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China's grains policy

IMPACTS OF ALTERNATIVE REFORM OPTIONS

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CHINA'S GRAINS POLICY: IMPACTS OF ALTERNATIVE REFORM OPTIONS

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Reforming China's grain policy could have significant implications for both domestic and international markets. China has begun to reform its price support policies for several commodities, replacing them with commodity specific area payments. The assessment of policy reform scenarios for grains, using two partial equilibrium models, show that China would maintain more than 80% of self-sufficiency in wheat and maize, and more than 95% in rice. The increase in its grain imports could increase international prices, in particular for wheat and rice. A gradual approach to reforming market price support with compensatory payments would smooth the potential impacts on domestic and world commodity markets, as well as on domestic farm income. While the reform of price support policies benefit consumers the most, more decoupled area payments could also have a greater impact on farm income without increasing the overall cost to society as well as environmental performance of agriculture. Lower costs of managing public grain stocks would equally reduce the budgetary cost of reforms.

***Key words*:** Agricultural policy reform, cereals, partial equilibrium model

JEL codes: Q11, Q17, Q18, F14

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Executive summary

Food security, especially maintaining self-sufficiency in food grains, has long been a central objective of the People Republic of China's (hereafter "China"). However, maintaining near self-sufficiency has become increasingly unsustainable both economically and environmentally. Public procurement of grains at higher than world market prices led to large public stocks. If policies are not changed, these stocks could continue to accumulate in the event of lower world grain prices, as projected in the latest *OECD-FAO Agricultural Outlook*. Environmentally, the intensive use of chemical inputs has led to soil degradation, water pollution, and a damaged bio-diversity. Water resources have reached the limit of sustainable use in many areas. And China has limited policy space to increase distortive support due to its World Trade Organisation (WTO) commitments.

To address these policy challenges, China began to reform its price support policies for several commodities (cotton, soybean and maize), replacing them with commodity specific area payments. In some provinces, China consolidated area-based direct payments into a single payment that focused on supporting the maintenance of grain production capacity rather than boosting production itself. It also switched payment away from land contract rights holders to actual land cultivators.

Reform scenarios of China's grain policy could have significant implications for domestic and international markets. This report assesses five policy reform scenarios for wheat, maize and rice. The reference scenario maintains price support policies as applied in 2015. The first scenario replaces price support with a commodity-specific area payment (reflecting recent policy developments), while the second scenario replaces price supports with non-commodity specific area payments, which have the potential to be rolled out more widely. The third scenario supposes that payments are linked to a historical, rather than current, area. The fourth scenario considers the implications of no area payments at all, while the fifth scenario introduces commodity-specific area payments accompanied by a period during which public stocks are released. The scenario analysis is performed with two complementary modelling tools: the OECD Policy Evaluation Model (PEM) and the OECD-FAO Aglink-Cosimo models.

Removing domestic price support programmes leads to lower domestic grain prices and reduces domestic production. While the recent change in China's food security policy foresees a moderate level of imports, the simulation results show that China would maintain more than 80% of self-sufficiency in wheat and maize and more than 95% in rice. This result holds even in the third and fourth reform scenarios, which break the direct link between support payments and production by replacing price supports with a historical area payment (third scenario) and even without any payment (fourth scenario). On the other hand, the increase in China's grain imports could increase international prices, in particular for wheat and rice, as prices could rise by up to 5% in these scenarios. This would slightly offset the effects of removing price support on domestic production.

Replacing price support with area payments coupled with production (first, second and fifth scenarios) would allow China to maintain a self-sufficiency rate of more than 90%. The impact on the world market would be lower, at least temporarily, if China were to reduce the level of grain stocks in the course of policy reform (fifth scenario). A gradual approach to reforming market price support with compensatory payments smooths the potential impacts on domestic and world commodity markets and on domestic farm income.

The reform of the price support system encourages less intensive production of grains and reduces the use of chemicals and fertiliser, while maintaining the domestic capacity of grain production. The more area payments are delinked from current production, the greater the reduction in use of chemicals and fertiliser, and the wider the benefits in terms of the sustainability of production.

Shifting from price support to area payments must take into consideration the administrative requirements of such a new policy. In China, plot level information on who cultivates which crop is often unavailable, meaning that owners of land contract rights are likely to receive the payments even if they do not actually cultivate the land or no longer engage in farming. This administrative constraint limits the potential of the reform to maintain the income of farmers. Hence, policy reform needs to be complemented with the establishment of a registration system of cultivators of land.

Reforming price support policy for wheat, maize and rice benefits consumers of these grains, including livestock producers. The burden of support would shift from consumers to taxpayers, while poor consumers (who spend a relatively higher share of their incomes on food) would gain the most. As a result, there would be a benefit in terms of equity. This price reform would reduce grain producers' income, but the simulations show that the complementary area payments could have a positive impact on farm income without increasing the overall cost to society. This finding is consistent with previous studies in OECD countries, which conclude that the more decoupled area based payments are, the more effective they support farm income. The introduction of complementary payments increases budgetary spending, but reform of the domestic price support programme would reduce the considerable cost of managing public grain stocks.

1. Introduction

Food security, especially maintaining food grain self-sufficiency, has long been a central objective of China's agricultural policy. A number of policy documents issued in the past set the basic goal of increasing food production and achieving food self-sufficiency with domestic resources. The goal was to ensure the basic supply of grain and other major agricultural products, as well as access to food for urban and rural residents. The Grain Issue in China, a white paper issued in 1996, put forward the goal of raising the food self-sufficiency level to 95%.

Since then, the focus of agricultural policy in China has evolved to include ensuring food safety, increasing the incomes and competitiveness of farmers, and improving the environmental performance of agriculture. Policy makers increasingly recognise that China is not fully capable of maintaining self-sufficiency of all agri-food products, and that the economic and environmental cost of maintaining self-sufficiency is high. The 2014 food security strategy called for a proper allocation and conservation of domestic resources to meet the most basic and important demand for grains. In this context, this new strategy, for the first time, considered "moderate imports" as a way to ensure food security.

Policy makers face a challenge to maintain a high level of self-sufficiency for major grains while supporting farm incomes within the limited policy space to increase distortive support due to China's WTO commitments. Public procurement of grains at higher than world market prices has led to large public stocks, which are costly to maintain. The coexistence of high domestic output, high imports, and high domestic stocks is dubbed the "triple high" phenomenon in agricultural policy debates in China (Yu, 2017).

To address these policy challenges, China has started to reform its price support policies for several commodities (cotton, soybean and maize), converting them to commodity specific direct payments. Similarly, it has consolidated the existing three area payments into a single area payment and has switched payment away from land contract rights holders to actual land cultivators, as well as focusing more on larger size farms.

