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Keep calm and trade on: China's decisive role in agricultural markets under turmoil

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International agricultural trade is key to improving global food security. It ensures access to more diversified foods (e.g. Krivonos and Kuhn 2019), acts as a safety net against local production shortfalls (Glauben et al. 2022) and helps make use of regional climatic or resource-related production advantages. While local production and short supply chains can reduce transport costs, they do not necessarily equate to resilient food systems or lower carbon footprints (Stein and Santini 2022). Currently, though, international agricultural trade is facing supply chain disruptions and rising world market prices resulting from the ongoing Covid-19 pandemic, increasing global food demand and extreme weather events. Both are threatening already strained food security, in particular in import-dependent, low-income regions. Geopolitical risks, such as the China-US trade war and Russia's invasion of Ukraine, are further rattling the food market. As the world's largest consumer of agricultural goods, China's trade strategies influence world markets, with ripple-down effects for consumers around the world, particularly in the Global South. This policy brief aims at shedding light on China's current market actions, and the likely short- and mid-term developments and their impacts. We argue for moderation in response to short-term shocks. Excessive mobility and trade restrictions as well as extreme stockpiling should be avoided. These harm the trade system's overall capacity to resist further and more serious global challenges related to population growth and climate change.

China's dilemma is the world's dilemma: Rising demand meets exhausted natural resources

China is the world's largest importer of agricultural commodities. In 2021, China's imports of agricultural products exceeded its exports by a factor of 2.6 to reach USD 219.8 billion. However, behind these numbers lies a serious dilemma: As China's population and per capita GDP grow, so too does its domestic demand for high-quality food. In particular, demand is rising for meat and dairy products, which both require more land and water resources than the grains and vegetables consumed as part of traditional diets (Burggraf et al. 2015; Ren et al. 2021). At the same time, production resources are stretching thin. In 2018, China had only 0.08 ha of arable land available per capita, which is not even half the global average of 0.18 ha per person. Furthermore, less than 7% of the world's freshwater must supply 20% of the global population, making China one of the most water-scarce countries in the world (Sun et al. 2017).

For decades, Chinese agricultural policy has therefore focused on increasing productivity via agricultural intensification. Between 1961 and 2020, rice production quadrupled while wheat production increased nearly tenfold. These production gains were mainly the result of increased use of fertilizer, pesticides and irrigation but came at the cost of arable land and water resources, which suffered extreme depletion and deterioration. The increasing

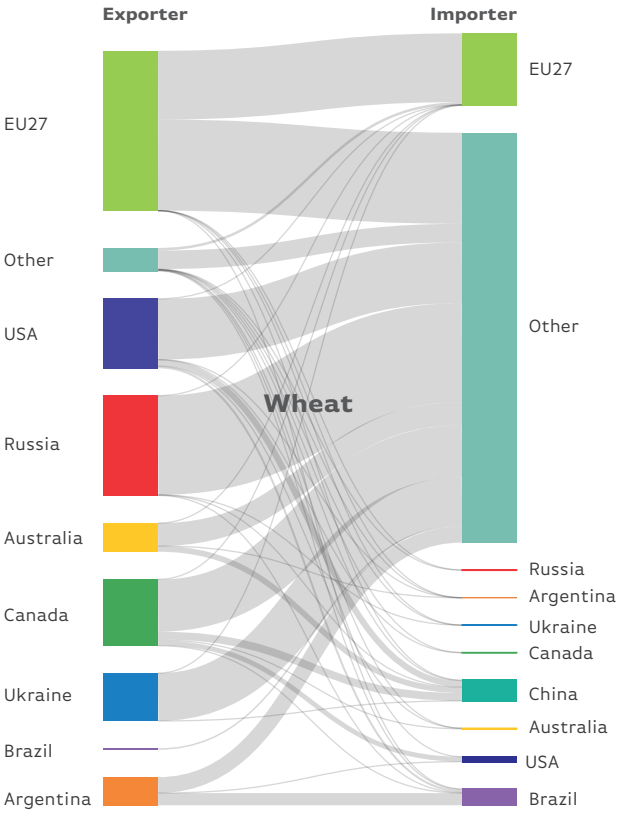

Figure 1: Trade flows wheat. Data: FAOSTAT 2022.

