



# Internal spatial fix: China's geographical solution to food supply and its limits



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## ABSTRACT

Over the past three decades, China has managed to maintain and even increase grain production in the context of rapid industrialization and urbanization through a process of internal spatial fix in which grain production is relocated to and concentrated in less developed inland regions. However, the fix created political and environmental problems that will undermine it in the future. Using national statistical data and two case studies, the paper demonstrates how the fix has been a result of complex interactions between central and local actors and is a key factor shaping China's trajectories of food politics and agrarian transitions. It also reveals that confronting the underproduction crisis of food under capitalist accumulation China has first sought to produce sufficient grain within its national border rather than rely on overseas resources.

## 1. Introduction

The rise of China affected both food supply and demand in the country. On the supply side, the acceleration of industrialization and urbanization gobbled up large quantities of farmland and water while pollution, environmental degradation and climate change worsened agricultural conditions (Chen, 2007; Christiansen, 2009; Khan et al., 2009; Liu et al., 2014; Nath et al., 2015; Piao et al., 2010). On the demand side, rising standards of consumption and the dietary shift to resource-intensive food such as meat and dairy have driven up food demand considerably (Schneider, 2014; Tilman et al., 2011). In addition, China faces extreme resource constraints in food production. Farmland per capita in the country is only 0.1 hectare, 40 percent of the world average while water resource per capita is 2039 cubic in 2015, a quarter of the world average (NBS, 2016: tables 8–1; 8–11; Wong and Huang, 2012).

As early as 1994, Lester Brown sounded the alarm that China would have to import a massive amount of food, thereby causing a global food crisis. In recent years, the question of “who will feed China” has drawn renewed interest due to two emerging trends. One is China's increasing food imports. From 2006 to 2015 its grain imports grew from 31.8 million to 114.4 million tons. In 2015, imports accounted for 15.5 percent of domestic consumption.<sup>1</sup> Most of the imports are soybeans, but the shares of cereals such as rice and wheat have been growing

(NBS, 2016: table 11–8; Yan et al., 2016). The other trend is the expansion of Chinese overseas agricultural investment, particularly its purchasing and leasing of overseas farmland (Bräutigam and Zhang, 2013; Edelman et al., 2013; Hofman and Ho, 2012; Muldavin, 2012).

Although this seems to validate Brown's warning, the volume of food imports still falls far short of what was predicted. Brown (1995, 97–99) estimated that China would import 369 million tons of grain if per capita consumption rose to 400 kg.<sup>2</sup> By 2015, consumption in China had risen to 534 kg per person, and it imported 114.4 million tons, a large quantity indeed but still much smaller than predicted. Why has China not imported more grain? The main reason is that domestic grain production has also increased in the past decade and a half, and it reached a record of 621.4 million tons in 2015, up 33.2 percent from that in 1995 (NBS, 2016: table 12–10).

This paper calls attention to the internal geographical restructuring of grain production in China. We distinguish between two processes: external spatial fix and internal spatial fix. External spatial fix refers to the phenomenon of relying on overseas resources to meet domestic food demand through means such as importation and transnational investment. As noted earlier, the scholarship has so far focused exclusively on the process of external spatial fix with regard to China's food supply. This paper will show that the process of internal spatial fix played at least an equally important role. Moreover, the two processes are interrelated, and an analysis of the internal spatial fix will shed light on

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<sup>1</sup> Sources of data: *China Statistical Yearbooks* 2007–2016.

<sup>2</sup> Brown did not include soybeans in his calculation. If included, the gap would be even larger.

China's future reliance on overseas food resources.

We focus on grain production because grain crops, broadly defined in China, have provided the main sources of human direct consumption, animal feedstuff and processed food products. The Chinese official definition of grain (*liangshi*) includes cereals (rice, wheat and corn), coarse grains, beans (such as soybeans) and potato tubers.<sup>3</sup> We will show that China has managed to maintain and even increase grain production through a process of internal spatial fix, which constitutes two processes: on the one hand, grain production is relocated to less-developed areas within the country, mostly inland and northern regions. On the other hand, grain production is concentrated in key grain-producing areas. The two processes are related as the key areas are mostly located in inland regions. The internal spatial fix enabled China to rely less on overseas resources for food than it would otherwise.

Although the internal spatial fix lessened China's dependence on overseas food resources, it created two problems that would subsequently undermine grain production. One is environmental deterioration in grain-producing areas. The intensification of grain production in these areas has added great stress on the already vulnerable environment. For example, many northern regions are short of water, but to expand grain production farmers have to pump underground water intensively, leading to the depletion of aquifers (Shalizi, 2006; Wang et al., 2007). The other problem is the conflict of interest between the center and local actors. The internal spatial fix set in motion a continuous geographical movement of grain production from developed to less-developed regions. As industrialization and urbanization spread, more localities would reduce grain production, thereby undermining the fix.