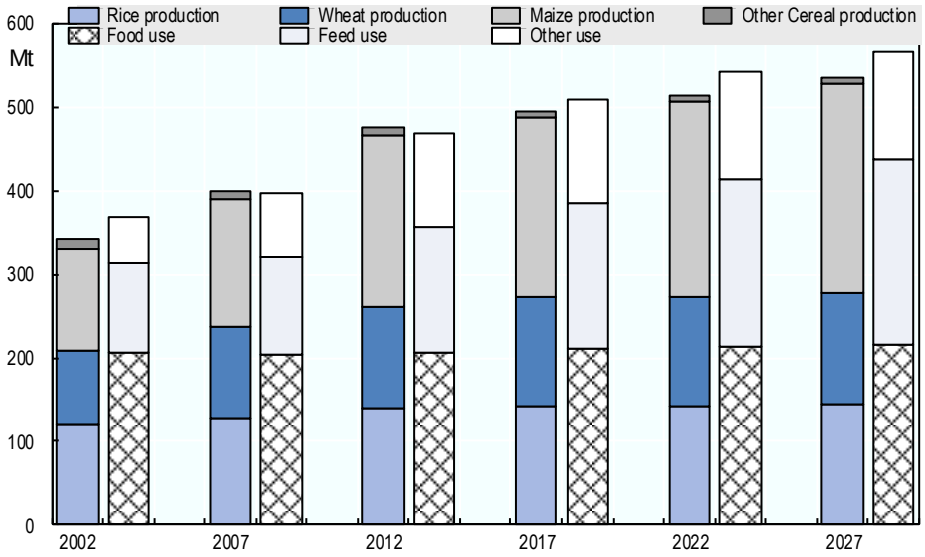
This policy study reviews recent developments in China's grain policies and markets. It then constructs policy reform scenarios and quantifies the domestic and international impacts using two complementary modelling tools: the OECD Policy Evaluation Model (PEM) and the OECD-FAO Aglink-Cosimo model. The impact assessment of the policy reform scenarios is followed by a conclusion.

2. Development of grain market and policy in China

2.1. Development of grain markets

China is one of the largest grain producers in the world and close to self-sufficient in grain production. Figure 1 illustrates that maize is the fastest growing and most important cereal produced in China, followed by rice and wheat.[1] Other cereals are of low importance in the production mix. Rice and wheat production both exhibited slow growth over the past decades and are projected to remain relatively stable for the next ten years as they face competition for arable land with oilseeds (soybeans, rapeseed, groundnuts), roots and tubers, cotton, and sugar crops according to the *OECD-FAO Agricultural Outlook 2018-2027* (OECD/FAO, 2018[1]). China currently has around 123 million ha of arable land, of which more than 70% is used for cereal production.

Figure 1. Production and domestic use of cereals in China



Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

Figure 1 illustrates the different types of uses for all cereals combined. Around 200 million tonnes of cereals have been consumed as food over the past decades and this amount is projected to remain largely unchanged in the future. Per capita food consumption of cereals is projected to decline slightly over the next ten years. Feed use of cereals has expanded rapidly in recent years and this trend is expected to continue. The drivers are the growing meat and aquaculture production in China, and the shift of backyard animal husbandry to a compound feed-based system. However, even if the expansion of cereal feed use has been strong in recent years, the share of cereals in the feed mix has declined due to the increasing use of soybean meal produced from imported soybeans. In the coming decade, it is expected that the share of cereals in the feedmix will remain stable or slightly increase, as the

[1] In October 2018, a revision of China's production data for the last ten years showed an even stronger growth in maize production compared to other cereals. This revision is not incorporated here.

domestic price relation between soybean meal and maize changed following the policy adjustment in the maize market in 2016 and the share of cereals in compound feed is low compared to other countries. Other uses of cereals, e.g. as ethanol feedstock or for the production of cereal based sweetener, are growing but are of smaller magnitude in the overall demand. The impact of a strong expansion of ethanol production is discussed in Box 2 as it is not included in the reference baseline described here.

Overall, cereal production and use follow similar growth patterns in China and the shift in the demand structure towards feed and other uses is matched with the increasing share of maize in the overall cereal mix. Nevertheless, since 2013 about 5% of domestic cereal usage is imported, more than have of which are other cereals such as barley and sorghum. Due to limited growth potential for arable land, it is expected that production over the next decade will exhibit slightly slower growth than domestic use. Consequently, China would remain a net-importer of about 5% of her cereal demand, especially for feed use.

2.2. Development of grain policy

Domestic price support measures

Price support policies are the main instrument of domestic agricultural policy in China. There are two main forms of price support in China: a minimum purchase price (MPP) policy and a temporary purchasing and storage price (TPSP) system. The MPP policy was implemented in 2004 for rice and wheat in major grain producing regions. The National Development and Reform Commission (NDRC) sets the minimum purchase price in consultation with the Ministry of Agriculture and other government institutions, considering various factors including prices of agricultural inputs, profit margins, and market supply and demand. The MPP is announced before sowing to help farmers make production decisions. The central government authorises the state-owned China Grain Reserves Corporation (Sinograin) and other state-owned companies to openly purchase at the MPP in the main grain-producing regions when market prices are continuously below the minimum price.[2]

China raised the MPP of rice and wheat continuously between 2008 and 2014 (Table 1). A higher level of domestic prices boosted grain output throughout this period. This contributed to the maintenance of food self-sufficiency, but gradually pushed up domestic food prices above international prices, leading to a significant rise in policy-based stock levels of rice and wheat. Considering high domestic prices as well as large domestic grain stocks, the government has started to reduce the MPP of rice in 2016. In October 2017, NDRC announced that the minimum price for wheat would be lowered from CNY 2 360 (USD 355) to CNY 2 300 (USD 340) per tonne from 2018.

During a sharp decline in commodity prices in late 2008, China implemented the temporary purchase and storage price (TPSP) system on an *ad hoc* basis for soybeans, rapeseed, maize, cotton and wheat (only in regions not covered by MPP). While the policy for maize and soybeans was applied in northeast China and Inner Mongolia, the policy for rapeseed was implemented in 17 rapeseed-producing areas, including Jiangsu, Hubei, and Anhui.

[2] Major producing areas of early indica rice include the 5 provinces and regions (Anhui, Jiangxi, Hubei, Hunan, and Guangxi); those of late rice (including medium and late indica rice and japonica) include 11 provinces (Jilin, Heilongjiang, Anhui, Jiangxi, Hubei, Hunan, Sichuan, Liaoning, Jiangsu, Henan, Guangxi); those of wheat include 6 provinces (Hebei, Jiangsu, Anhui, Shandong, Henan and Hubei).

The TPSP system was extended to frozen pork in 2009 and to cotton in 2011. With the introduction of a pilot programme for a target price system, the temporary purchase and storage policy was abolished for cotton and soybeans in 2014. The TPSP for rapeseed was not used after 2014, while the TPSP for maize was not used after 2016. The TPSP for wheat was used only in Xinjian Province until 2017.

Table 1. China's Minimum Purchase Price (MPP) and Temporary Purchase and Storage Price (TPSP) for crops

Yuan per tonne

Variety	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Minimum Purchase Price (MPP)														
Rice														
Early indica	1 400	1 400	1 400	1 400	1 540	1 800	1 860	2 040	2 400	2 640	2 700	2 700	2 660	2 600
Medium and late indica	1 440	1 440	1 440	1 440	1 580	1 840	1 940	2 140	2 500	2 700	2 760	2 760	2 760	2 720
Japonica	1 500	1 500	1 500	1 500	1 640	1 900	2 100	2 560	2 800	3 000	3 100	3 100	3 000	2 600
Wheat														
White wheat			1 440	1 440	1 540	1 740	1 800	1 900	2 040	2 240	2 360	2 360	2 360	2360
Red wheat			1 380	1 380	1 440	1 660	1 720	1 860	2 040	2 240	2 360	2 360	2 360	2360
Mixed wheat			1 380	1 380	1 440	1 660	1 720	1 860	2 040	2 240	2 360	2 360	2 360	2360
Temporary Purchase and Storage Price (TPSP)														
Maize					1 500	1 500	1 800	1 980	2 120	2 240	2 240	2 000	—	—
Soybean					3 700	3 740	3 800	4 000	4 600	4 600	—	—	—	—
Rapeseed					4 400	3 700	3 900	4 600	5 000	5 100	5 100	—	—	—
Cotton								19 800	20 400	20 400	—	—	—	—

Source: National Development and Reform Commission.