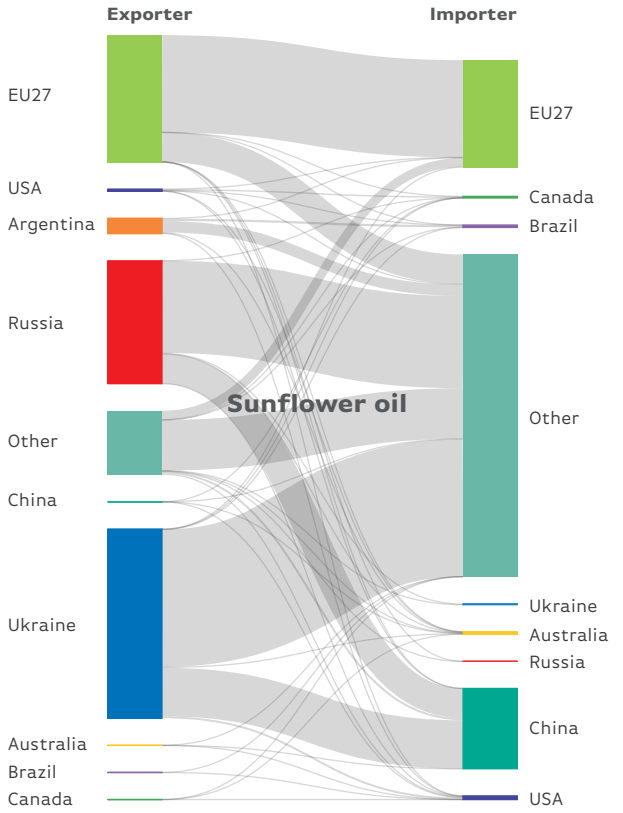

Figure 2: Trade flows sunflower oil. Data: FAOSTAT 2022.

demand of China's growing middle class for animal products has now spoiled the pursuits of complete self-sufficiency. Between 2020 and 2050, it is estimated that this nutritional transition will require between three and 12 million hectares of land (Zhao et al. 2021) – a target that will be most difficult to meet, as China is already struggling to maintain its current farmland area.

This dilemma has authorities in China worried about food security. On June 11, the Chinese Ministry of Agriculture and Rural Affairs (MARA) launched a multi-pronged rural investment program that urged local officials to stabilize grain production and expand soybean and oilseed production (MARA 2022b). In May, MARA issued a list of preferred industries and called for investments to ensure food supplies, including "food security industry belts" for grain and oilseeds, soybean and oilseed production bases, "smart" grain storage, and large-scale livestock industries (MARA 2022c). Above all, there are four strategic agricultural goods: wheat, vegetable oil, corn and soybeans.

Wheat, oil and meat: Short-term stabilization is possible, but the new price level will remain

Wheat, along with rice, is the most important staple food in China. While the country is largely self-sufficient in terms of wheat (94.3%), the annual import volume is nevertheless around 9.5 million metric tons (USDA 2022). China's range of trading partners for wheat is diverse and includes the EU, Russia, the USA, Canada and Ukraine (Figure 1). Global uncertainties and the loss of Ukraine as a trading partner sent domestic wheat prices soaring in March, even though price transmission from world markets to China is typically low (e.g. Arnade et al. 2017).

In general, China is well prepared for price and supply shocks: the USDA estimates that China had 142 million metric tons of wheat stocks in 2021. This means that, while China has 20% of the world's population, it likely holds more than 50% of the world's total wheat stocks, or a fifth of total annual large-scale wheat production, as a reserve. Furthermore, China is working on diversifying its imports. For instance, import restrictions on Russian wheat and barley were lifted on February 2, paving the way for increased trade with Russia.

National wheat harvests also appear stable. Official assessments of this year's national harvest changed from "worst harvest in history" to "bumper harvest" within just two months. In June, the USDA projected a harvest of 135 million metric tons, which is around the level of the previous two years (USDA 2022). Nevertheless, strong political efforts keep aiming at reducing harvest losses. For instance, MARA strongly critized farmers who were harvesting immature wheat to take advantage of more profitable silage. To cushion the effect of China's zero-Covid strategy, emergency crop harvesting teams replaced seasonal labor stuck in local Covid-19 lockdowns and a "green channel" expedited highway inspections and Covid-19 screenings involving the transport of farm equipment.

