et al. 2000), which is thought to have facilitated the smooth transformation from the planned to a market economy. This gradual reform process is also thought to have helped to diversify China's agriculture during its transformation. Unlike transitional economies in Europe, China's leaders did not move to immediately dismantle the planned economy in favour of liberalised markets (Rozelle and Swinnen 2004). Liberalisation began only for nonstrategic products (such as vegetables and fruits), in the mid-1980s, gradually moving to animal products (fish and meat) and then to crops such as sugarcane, edible oils, cotton and grain—the products of strategic importance for China. Although grain market liberalisation was intermittent because of large fluctuations in grain production and prices in the 1980s and early 1990s, by the late 1990s, the government had all but phased out its direct market intervention (Huang et al. 2004; Huang and Rozelle 2006).

A caveat, of course, is that in recent years, the Chinese Government has sharply intervened in markets due to concerns over farmers' incomes and national grain security.

In the area of international trade, agricultural liberalisation was similarly slow to start, but proceeded steadily. The liberalisation of international trade started in the early 1990s with relaxation of trade restrictions and allowing nonstate actors access to agricultural commodity markets. After these initial moves, tariffs were steadily reduced (Huang et al. 2007). From the 1990s until China's accession to the World Trade Organization (WTO) in 2001, the average import tariff for all agricultural products was reduced from 42.2 per cent, in 1992, to 23.6 per cent in 1998 and 21 per cent in 2001. Tariff rates fell to 12 per cent in 2004, making China one of the most free agricultural trading nations in the world. China also made significant commitments and concessions in terms of domestic support and export subsidies (Anderson et al. 2004).

Accompanying and facilitating market reform were initiatives to aid farm commodity markets. Investment in roads and communications and policies to facilitate the free movement of goods across provincial and prefectural boundaries produced commodity markets that were among the most efficient in the world. By the early 2000s, almost all markets (92 per cent for rice, 98 per cent for soybean and 99 per cent for maize) moved together (Huang et al. 2004; Huang

and Rozelle 2006). Because reform of agricultural products other than grain began relatively early, integrated national markets for these products were established earlier than for grain.

Market reforms have played an important role in agricultural growth, production structure and farmer incomes. Farmers have increased their allocative efficiency by basing their decisions on relative market prices (Huang and Rozelle 1996; de Brauw et al. 2004). The reforms also reduced the price of farm inputs and increased selling prices for agricultural commodities.

China's open-door policies in agriculture also saw it become increasingly integrated into international markets. By the mid-2000s, most agricultural commodity prices in China were almost equal to the price of imports at the border (Huang et al. 2009). Exports of labour-intensive products (such as horticulture and livestock) and imports of land and water-intensive commodities (soybeans, cotton, edible oils, sugar) have been rising. China's comparative trade advantage means the domestic farm economy has improved its resource allocation and agricultural production efficiency.

Investing in agriculture

Agricultural investment created the foundation for China's steady agricultural growth and rapid agricultural transformation. China is one of a few large countries to see substantial increases in agricultural investment in recent decades—the largest of which have been in water (irrigation and flood) control and land improvement. The area of irrigated agricultural land increased from 45 million hectares in 1978 to 67 million hectares in 2016 (NBS various years). Today, more than half of China's cultivated land is irrigated—a very high ratio by international standards. Investment in low- to mid-quality land has also helped to improve soil quality and raise agricultural production capacity.

Massive investment in rural roads and wholesale markets fostered market integration and linked hundreds of million of small farms with retailers and consumers. China has invested substantially in road infrastructure during the reform era. Highway mileage increased from 890,000 km in 1978 to 4.4 million km in 2013 (NBS various years). Today, nearly every village has access to a public paved road. Empirical evidence shows government spending on rural roads has very high impacts on agricultural transformation, off-farm employment and poverty reduction (Zhang et al. 2004).

Farmers have also significantly increased their own investments and use of inputs. In terms of fixed assets, farmer investments in irrigation (Wang et al. 2005) and agricultural machinery (Wang et al. 2016) have steadily risen over time. In terms of variable inputs, the use of chemical fertilisers and pesticides has increased dramatically since 1978. For example, total fertiliser inputs for China's farm sector increased from 8.84 million tonnes in 1978 to 59.84 million tonnes in 2016 (NBS various years), significantly raising crop yields.

Recent challenges, policy responses and reforms

This section focuses on the evolution of China's agricultural policies and draws heavily on the analysis in a recent paper by Huang and Yang (2017).