In contrast to the MPP, the government announced TPSPs only during harvest with the exception of cotton, for which the TPSP was announced before planting. State-owned companies purchase at the TPSP if the market price was lower. However, intervention prices may differ across provinces and purchases are not undertaken systematically every year (OECD, 2013). The TPSP of maize, soybean and rapeseed were continuously raised between 2008 and 2012.

The amount of crops purchased by state-owned companies at MPP or TPSP have changed annually, depending on the relative levels of market prices and policy prices set by the government. In some years, the government was the dominant buyer of grains. In 2015, it purchased a record 175 million tonnes of grains, of which just 18.5 million tonnes was auctioned (Renmin Daily, 2016) due to high prices and inconsistent quality (GAIN-CH15058, 2015).

Border measures

China currently operates tariff rate quotas (TRQs) on major grains including wheat, maize and rice, and cotton. According to regulations issued by NDRC and Ministry of Commerce, the TRQ for wheat is set to 9.63 million tonnes, of which 10% is open to imports by private traders and 90% is reserved for state-trading entities. The TRQ for maize is set to 7.2 million tonnes, of which 40% is open to non-state trade, and that of rice at 5.32 million tonnes (half long grain rice and half medium and short grain rice), of which 50% is open to

non-state trade in 2017. The in-quota duty rate for wheat, maize, unhusked rice and rice is 1%, and the out-of-quota most favoured nation tariff is 65%.

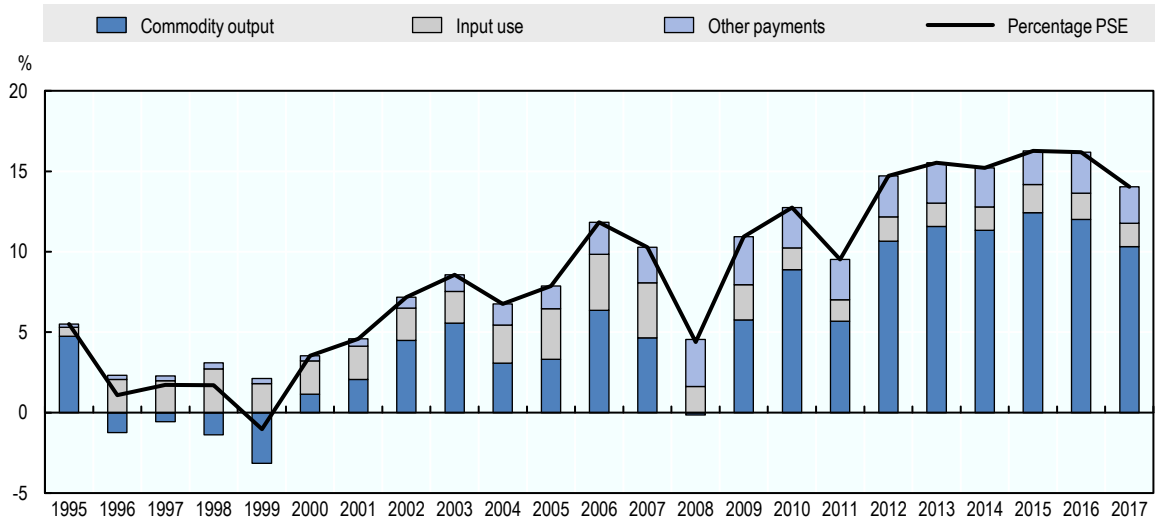
In recent years, the TRQs for rice, wheat and maize have remained under-filled. Fill-rates in 2017 were at 75%, 45% and 39% for the three grains, respectively. On the other hand, imports of cotton have exceeded the corresponding import quota since 2003. Instead of charging the out-of-quota tariff of 40%, however, China has applied a sliding-scale tariff between 0% and 40% on out-of-quota imports, and for some years added a supplementary import quota, thereby effectively reducing the import protection (Yu, 2017).

Producer support estimate for China

Overall, market price support (MPS) is continues to be a dominant instrument to support producers, accounting for 73% of the PSE in 2015-17 (Figure 2). The price gaps between domestic and world markets continued to increase for most commodities. As a result, the gap between the producer price and the border price (Nominal Protection Coefficient) in 2015 reached the highest level since 1995, when the OECD started to calculate Producer Support Estimates (PSE) for China. As indicated above, the support helped to boost domestic food production and maintain a high level of food self-sufficiency. However, by raising the domestic prices above international prices, it increased food costs for consumers and put pressure on the government budget, which was forced to cover the high costs of storage. The budget expenditure for public stockholding accounted for 46% of General Services Support Estimate (GSSE) in 2015-17.

Figure 2. Evolution of support for China's agricultural producers, 1995-2017

As a percentage of gross farm receipts

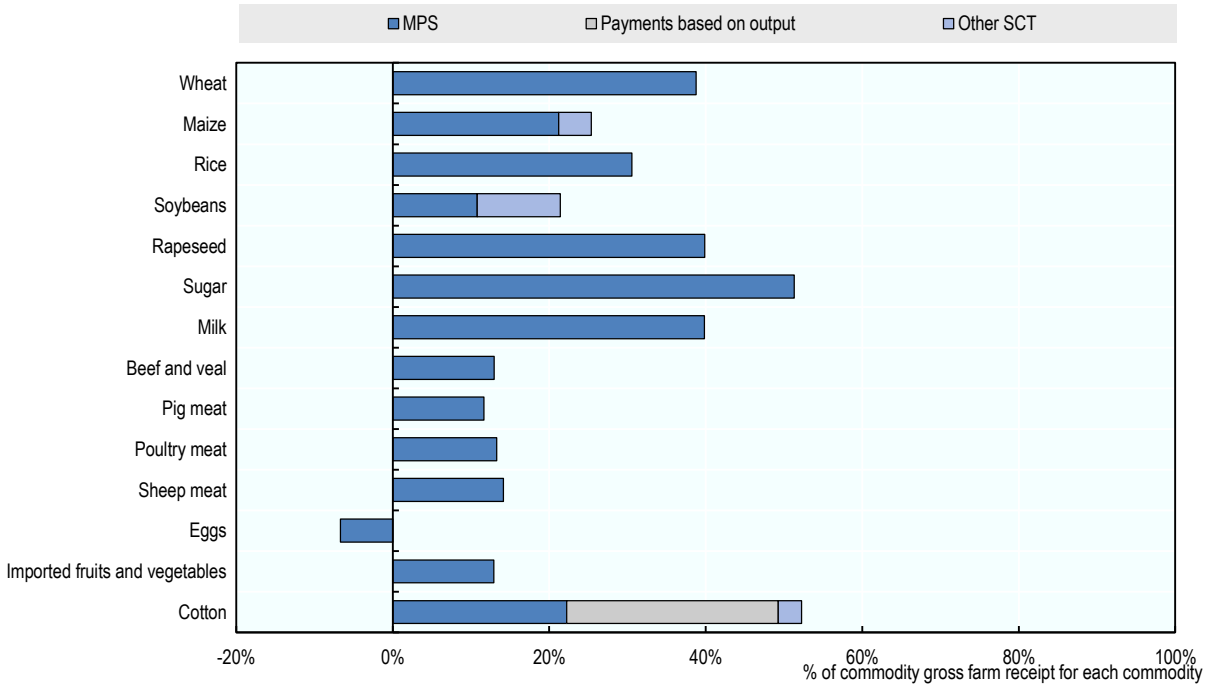


Source: OECD (2018), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database). https://doi.org/10.1787/a195b18a-en.