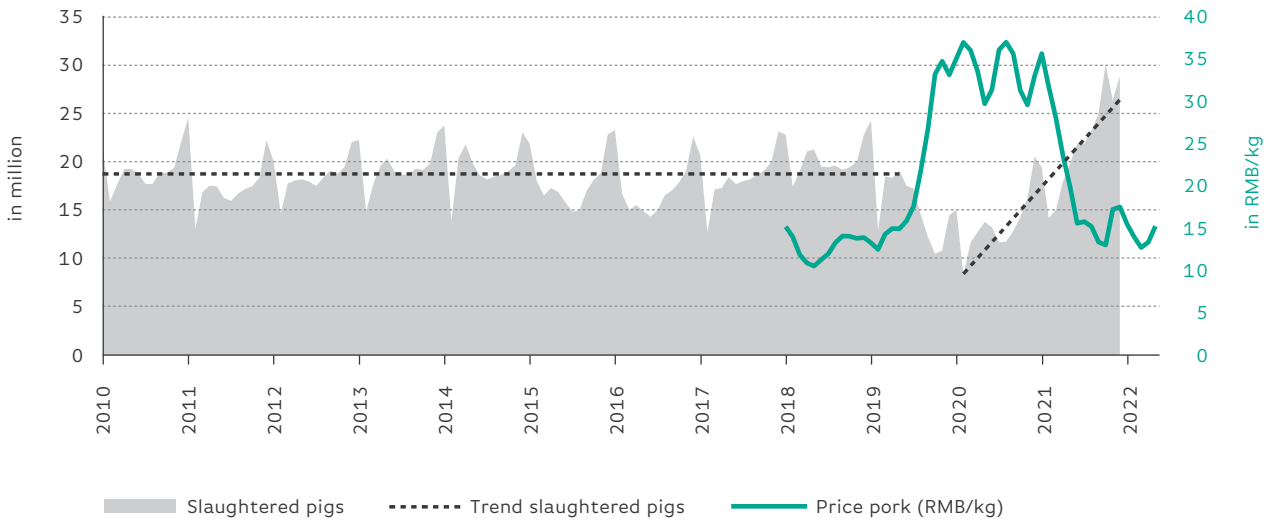

Figure 3: Slaughtered pigs and pork price, China (only hog farms above national standard).
Data: Own depiction, data from the Chinese Ministry of Agriculture and Rural Affairs.

Finally, sales from national strategic wheat reserves were halted in April 2022 and were further boosted by national procurements in June.

The further expansion of strategic reservers is surprising, in particular considering positive harvest outlooks. It is impossible to determine if China's current wheat stockpiling is an expression of its risk-averse government or result of politically motivated self-sufficiency efforts. In any case, Chinese consumption and stockpiling are likely to influence world market prices. Much depends on whether the wheat production area will remain stable, considering the considerable political and price incentives to produce competing strategic goods, such as oilseeds and animal feed.

Sunflower oil, like other vegetable oils, is heavily used for frying and cooking in China. Although sunflower oil accounts for less than 10% of China's total vegetable oil consumption, high prices affect the supply and price of other vegetable oils, such as rapeseed oil. China imports sunflower oil from a small number of trading partners (Figure 2) and predominantly from the USA and Ukraine. As prices started to rise in February, Chinese consumers began stockpiling cooking oil – a trend that was observed among consumers worldwide. Nevertheless, China has reduced its forecast of vegetable oil imports for the current marketing year by 13% to 7.43 million metric tons due to currently high market prices. Instead, national reserves were released in February to ease the national market. China will likely wait for world market prices for oil to stabilize before it fills up its strategic reserve.