The term of "spatial fix" was originally used by David Harvey (1981) to refer to the geographical solution to the over-accumulation crisis in capitalist economies, that is, capital tends to move across space to seek new markets and investment opportunities in an attempt to counter the falling rates of profit. This paper employs it to refer to the solution to another kind of crisis under capitalism: the underproduction crisis (of raw materials and food) (Moore, 2010: 392–393, 2015: 91–110). According to Karl Marx, "... with other things being equal, the rate of profit varies inversely as the value of the raw material" (1991: 207). However, "it is possible, indeed unavoidable when capitalist production is fully developed, that the production and increase of the portion of constant capital that consists of fixed capital, machinery, etc. may run significantly ahead of the portion consisting of organic raw materials, so that the demand for these raw materials grows more rapidly than their supply, and their price therefore rises" (1991: 213–214). Insofar as food is concerned, foodstuffs are used both as the raw material of production and to feed workers, and thus high food prices will undercut the profit for capital.

The underproduction crisis of food in this paper refers to the tendency toward a situation where food production cannot catch up with increasing demand driven by capitalist accumulation, thus pushing up food prices and causing food shortages in some parts of the world or even on a world scale. Over the past two centuries since the Industrial Revolution, the tendency towards a full-blown underproduction crisis has been checked by the dynamics of "geographical expansion and social-technical innovation" (Hazel, 2009; Moore, 2010: 293; Patel, 2013). However, there were instances of local, regional and even global crisis. Examples include the 1972/3 food crisis and the 2008 food crisis, not to mention many local and national crises. The spatial solution to check the tendency toward the underproduction of food has been employed by many capitalist economies, particularly those facing the constraint of natural resources such as land and water. For example, 19th-century Britain outsourced the production of staple food to its colonies (Friedmann, 1982; Friedmann and McMichael, 1989; McMichael, 2009). In the post-war period, industrialized countries in

East Asia such as Japan and South Korea also relied heavily on food imports (Chang et al., 2013, 601; McMichael, 2000).

The concept of spatial fix situates the geographical restructuring of China's grain production in the larger process of global capitalist expansion (Muldavin, 2013). China has been incorporated into the global capitalist economy after market reform in the late 1970s, with southern and coastal regions being turned into the "world factory" (Hung, 2009; Lin, 2002). This created a contradiction on food supply, or an "underproduction crisis of food," as capital accumulation in these regions exhausted land resources, increased the costs of food production, and raised the demand for food (Chen, 2007; Christiansen, 2009; Liu et al., 2014; Seto and Kaufmann, 2003). The discourse of "who will feed China" further heightened the sense of crisis in the Chinese state (Boland, 2000; Brown, 1994). To check the tendency toward underproduction, China first resorted to the internal spatial fix, and it was only until the recent decade (2004 onwards) that it started to rely more on external resources.

To alleviate the fear of "who will feed China," China announced in a white paper in 1996 that it would produce 95 percent of grain it consumes (State Council of China, 1996). It has thereafter taken a number of policy measures to increase grain production, which in many cases facilitated the relocation and concentration of grain farming. In developed southern and coastal regions, the expansion of capitalist production led to local governments and private investors diverting natural, financial and human resources from grain crops to urban and industrial sectors. Conversely, in less developed inland regions, particularly those in the north, efforts in grain farming were enhanced due to supportive central policies and access to new agricultural technologies.

The process of internal spatial fix interacts with regional comparative advantage, technological innovation and agrarian transitions. Firstly, the outcome of restructuring can be partly attributed to regional differences in resource endowment (Chen, 2009; Qu and Su, 2003; Zhong and Qin, 2010). For instance, the size of landholding in many inland provinces is larger than that in coastal provinces while levels of industrialization in the former are lower. Secondly, technological innovation played a role, which David Harvey (2003) calls "technological fix" as a parallel process to spatial fix. The increase in grain production in China has been attributed to the application of new agricultural technologies (Jin et al., 2002). Due to limited space, this paper is unable to examine this issue extensively, but it will show that spatial and technological fixes are intertwined. The relocation of grain production to less developed areas was made possible by the application of new seeds, new materials and new methods of cultivation. Finally, the internal spatial fix had an effect on agrarian transitions. It has been shown that agricultural capital, embodied in large farms and agribusiness companies, has become increasingly powerful in Chinese agriculture (Andreas and Zhan, 2016; Schneider, 2017; Yan and Chen, 2015; Zhan, 2017a; Zhang and Donaldson, 2008). This has much to do with the efforts to increase grain production. The Chinese state provided political and financial support for large farms and agribusiness, in a belief that these entities are more efficient than small households in farming crops (Gong and Zhang, 2017; Zhan, 2017b).

This paper has three aims. The first is to illustrate the overall pattern of the internal spatial fix. It will show with quantitative data how grain production has been geographically restructured over the past three decades. The second aim is to examine policy measures that the central government took to ensure sufficient grain output and stabilize the internal spatial fix. Finally, it will examine the political and environmental problems inherent in the fix based on two county cases, which are located in Hunan Province and Inner Mongolia respectively with distinct positions in the national food system (Fig. 1).

Both counties are located in the inland as well as in key grain-producing areas. However, the impacts of industrialization and urbanization on their grain production are very different. The county in Hunan Province, pseudonymized as "Serenity County", has been a major rice-producing area for centuries. As rapid urbanization and

<sup>3</sup> The Food and Agricultural Organization of the United Nation excludes soybeans and potato tubers from the category of grain.

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