Single Commodity Transfer represent 76% of China's total PSE in 2015-17. Among the commodities, cotton and sugar receive the highest level of single commodity transfer SCT), exceeding half of commodity gross farm receipts (Figure 3). In China, grains receive higher levels of commodity specific support than meats. MPS accounts for more than 30% of gross

farm receipts for wheat and rice. For cotton, soybean and maize, a part of SCT was converted from MPS to budgetary payments.

Figure 3. Transfer to specific commodity (SCT) in China, 2015-17



Source: OECD (2018), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database). https://doi.org/10.1787/a195b18a-en.

Recent reform of the grain policy

In a series of recent white papers (CCCPC and State Council of China, 2015 and 2016), the Chinese central government announced the modernisation of its farm policy, with a gradual movement towards a more market-oriented approach and more differentiated policies on different commodities Following this policy direction, China started to replace the price support system with a target price system for several agricultural products (State Council of the People's Republic of China, 2014). When average market prices for a given product are below the pre-determined target price, farmers can receive payments covering the price difference.[3] In 2014, China launched the three-year pilot programme of target price payments for soybeans in Northeast and Inner Mongolia. It also introduced area payments to rapeseed producers in 2015, replacing the TPSP programme. This target price system for cotton and soybean replaced the government procurement programme in 2014.

In 2016, China replaced the TPSP programme for maize with a new mechanism of market-based purchases, while farmers received a compensatory support in the form of commodity specific area payments. The reform was implemented in key maize producing areas: in Heilongjiang, Jilin, Liaoning, and Inner Mongolia. As a result, the domestic prices of soybeans, cotton, rapeseed and maize declined gradually closer to international prices.

[3] Special sites are set up to monitor the average market purchase price in certain periods. Subsidies are granted based on actual planting area, yield or trading volume.

Faced with the rising cost of maintaining high levels of public stocks, China also declared that the size of state reserve stocks would need to be "scientifically" determined and that stock build-up and release mechanism would need to be "perfected". In particular, China has accelerated the liquidation of maize temporary reserve stocks through auctions and various processor support programmes. In early 2017, Northeast provinces provided between CNY 100-300 (USD 15-45) per tonne to processors for purchasing maize from reserve stocks for starch, ethanol, and other maize milling by-products. In 2017, China also announced the targets of a national blending mandate of 10% ethanol (E10) in transportation fuel by 2020. By 2025, the plan calls for an ambitious shift from conventional renewable fuel production to commercial-scale cellulosic fuel production (OECD, 2018a).

China has developed four main direct payment programmes since the early 2000s: direct payments for grain producers; payments to compensate farmers for an increase in prices of agricultural inputs, in particular for fertilisers and fuels; subsidies for improved seeds; and subsidies for purchases of agricultural machinery. In 2015, the government implemented a pilot programme to combine the first three subsidies into a single area payment programme, called "agricultural support and protection subsidy", in five provinces including Anhui, Hunan, Shandong, Sichuan and Zhejiang. The payment programme was made nationwide in 2016. The payment consists of two components. Four-fifths of the value has been paid per unit of land directly to owners of land use rights, and is intended to protect arable land fertility and preserve grain production capacity. One-fifth of budgetary allocations has been set aside for "new-style" farms producing on rented land, "family farms", co-operative farms, and farms run by agri-business companies. This reflects a shift of the country's agricultural policy orientation from boosting production to preserving production capacity and promoting structural adjustment towards large-scale operations.

3. Scenarios of grain policy reform

The recent development of China's grain policy and a potential future policy reform are expected to have a considerable impact on both domestic and world markets. The compensatory area payment has a role to cushion the impacts of lower domestic price on markets and farm incomes, but its impact depends on the design of the payments. In China, the potential market impact of grain policy reform also depends on the associated change in the public stock holding regime. The increase in the level of imports as a result of the reform may require changes to China's TRQ system.

The assessment of the impacts of different scenarios of grain policy reform in China requires analytical tools, which capture price support policies, different types of direct payments and grain stocks, and which have the capacity to quantify the impacts on multiple dimensions including on commodity markets and farm income. This report uses two modelling tools, namely the OECD Policy Evaluation Model (PEM) and the OECD-FAO Aglink-Cosimo models.[4] Both PEM and Aglink-Cosimo have the capacity to assess

[4] PEM is designed to translate PSE data into quantitative impacts, and has been used extensively as a tool to evaluate policy reforms in OECD countries. As a part of the on-going effort to extend the country coverage, a new China module was developed for PEM (Box 1). Aglink-Cosimo is a partial equilibrium model for global agriculture, used to generate the baseline projections for the *OECD-FAO Agricultural Outlook*. The version of Aglink-Cosimo used is the one of the *OECD-FAO*

medium-term market impacts, such as effects on domestic prices, production, consumption and self-sufficiency rates as well as world market prices.[5] Each model has its specific strengths and the use of both models in parallel allows the analysis of the different aspects of the reforms and their impact on domestic and international variables. More specifically, PEM has the advantage of providing a more disaggregated decomposition of welfare effects, and a more detailed representation of the impacts on factor markets and on the markets for purchased inputs, such as fertilisers and chemicals. In turn, Aglink-Cosimo includes specifications of trade, stockholding and biofuel policies, and – being recursive-dynamic as opposed to comparative static – can be used to describe and analyse adjustments over time.

Box 1. Application of OECD Policy Evaluation Model to China

PEM provides a stylised representation of production, consumption, and trade of major cereal and oilseeds crops, milk, and beef in seven OECD countries or regions: Canada, the European Union, Japan, Korea, Mexico, Switzerland, and the United States. The OECD has been using PEM as a tool to assess the impacts of policy reforms in a number of country studies as well as in thematic studies such as the decoupling of producer support.

Since PEM is particularly useful in simulating the impacts of policy reforms that re-instrument market price support with payments linked to area, it has been extended to simulate recent and future policy reforms in China. Extending the country coverage of PEM made use of detailed information on the structures of agricultural output and factor markets (e.g. factor cost shares and the degree of substitutability across different land uses). Parameters and structural variables used in the module are based on a systematic review of the empirical literature and validated by the experts. However, as is the case for other countries represented in PEM, uncertainty exists for the parameters chosen in the model. The present study builds on this extended PEM model to evaluate options of China's agricultural policy. An OECD technical document provides the documentation of the China module of PEM, including some sensitivity tests of key model parameters to the simulation results to check the robustness of the simulation results.

Design of policy reform scenarios

As described in Section 2, China's policy re-instrumentation from domestic price support to commodity specific area payment has been gradually extended from cotton in 2014 to soybean in 2015 and maize in 2016. This report assesses a set of policy scenarios including the on-going reform in maize and future reforms potentially extending to wheat and rice. All scenarios are compared to the reference scenario, which assumes a continuation of policies in place in 2015. Thus, the reference scenario includes domestic price support for maize, rice and wheat. This approach was chosen, as limited information of the changes to the maize market in the first two years of implementation is available. In addition, it allows to compare the impact of changing support regimes across all three major grains at the same time.