Policies also focus on upscaling the domestic production area of oilseeds this spring (Reuters 2022). For this season, MARA is expecting a bumper harvest for rapeseed, with 90% of the harvest already concluded as of June 2022. However, none of this will be sufficient to replace Ukrainian export volumes. Instead, market strains might be somewhat eased by China's zero-Covid strategy, as strict lockdowns have devastated the restaurant and street food sector, which is the largest consumer of vegetable oils. It is unlikely that China will be able to substantially increase their vegetable oil production. As limited natural resources mean oilseed production for vegetable oil is in direct competition with the production of another strategic good – animal feed.

Serving the people pork: Rising consumption of meat will keep prices for corn and soybeans high

China consumes nearly half of the world's pork, and demand for animal feed has proven to be the Achilles heel of China's self-sufficiency ambitions. When African swine fever hit China in 2018, an estimated 43.46 million pigs died or were culled (You et al. 2021). As a result, national pork prices surged, leading to a boom in the Chinese hog industry. This was exacerbated by China's strict ban on pork imports from countries with outbreaks of swine fever. By the end of 2021, the number of slaughtered pigs jumped from a long-year average of about 18 million to about 28 million (Figure 3). To upscale pig production without using precious land resources, national policies propagate large-scale livestock farms. For animal feed, the industry cannot rely on household waste like the old, backyard farms, but requires corn and soybean meal to provide energy and protein. As such, the boom was accompanied by a spike in demand for animal feed that followed the high-price period between mid-2019 and early 2021.

In 2020, China imported close to 100 million metric tons of soybeans, or close to 60% of the global trade volume. These were mostly GMO soybeans for animal feed. Due to the trade war with the USA, China has been increasingly turning to Brazil as a key trading partner (Figure 4). However, the import structure remains highly concentrated. While Argentina exports soybean oil for human consumption, exports of soybeans remain heavily taxed.

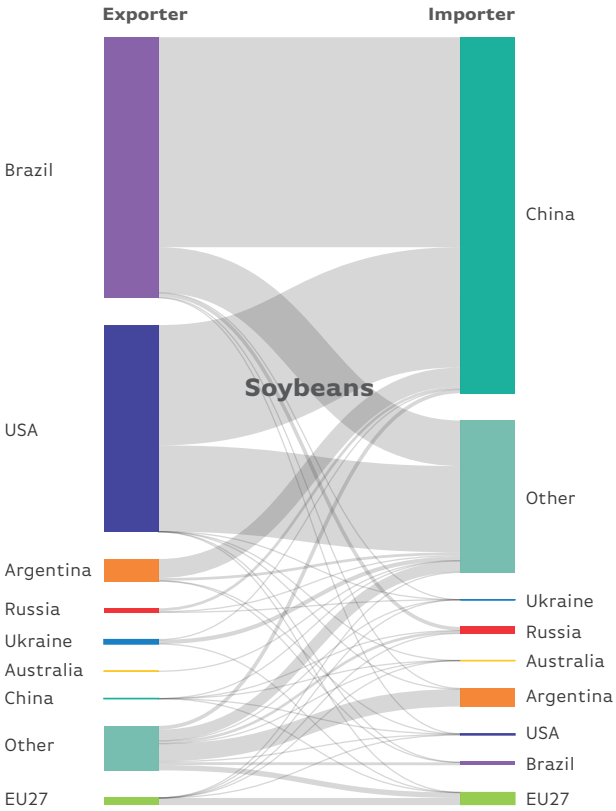

Figure 4: Trade flows soybeans. Data: FAOSTAT 2022.