Emerging challenges

Achievements in the agricultural sector have been quite remarkable; however, it is clear that China's cropping, livestock and fisheries sectors are facing enormous new challenges. While average real income per capita in rural and urban areas has increased significantly in the past four decades, the urban–rural income gap remains wide. By 2003, the ratio of urban to rural incomes exceeded 3:1 (NBS 2010). Such levels of inequality can threaten social stability.

Ensuring national food security is also one of China's primary policy goals. Grain production reached a high in 1998 (of 512 million tonnes), but it fell to 431 million tonnes in 2003 (NBS 2010). At the same time, rising incomes have seen the demand for food—especially animal products—continue to rise. In fact, the dynamics between supply and demand hit a milestone in 2004, when for the first time, China shifted from being a net food exporter to a net food importer, and food imports have steadily increased. The cost of crop production in China has also risen—largely due to rapid wage growth in all economic sectors.

There are now concerns about the sustainability of China's agriculture. Research shows groundwater in northern China is being overdrawn and the water table is falling (MWR 2016). Soil degradation is being observed in many regions (Liu et al. 2013; Zhang et al. 2013; Lu et al. 2015) and excessive use of chemicals has caused serious pollution and soil degradation (Liu et al. 2013).

Responses to farm income and national food security challenges

In this subsection, we describe some of the government's responses to rising challenges.

Shifting from taxing to subsidising agriculture

In response to rising concerns about farmer income and food security, China has taken several major policy measures since 2004. As a demonstration of the government's commitment to 'three rural issues'—the agricultural sector, rural livelihoods and the future of farming communities—the Central Committee of the Communist Party of China (CPC) has, since 2004, issued a yearly 'No. 1 document' on the three rural issues.

The initial set of policies in 2004 included the abolition of taxes and fees and introduction of direct subsidy programs, the first of which were the direct grain subsidy, quality seed subsidy and machinery subsidy. After domestic prices of chemical fertilisers and other agricultural inputs rose in 2006, China's policymakers expanded the direct subsidy program to include an aggregate input subsidy.

The level of subsidies increased significantly as international prices surged in the late 2000s, especially during the Global Financial Crisis (GFC) of 2007–08. Almost all rural households with contract land received subsidies.

At their peak, the total amount of the four major subsidies reached RMB164.3 billion (US\$26.1 billion), in 2012, or about 3.13 per cent of agricultural GDP. Additional recent farm subsidies include those for agricultural insurance, credit, land consolidation and soil conservation and improvement.

Despite this enormous investment, the subsidy program has had only moderate impact on farmers' incomes. In the late 2000s, China had more than 200 million rural households with land contracts. On a per farm household basis, even in 2012, the year with the highest level of subsidies, the average household received only RMB850 (US\$130). The use of agricultural subsidies to raise farmer incomes is therefore meaningful mainly as a political statement demonstrating the government's commitment to the farming community.

Empirical studies found there was also only a limited impact from subsidies on production and therefore on national food security. Huang et al. (2011) found that subsidies were mostly being given to the land contractor (who often was not even farming), not the tiller, and that subsidies did not affect the level of inputs.

Initial policy response through market interventions

Beyond the use of subsidies to increase farmers' income and promote farm production, China's agricultural officials have also used price supports. The most important policy measure was the minimum procurement price initiative, which was launched for rice in 2004 and for wheat in 2006. There was also the temporary storage program (TSP) aimed at raising market prices, which was initiated for maize, soybean and rapeseed in 2008, cotton in 2011 and sugarcane in 2012.

While these price interventions did increase farmer incomes, they also generated a large price gap between China's domestic market and international commodity markets. During the GFC, China was able to prevent a significant rise in grain prices by drawing down stocks and applying trade controls (Yang et al. 2008). However, while global food prices fell sharply in late 2008, and have since fluctuated, after 2009, China continued to raise its domestic prices through the use of minimum prices and the TSP. As a consequence, significant price gaps between domestic and international markets increased after 2012. For example, by 2015, the wholesale

price of maize was 40 per cent higher than the imported price; it reached 50 per cent in early 2016. Domestic wholesale prices of rice, wheat and cotton were also higher than international prices, by 30–50 per cent in 2015. Market intervention has also been shown to distort agricultural production, hurt livestock production and processing and ultimately led to a huge grain reserve in government storage facilities (Hejazi and Marchant 2017; Huang and Yang 2017).