Agricultural Outlook 2017-2026 (OECD/FAO, 2017[5]). The Aglink-Cosimo documentation is available online at: http://www.agri-outlook.org/about/Aglink-Cosimo-model-documentation-2015.pdf.

[5] If not stated otherwise, the results of Aglink-Cosimo are presented as the averages in 2025-2027 relative to the baseline, while results in PEM should be interpreted as changes in five year time horizon from base year (2015) as the parameters in PEM are calibrated so that the policy shock leads to a new market equilibrium in five years. The database of 2015 base year is constricted from 2017 edition of Producer and Consumer Support Estimates.

Following the on-going approach of policy re-instrumentation in China, Scenarios 1 to 5 assume that the domestic price support programmes for maize, rice, and wheat are eliminated (Table 2). Scenario 1 (commodity specific area payment) assumes that the domestic price support programme is replaced with a commodity specific payment based on current area of production. Scenario 2 (non-commodity specific area payment) and Scenario 3 (historical area payment) introduce more decoupled types of compensatory area payments.[6] In all of these scenarios it is assumed that the overall level of compensation is equivalent to the value of reduction of market price support. Scenario 4 (no area payment) does not implement any compensatory payment associated with the termination of domestic price support programme. These four scenarios assume that the levels of grain stocks remain unchanged relative to the reference scenario.

Table 2. Definition of policy scenarios

	Price support policy	Compensatory payment	Grain stock
Reference	Policies remain the same as of 2015 (support price for rice, wheat and maize)		
1. Commodity specific area payment	Elimination of domestic price support programme for maize, wheat and rice	Commodity specific area payment for rice, wheat and maize	Remain unchanged to baseline
2. Non-commodity specific area payment		Non-commodity specific payment for arable crop	
3. Non-current area payment		Non-current area payment	
4. No area payment		No compensatory payment	
5.Commodity specific area payment and destocking		Commodity specific area payment for rice, wheat and maize	Reactive grain stock

Scenario 5 (commodity specific area payment and destocking) is a variation of Scenario 1 and allows China's grain stocks to react to prices, demand and supply. Under the reference scenario, stock levels in China are influenced by two sets of drivers which are represented in two separate equations. First, stock levels are driven by demand and production quantities as well as the difference between the current and average past prices. Second, additional stocks are accumulated if the producer price is below the support price, reflecting government buying at the support price. There is no distinction between public and private stocks as no data is available. Since Scenario 5 assumes the elimination of price support, the second element of stocking is deactivated and stocks only react according to the first (standard) stock equation.

Due to the design of the models, the assessment of Scenario 3 is analysed using PEM only, whereas Scenario 5 uses only Aglink-Cosimo. In all scenarios, both models implicitly assume that ad-valorem tariffs are reflected in price gaps and tariff-rate quotas (TRQs) are expanded if necessary.[7]

[6] Historical area payments are linked to a historical area of production, rather than current area. Non-commodity specific area payments are paid based on per hectare of production of any arable crop.

[7] Following the concept of MPS measurement in the PSE database that captures all the policy measures affecting the domestic price of a commodity. Therefore, PEM does not explicitly model

3.1. Quantification of the policy reform scenarios

The scenario of policy re-instrumentation is represented as a shift from market price support (MPS) to a commodity specific area payment in the PSE database. The elimination of the temporary purchase and storage price (TPSP) or minimum purchase price (MPP) programme would not result in an elimination of the MPS, as the MPS itself is the result of several policy instruments including the domestic price support programme and border policies such as the TRQ systems. In both models the reduction in MPS is implemented as a reduction of the price gap between the domestic producer price and the reference price; it is, therefore, a reduction of the effective border protection.

The size of area payment for maize introduced in 2016 is assumed to be USD 4.5 billion based on USDA estimates (GAIN-CH16058). Thus, the policy scenarios assume an equivalent decrease of MPS for maize. For maize, direct payments replaced approximately 25% of the pre-reform MPS in 2014. Assuming also a 25% reduction of MPS for wheat and rice accounts for USD 4.7 billion for wheat MPS and for USD 6.3 billion for rice. Scenarios 1 and 5 introduce the equivalent amount as commodity specific current area payments. In Scenarios 2 and 3, the size of the non-commodity specific payment is assumed to be the sum of the reduction of MPS for maize, rice and wheat (USD 15.5 billion).

There are major uncertainties regarding China's stock levels of grains and the actual stocking behaviour. The historic reference values are taken from the AMIS database but other and considerably different estimates exist, for example from the International Grains Council (IGC). Regarding the stocking behaviour, the standard Aglink-Cosimo approach was adjusted in a way that cereal stocks were accumulated up to a point where the domestic price is higher than the MPP or TPSP.

4. Assessment of grain policy reform scenarios

4.1. Market and price impacts

With the termination of the domestic price support programme, the reform scenarios lead to lower average domestic grain prices compared to the reference scenario (Table 3). The lower domestic prices stimulate the consumption of grains, but reduce domestic production. The impact on wheat is generally the largest, followed by maize. The smaller impact on rice is partly explained by a lower flexibility to convert rice paddy land into other types of land use and by the low elasticity of demand, which reflects the consumption of rice as major food staple.

The magnitude of the impacts on commodity markets depends on the existence and type of compensatory payments. Compared to Scenarios 1 and 2 which introduce current area payments, introducing a historical area payment in Scenario 3 leads to a further reduction of grain production in China as the payment has the smallest impact on production decisions. In Scenario 4, which provides no compensatory payment, the domestic production of wheat and maize decline more than in Scenarios 1 and 2. With higher net-

border policies such as tariffs and import quota. On the other hand, Aglink-Cosimo is explicit on border measures such as tariffs and tariff rate quota. To remain comparable, a fixed tariff was maintained in Aglink-Cosimo and tariff rate quotas are not binding.

imports by China, world grain prices increase more in Scenarios 3 and 4 than in Scenarios 1 and 2.

The simulated supply response is larger in PEM than in Aglink-Cosimo, although the direction of production and price impact and the relation between different scenarios are mostly consistent between the two models. The difference in the production impacts between PEM and Aglink-Cosimo is due to the different structure of the models and their underlying parameterisation. The recursive-dynamic nature of Aglink-Cosimo implies that the parameterisation uses annual changes and changes influence adjustments in subsequent years. On the other hand, the comparative static PEM parameterises on two equilibrium stages, assumed five years apart. The factors of production in PEM are more substitutable in five year time horizon than Aglink-Cosimo. Unlike the Aglink-Cosimo, the production impacts are independent from the historical yield trends. The results imply that the medium-term production impacts depend on the extent to which the adjustment occurs in production factor markets. The different reactivity of PEM and Aglink-Cosimo to policy shocks requires further investigation but highlights the uncertainty of model results.