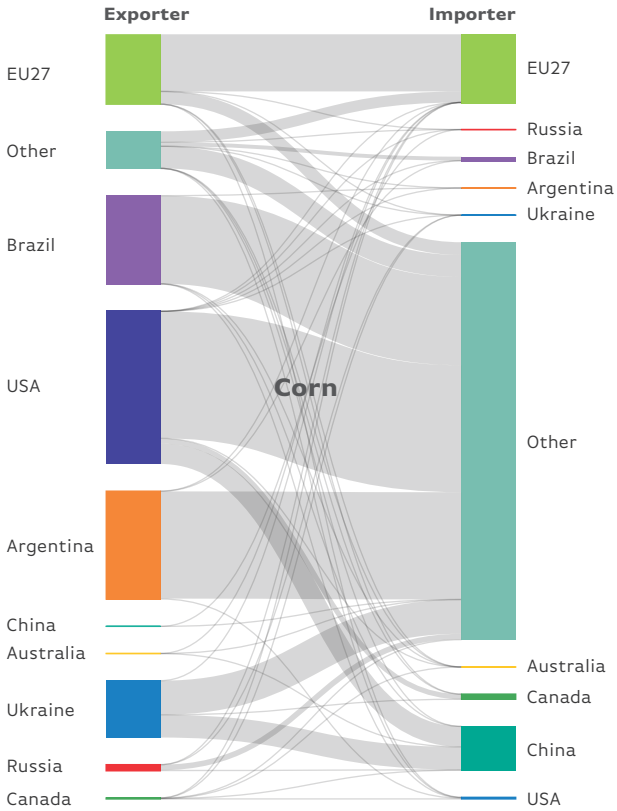

Figure 5: Trade flows corn. Data: FAOSTAT 2022.

Ukraine only accounted for 0.1% of total soybean imports, making potential production shortfalls irrelevant for China. However, the current geopolitical upheaval will have consequences for China's sourcing strategy. While increased trade with South America is likely, there is also speculation that China might strengthen its trade ties with Russia, the world's ninth largest producer of soybeans. However, climatic conditions limit Russia's ability to increase production much beyond its current annual volume of 4.3 million metric tons. In addition, Russia is seeking to expand its beef and hog industry, meaning it may need to reserve more soybeans for its domestic market.

The current crises have had the by far strongest impact on China's corn trade. China is a key producer of corn, with a self-sufficiency rate of 95.8%. However, it is also the world's largest net importer of corn, with a heavy reliance on the USA and Ukraine (see Figure 5), which account for 55% and 39% of its total corn imports, respectively. There is now a significant gap in China's corn imports, and recent record corn deals with South American countries were seen as a reaction to the war in Ukraine. However, Chinese corn purchases were at record highs even before Russia's invasion of Ukraine.

Nevertheless, China will have to substitute lost trade volumes from Ukraine. South American countries such as Brazil and Argentina provide alternatives to the USA, and China is already on the verge of striking a major trade agreement with Brazil for corn and soybeans. This is intended to revitalize the 2014 trade agreement that was hindered by high phytosanitary requirements and procedures.

However, China's government is aware of the risk of increasing dependency on corn imports. As a result, the country has been building immense stocks of corn, which are estimated at 210 million metric tons and accounted for more than two-thirds (68%) of global corn stocks at the end of the last season. Already in 2021, MARA was calling for soybeans and corn in animal feed rations to be replaced with other grains like barley and sorghum (Gu, Patton 2022). While the planting area of corn increased by about 5% in the 2021/2022 season, the further expansion of corn at the expense of other crops does not seem to be part of China's strategy. According to MARA, the corn planting area in the 2022/2023 season is expected to drop by 1.8% to make room for increased soybean production (Sina 2022).

When it comes to international markets, in the short term a lot depends on the current domestic harvest, which remains difficult to assess, as Covid-19 lockdowns kept crop analysts from travelling to some of the production regions. While June projections by the USDA predict a "normal" corn harvest of 271 million metric tons (USDA 2022), the critical growing phase is yet to come in some regions.

Still, there is a silver lining. As shown in Figure 3, overproduction of hogs sent pork prices plummeting in spring 2021. By March 2022 they had reached a minimum that fell below the break-even point for many farmers (see Figure 3). In addition, the output targets of the Chinese government's five-year plans did not indicate further growth in the hog sector (MARA 2022a). Therefore, we should

not expect any further short-term demand surges like those in the last two years. However, demand for pork continues to keep step with rising populations and incomes. While less efficient farmers might be forced out of the market, the general appetite is far from saturated. Import bans on pork from countries with incidences of African swine fever mean that China will have to maintain a substantial domestic pork industry. The domestic industry structure will change, but demand for corn and soybeans on the world market will not.