Policy efforts to adjust the support system

Given the clearly unsustainable nature of the market intervention, China's leaders have changed farming sector policies. A review of the subsidy policy determined that the significant expenditure had produced only a moderate effect on farmer incomes and no increase in grain production.

In place of the subsidy and market intervention programs, several new policies have been implemented and the subsidy targets were changed. Officials gradually began to shift part of the budget from subsidising contractors to supporting more productivity-enhancing investments, such as land consolidation. In 2016, China merged all subsidies on grain, seed and aggregate inputs into a single general income support program.

China also has started to reduce the intensity of market interventions and phase out most price distorting policies. In 2013, the government lowered the minimum agricultural procurement price, before completely phasing out procurement programs for rapeseed, sugarcane and soybean. Procurement for maize (which had been the most distorting) was abolished in 2016. Currently, the target price policy is being implemented only for cotton in Xinjiang. And, while rice and wheat are still subject to the minimum price procurement program, procurement prices and grain levels have been reduced since 2015. The story of market intervention and reliberalisation supports the idea that market reforms were one of the major factors in the success of China's agricultural development and that China seems to be returning to a pro-market policy.

Responses to agricultural sustainability challenges

Recognising the resource constraints in its farming economy and the challenges for any country in meeting a strict set of sustainable development goals, the Chinese Government has made a strong commitment to agricultural investment. Since the mid-2000s, the Ministry of Agriculture has overseen significant public investment in land, water and technology, with the growth of agricultural investment exceeding the government's overall fiscal expenditure. Between 2004 and 2014, while the share of agriculture in GDP fell from 13 per cent to 9 per cent, its share in government expenditure rose from 8 per cent to 10 per cent (NBS various years). In 2011, China committed to investing about US\$630 billion in water conservation during

the period 2012–20. In addition to efforts to conserve water through better infrastructure, China is planning to establish a pricing mechanism that more appropriately reflects the cost of water to encourage water savings. Priority is also being given to raising the productivity of land and creating a system that protects and enhances the quality of farmland.

More significant is China's attempt to incorporate sustainable agriculture into the nation's overall development goals, including through: 1) substantially enhancing S&T innovation capacity and implementing the strategy to 'store food in technology' to boost agricultural productivity in the long run; 2) increasing investment in land and water infrastructure and implementing the 'storing food in land' production strategy to improve the quality of farmland and therefore agricultural production capacity in the long run; and 3) protecting the rural environment through reductions in fertiliser and pesticide use. These measures will undoubtedly play important roles in the sustainable development of Chinese agriculture in coming years.

Concluding remarks

China's agriculture has recorded remarkable achievements in the past four decades. Despite the increasing scarcity of water and arable land, China has largely been able to ensure its food security. Accompanying the rapid growth of agricultural output and incomes has been the significant change in the structure of agricultural production—from a sector based on staple grain production to one with a set of much more varied high-value commodities. There has also been a massive reduction in rural poverty.

We have argued that China's policymakers have generated this transformation through agricultural reform policies, which started in 1978 with the HRS, greatly improving farmers' production incentives and productivity. Other institutional changes involved giving farmers the freedom to rent land and allocate their labour in response to market signals, which were key parts of the reform package that improved agricultural productivity and facilitated the sector's transformation. Indeed, both domestic market reforms and international trade liberalisation improved the efficiency of resource allocation, stimulated agricultural structural change and helped millions of small farmers to sell their products.

The government has also overseen a number of direct investments. Agricultural S&T has become one of the primary sources of agricultural growth, and massive investment in rural infrastructure, particularly irrigation and roads, provided the foundation for agricultural productivity growth and successful liberalisation. Although there have been setbacks, in general, the government's efforts in institutional innovation, technological change, market reform and agricultural investment accelerated agricultural growth and transformation.

China's agriculture is, however, still facing many challenges. In response, a number of lessons can be learned from past successes and failures. In 2017, China initiated a national strategy on rural revitalisation. While this is an update of previous agricultural development programs, it has provided an even clearer pathway to agricultural transformation. It aims to establish an institutional framework and policy management to oversee the revitalisation of the rural sector by 2020. It commits China to largely modernise agriculture and the rural economy by 2035 and fully modernise by 2050.

The strategy also calls for higher-quality growth and stresses the importance of environmentally sustainable development.

Can this succeed? Of course, only the future will tell. However, we believe one thing is clear. If success is accomplished, it will be in no small part because for the past 40 years, there has been a series of innovative and bold reforms and large investments that have taken agriculture from where it was in 1978 to where it is today.

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