Table 3. Impact of policy reform on commodity markets

		Production		Consumption		Domestic price		World price	
		PEM	Aglink-Cosimo	PEM	Aglink-Cosimo	PEM	Aglink-Cosimo	PEM	Aglink-Cosimo
		(% change)							
1. Commodity specific area payment	Wheat	-4.9	-0.6	3.6	3.5	-8.8	-10.8	1.9	2.8
	Rice	-2.5	-0.2	0.4	1.2	-3.7	-8.4	4.7	3.2
	Maize	-0.9	0.1	1.9	1.2	-6.1	-6.6	0.5	1.0
2. Non-commodity specific area payment	Wheat	-5.2	-1.6	3.7	3.3	-8.9	-10.0	1.6	3.2
	Rice	-3.0	-0.7	0.2	0.9	-3.4	-7.1	5.1	3.7
	Maize	0.9	-0.1	2.0	1.1	-6.3	-6.1	0.1	1.1
3. Non-current area payment	Wheat	-10.6	--	3.3	--	-8.0	--	3.5	--
	Rice	-2.3	--	0.4	--	-3.4	--	5.1	--
	Maize	-6.3	--	1.7	--	-5.4	--	1.9	--
4. No area payment	Wheat	-11.0	-1.7	3.2	3.3	-7.9	-9.8	3.6	3.4
	Rice	-2.0	-0.9	0.4	0.8	-3.6	-6.4	4.9	4.0
	Maize	-6.5	-0.4	1.6	0.8	-5.4	-5.2	2.0	1.3
5.Commodity specific area payment and destocking	Wheat	--	-0.6	--	3.6	--	-11.2	--	2.4
	Rice	--	0.3	--	0.3	--	-5.4	--	0.9
	Maize	--	-0.2	--	1.8	--	-8.5	--	0.6

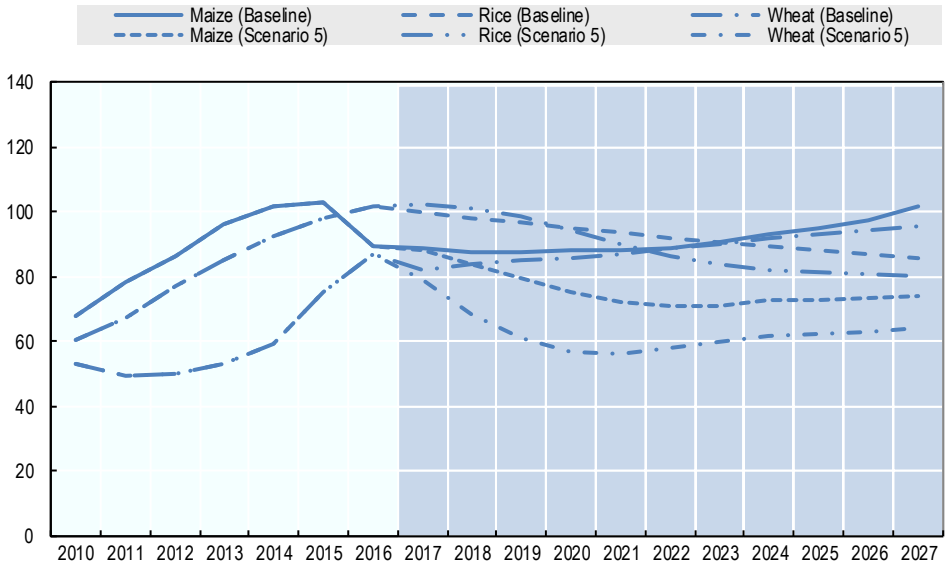
Note: Changes are expressed compared to the baseline (average 2025-2027) for Aglink-Cosimo and in five-year time horizon from the base year (2015) for PEM.
Source: OECD PEM and Aglink-Cosimo.

Under the assumption of unchanged domestic grain stock levels (Scenarios 1 to 4), the larger gap between domestic production and consumption of grains would be filled by an increase in imports, leading to a lower level of grain self-sufficiency, in particular wheat. The self-sufficiency rate of wheat and maize could also decline up to 16 and 10 percentage points, respectively. In the scenarios which introduce current area payment (Scenarios 1 and 2), the self-sufficiency of wheat declines by 4-10 percentage points, while that of maize and rice declines by less than 4 percentage points. A higher level of China's imports pushes up the world market price. Due to the more rigid supply response of rice when compared to wheat, and lower volume of world trade, China's additional rice imports would elicit a

larger change in world rice prices than that of wheat prices. In turn, the price response on the world market cushions the impact of reform on the domestic market price.

By allowing grain stocks to adjust (Scenario 5), destocking occurs in the first years and stock levels will be lower afterwards (Figure 4). The difference between final stock levels due to destocking is larger for wheat and maize. The price impacts are lower on the world market as more of the additional gap between production and consumption is covered by releasing domestic stocks instead of by importing more. The impact on domestic prices is stronger compared to the other scenarios caused by increasing domestic supply of grains due to destocking.

Figure 4. China's cereal stocks 2010 to 2030



Source: Aglink-Cosimo scenario results.

The discussion so far ignores the specifics of China's TRQ system. PEM simulation shows that China's net import of wheat, maize and rice increasing to 17.9, 17.6 and 3.5 million tonnes, respectively, when the domestic price support programme ends. Consequently, imports could exceed the current level of TRQs, in particular for wheat and maize. Thus, either the out-of-quota tariffs of 65% would apply or specific exemptions would have to be made.[8] With Aglink-Cosimo, a set of additional simulations was carried out which assume a transition to the out-of-quota tariff when the import is getting close to the TRQ level. The results of this variant are not shown since they are very similar to the results presented above with the general adjustment that domestic prices would decline less (given the higher remaining rate of protection) and world prices would increase less (due to a smaller increase in imports). The change is stronger for rice and wheat than for maize as imports are closer to the TRQ level in the baseline. Generally, the inclusion of stock adjustments and application of TRQs result in a lower impact of the change in China's grain policies on the world market.

The reform of support policies for wheat, rice and maize has indirect impact on other commodities. In particular, it affects oilseeds (soybeans, rapeseed, sunflower and

[8] China applied sliding scale tariff and add supplementary import quota when domestic price policy reform for cotton increased the imports of cotton beyond the existing import quota.

groundnuts). Since China imports around 80% of domestic consumption of soybeans, reducing price support for wheat, rice and maize has only marginal impact on the domestic price of soybean. However, the PEM simulations suggest that domestic oilseed production would increase by 11.7%, reducing imports by 3.4% when the compensatory payment is implemented as non-commodity specific area payment covering all the arable crops including soybean (Scenario 2). However, when payment is designed to be a historical area payment covering all types of land use, land use would be shifted to pasture and reduce the production of all crops including soybeans (Scenario 3). The impacts simulated in Aglink-Cosimo are generally smaller on the area harvested and yields of other crops than in PEM but of the same sign. Livestock sectors benefit from lower grain prices as the reduced feed cost makes livestock production relatively more profitable than grain production. The average feed cost per tonne of compound feed declines by around 3% in all five scenarios. Nonetheless, the simulated impact on livestock production is less than 1% in all the scenarios.

Another sector affected by changes is biofuels. The Chinese government proposed a new nationwide ethanol mandate which would affect Chinese grain markets. To compare the impact the implication for China's grain markets of the introduction of a 10% ethanol mandate was analysed (Box 2).

Box 2. Impact of an increasing ethanol mandate

In September 2017, the Chinese government proposed a new nationwide ethanol mandate that expands the mandatory use of E10 fuel from 11 trial provinces to the entire country by 2020. The underlying rationale for that announcement is not clear but could be related to abundant grains stocks and to environmental concerns. Mechanisms for implementation and enforcement have not been announced yet. If fully implemented these policies could have important impacts on biofuel and agricultural markets.