With great consumption comes great responsibility: China is a driving force for micro- and macrotrends on international food markets

On a positive note, China is currently showing no indications of further extreme demand surges for strategic agricultural products caused by microtrends in the wake of shocks like the African swine fever, the Covid-19 pandemic and, most recently, the war in Ukraine. The immediate effects of these shocks have already been absorbed and priced in. Chinese national strategic reserves are high, imports from Ukraine can be and are being substituted by other trading partners, and there are no indications of a poor Chinese harvest. Finally, pork prices do not incentivize a continuation of the hog boom.

In the long term, however, many macrotrends will persist, including those caused by climate change, population growth and higher consumption of animal proteins. Considerable parts of China's population have only recently reached higher income levels and are eager to improve their diets. Demand for food on world markets will therefore continue to increase steadily. It is not clear whether productivity gains can keep pace in the face of climate change and scarce water resources.

Sensible and carefully planned food security policies keep global food markets resilient

These global challenges cannot be solved by a single country and require concerted efforts. However, it is up to political decision-makers to react to microtrends. We argue that recent price volatilities were a consequence of political decisions in individual countries. First, complete isolation in the face of human and animal pandemics is understandable but unsustainable, and prolonged extreme lockdown measures during the Covid-19 pandemic led to major trade disruptions. Import bans on pork supported the quick and unsustainable expansion of China's hog industry, leading to surging prices for corn and soybeans. These price surges are intrinsically problematic but also have ripple-down effects due to the scarcity of land and water resources. The sudden expansion of animal feed production will inevitably lead to damaging price fluctuations for other crops or the depletion and deterioration of available natural resources. Second, excess stockpiling for national food security removes large quantities of crops from world markets and can lead to shortages, in particular in low-income countries. Hoarding in times of crisis is harmful and also inefficient. While excess strategic reserves might not even be necessary, the costs of stockpiling are immense and storage losses are considerable. Removing large quantities from the world markets is likely to amplify price spikes and stands in the way of price stabilization.

The new price level will persist, but trade relations are going to change

In summary, we can hope for markets to recover for some products, in particular wheat. In the midterm, ongoing political tensions might lead to diversification away from the USA, which, in the absence of Ukraine on the world market, remains China's main trading partner for corn and soybeans. China will likely intensify trade relations with Brazil, Russia and other countries in South America.

Climate change, a nutrition transition and resource limitations are driving forces for macrotrends, which will prevent world market prices from returning to pre-Covid levels anytime soon. There are attempts to solve resource constraints, and in China, for instance, high hopes are pinned on the breeding of new seeds at the newly established seed center in Hainan. Nevertheless, miracles are not to be expected. Reallocation of land and water resources within China is at best a zero-sum game and may even lead to losses, such as evaporation in the case of China's colossal water transfer project. Also, overseas land deals are no panacea, as past experience has shown that also Chinese investors are facing common local agronomic and socioeconomic challenges.

Risk-sharing becomes unavoidable in a less predictable world

Like most countries around the world, China cannot afford to, nor does it intend to, withdraw from world food markets. The country is facing the same global challenges: Food demand is rising, while resources are limited and increasingly strained. Furthermore, shortages and soaring prices for mineral fertilizers, such as nitrogen, are limiting the potential to squeeze out any further productivity gains. At the same time, climate change is increasing uncertainties in crop production. Human and animal diseases are spreading faster, increasing the risk of production and infrastructural disruptions. Finally, geopolitical tensions are rising once again, bringing about all sorts of value chain and trade disruptions. In the end, no country, not even China, will be able to overcome global challenges on its own. Complete self-sufficiency in terms of major food products may be the goal, but it can't be achieved without resource depletion and

massive losses in welfare and quality of life. To master the coming challenges, China will have to participate in international markets to share various production, price and logistics risks. In the face of the current crises, only international markets can provide the volumes required to feed the masses.

Increasing geopolitical conflict is posing immense challenges not only to global food security but also to the living conditions of millions of people. Strong political blocs would lead to a de-globalization of established trade structures and fragmentation of the global market. As a consequence, the safety net of international agricultural trade would be massively weakened, likely to the detriment of food-insecure people in the Global South, and cause economic hardship around the world. Rather, an open trading system is required, especially in times of geopolitical crisis.

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