Additional scenarios have been conducted with Aglink-Cosimo to assess the impact of the introduction of the 10% mandate for ethanol in Chinese gasoline use. They are adjustments to the situation with price support for all grains (baseline) and the scenario with commodity specific area payments and reactive stocks (Scenario 5). In these simulations both the TRQs and the stock adjustments are reactive to prices and market balances.

The impact on domestic prices and world market prices for cereals of the introduction of a 10% ethanol mandate in China would be considerably larger than any of the different options to redesign China's grain support discussed before (Table 4). The price effects are especially strong for maize, the main feedstock for the production of ethanol, but also spill over to wheat and to a lesser extent to rice. Destocking would be stronger than in Scenario 5. Imports would reach TRQ level but the high out-of-quota tariff limits additional imports. Consequently, the impact on world prices is lower than without the TRQ regime. The combination of the introduction of the 10% ethanol mandate with the elimination of price support has smaller price effects but would result in a stronger production response.

Table 4. Impact of a 10% ethanol mandate on China's grain markets

Change in percentage compared to the baseline (average 2025-2027)

		Production	Total use	Domestic price	World price
Baseline with 10% ethanol mandate	Wheat	0.2	5.0	18.1	9.0
	Rice	-0.1	0.6	7.5	3.6
	Maize	3.9	6.2	33.3	10.2
Commodity specific area payment and destocking and 10% ethanol mandate	Wheat	1.6	5.8	15.9	8.5
	Rice	1.0	0.8	6.3	3.6
	Maize	4.2	6.5	32.8	9.9

Source: Aglink-Cosimo simulation results.

4.2. Impact on harvested area, yield and input use

Policy reforms that eliminate domestic price supports would lead to a less intensive grain production. Lower expected prices reduce input demand which leads to lower yields, but the introduction of current area payment generates an incentive to expand the area of production (Table 5).

The extent to which the reform scenario leads to a less intensive production depends on the substitutability between land and other inputs as well as between different land uses. In PEM, the yield is determined by the changes in land and other input use. The policy shift from MPS to commodity specific area payment (Scenario 1) results in substitution of other inputs with land and also reallocates land to commodities receiving area payment. In this scenario, 4% of other arable land and 1% of pasture land would be reallocated to the production of wheat, maize and rice. On the contrary, Scenario 3 which introduces a historical area payment shifts the land use from grain production to other arable crop and livestock production. Overall, the effects on harvested area and yield, and hence production, are considerably larger in PEM than in Aglink-Cosimo as the factors of production are more substitutable in PEM than Aglink-Cosimo. The sensitivity test shows that substitutability between land and other factors affects the responsiveness of harvested area and yield current area payments are introduced.

Table 5. Impact of policy reform harvested area, yield and inputs

		Harvested area		Yield		Chemical	Fertilizer
		PEM	Aglink-Cosimo	PEM	Aglink-Cosimo	PEM	
		(% change)					
1. Commodity specific area payment	Wheat	5.6	-0.1	-9.9	-0.6	-2.1	-2.4
	Rice	1.0	0.3	-3.4	-0.4		
	Maize	4.2	0.3	-4.9	-0.3		
2. Non-commodity specific area payment	Wheat	5.8	-1.0	-10.4	-0.6	-1.7	-1.7
	Rice	0.1	-0.3	-3.1	-0.4		
	Maize	7.3	0.2	-6.0	-0.2		
3. Non-current area payment	Wheat	-6.2	--	-4.7	--	-4.1	-5.8
	Rice	-0.8	--	-1.5	--		
	Maize	-4.9	--	-1.4	--		
4. No area payment	Wheat	-6.8	-1.2	-4.5	-0.5	-4.0	-5.9
	Rice	-0.2	-0.6	-1.8	-0.3		
	Maize	-5.3	-0.2	-1.2	-0.2		
5. Commodity specific area payment and destocking	Wheat	--	0.0	--	-0.6	--	--
	Rice	--	0.6	--	-0.3		
	Maize	--	0.1	--	-0.3		

Note: Changes are expressed compared to the baseline (average 2025-2027) for Aglink-Cosimo and in five year time horizon from the base year (2015) for PEM.
Source: OECD PEM and Aglink-Cosimo.

Improving the environmental performance of agriculture has recently become one of the central objectives of China's agricultural policy. The 2020 Zero-Growth Action Plan for Chemical Fertilizers and Pesticides restricts the annual growth of chemical fertiliser use to below 1% in 2015-19 and to zero by 2020 for major agricultural crops. The policy simulation shows that all the scenarios lead to reduced use of chemical and fertiliser. Under

Scenario 1, the use of chemical inputs and fertiliser declines by 2.1% and 2.4%, respectively, less than the case without compensatory payment (Scenario 4). The reform scenario replacing domestic price supports with a historical area payment (Scenario 3) has the greatest impact on production and hence the largest impact in reducing chemical and fertiliser use. Overall, the reform in domestic price support policy improves the policy coherence with China's objective to promote a more sustainable agriculture by reducing the use of chemical and other purchased inputs.

4.3. Welfare impacts

The policy reform scenarios reallocate the economic surplus between producers, consumers, input suppliers and taxpayers. Shifting from domestic price support to an area based payment would reallocate the cost of support from consumers to tax payers.

In the absence of compensatory payments (Scenario 4), agricultural producers would face a loss of USD 10.6 billion. However, milk and beef producers have a positive welfare gain in all scenarios due to lower feed costs.[9] Input suppliers lose USD 2.0 billion, which indicates that they capture 13% of the transfer associated with the domestic price support programme for wheat, rice and maize. On the other hand, compensating the reduction of the price support with commodity specific area payments (Scenario 1) would lead to a net welfare gain for producers by USD 3.0 billion and a welfare loss to input suppliers of USD 0.9 billion (Figure 5). The impact of alternative types of payments show that producers would gain more from a shift to a more decoupled type of payments, consistent with previous work on the income transfer efficiency of different types of support (OECD, 2001). The scenario shifting to a historical area payment (Scenario 3) leads to the largest producer gain of USD 4.7 billion as losses from inefficient use of resources would be minimised.

PEM measures the changes in producer's welfare as returns above opportunity cost for the two farm factors in the model: land and the aggregate other farm owned factor. The decomposition of producer's welfare change in the scenarios introducing area payment shows that producers gain entirely from higher returns on land, while returns on other farm owned factor decline. Producers' net welfare gain associated with the introduction of the compensatory payment depends largely on the assumption that the land is owned by farmers. The impact on producer welfare would be lower if the owner of the land contract does not farm.

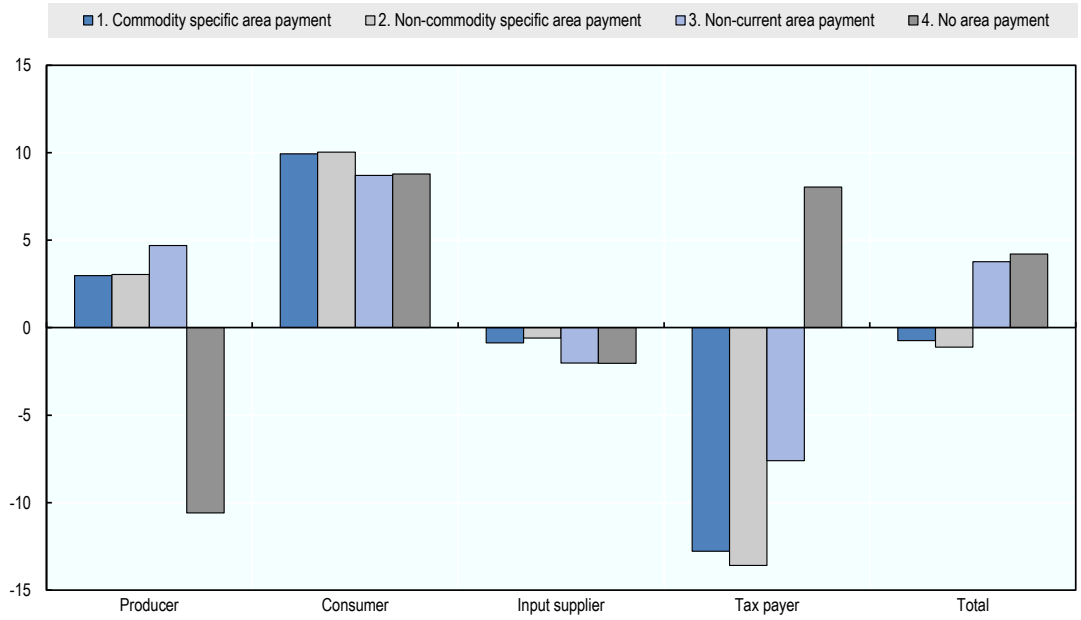
Consumers gain the most from the policy reform through lower grain prices, including livestock producers who would have lower feed costs. On the other hand, the introduction of compensatory payments increases the cost to tax payers. The increase in the fiscal cost would be the highest in the scenarios introducing current area payments (Scenarios 1 and 2) as tax payers would have to finance an additional expenditure for the existing area payments attached to crop production due to the expansion of the crop production area. Total welfare impacts shows that the policy reform scenario without compensatory payment (Scenario 4) would generate the largest efficiency gain, followed by the scenario introducing a historical area payment (Scenario 3). The net welfare loss of the scenarios introducing the current area payment (Scenarios 1 and 2) is driven by the additional fiscal

[9] The pork and poultry sectors would be the main beneficiaries of lower grain price as they are the main users of feed in China. The omission of pork and poultry sectors in the PEM underestimates the benefits of reform in price support programme for grains in China.

cost required to finance the existing payment for an increasing area of crop production. Policy makers should be aware of the unintended increase in the budget expenditure for the existing current area payment programme as a result of the introduction of new compensatory area payments.

Figure 5. Welfare impact of policy reform scenarios

Change in USD billion



Source: OECD PEM.

The assessment of fiscal costs in PEM does not take into consideration the link between the temporary procurement policy and government stockholding. PSE/CSE database records the annual expenditure of USD 16.4 billion in 2017 for public stockholding for food security purpose. This is larger than the size of the complementary payment programme (USD 15.5 billion). As the removal of the temporary purchase and stock programme would reduce the cost of public stockholding, the fiscal cost of replacing the domestic price support programme with the compensatory area payment is likely to be smaller.

Moreover, the welfare assessment does not take into account the implementation cost of policy reform. The experience in OECD countries shows that the implementation cost for targeted policies could be high, for example due to information needs and identification of program recipients (van Tongeren, 2008[2]). In the European Union, the issue of the administrative cost of policies arose in the context of the introduction of area payments to compensate the reduction of intervention price in 1992 (OECD, 2007[3]). China also faces a challenge to administer the area based payments.[10] In the absence of a proper registration

[10] In China, institutional reforms in the 1980s allocated land contract rights to individual family farms, while village collectives continued to retain ownership of farmland. China also introduced a reform to separate operational rights from contract rights to stimulate land rental transactions. The ownership of land contract rights has been strengthened through registration, but the transaction of operational rights are often not registered.

system on the operational rights of land, area payments are often paid to the owners of land contract rights but who no longer cultivates the land (OECD, 2018[4]). This limitation in policy implementation may effectively decouple payments from production, but reduces the income compensation function of the area payments.

5. Conclusions

Food security, especially maintaining the food grain self-sufficiency, has long been a central objective of China's agricultural policy. However, policy makers in China recognise that the economic and environmental costs of maintaining self-sufficiency are high. The domestic price support programme led to large public stocks of grains, which are costly to maintain. Maintaining the level of the current target price may be unsustainable in the long run as the baseline market projections suggest a continuous low grain price over the next ten years even while the cost of production is continuously rising in China. To address these policy challenges, China has started to reform its price support policies for several commodities (cotton, soybean, rapeseed and maize), replacing them with commodity specific area payments. It has also reduced the minimum purchase prices for wheat and rice.

This report assesses the impacts of recent reforms in grain policies and future reform options in China on multiple dimensions using two complementary agriculture sector modelling tools, PEM and Aglink-Cosimo. Five policy reform scenarios are simulated, differing in assumptions on whether and how the reduced price support is compensated through area payments, and on changes in public stockholding.

Removing domestic price support programmes leads to lower domestic grain prices and reduces domestic production. While the recent change in China's food security policy allows a moderate level of imports, maintaining a relatively high level of grain self-sufficiency remains a policy goal in China. The simulation results show that China would maintain more than 80% self-sufficiency in wheat and maize and 95% in rice. This result holds even in the reform scenario which breaks the direct link between support payments and production by replacing price supports with an historical area payment, and even without any payment.

Simulations show that the reform impact on the world markets is larger for rice and wheat than it is for maize as the world prices of rice and wheat are more sensitive to an increase in China's imports. Nevertheless, these simulations indicate that the world market can supply increased grain to China with only a modest increase in world prices. The analysis therefore suggests that China can rely on the world market for increased imports and still maintain a relatively high level of self-sufficiency. The impact on the world market could be lower, at least temporarily, if China reduces the level of grain stock in the course of its policy reforms. China's gradual approach to reforming market price support with compensatory area payments should smooth the potential impacts on domestic and world commodity markets as well as on domestic farm income.

The reforms to suppress the domestic price support programme encourage less intensive production of grains and reduce the use of chemicals and fertilisers. The shift to current area payments would encourage an increase in land use for crop production and lower yields. However, the extent to which yields decrease depends on the substitutability between land and other inputs, as well as between different land uses. The introduction of non-current area payments reduces the incentive to produce and has nearly the same impact

in reducing chemical and fertiliser use as the case where a complementary payment is not provided. The reform scenarios are consistent with China's sustainable agriculture development plan to encourage more sustainable production practices and preserve domestic production capacity.

Past reform experience in OECD countries suggests that the administrative cost of the new policy may need to be taken into consideration. In China, plot level information on who cultivates which crop is often unavailable. Despite the intention that the actual cultivators receive the payment, owners of the land contract rights are likely to receive the payments, even if they do not actually cultivate the land or no longer engage in farming. This would limit the impact of the direct payment in offsetting the decrease in farm income, which would otherwise occur. The policy reform would require the establishment of a registration system of cultivators.

Judging from the simulated welfare effects, particularly in relation to the burden associated with producing at high domestic costs, replacing price support with area based payments provides welfare gains for producers overall, even when area payments are linked to production decisions. The area payments, decoupled from current production decisions, are the most efficient, both in terms of transferring income to producers and reducing the overall economic cost of support. While the reforms to re-instrument domestic price support programmes with area payments increase budgetary expenditure, these reforms would reduce the considerable cost of managing public grain stocks.

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