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The decline and transformation of smallholders in Chinese agriculture: national trends

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ABSTRACT

Using data from official statistical sources and a nationally representative survey, we find that since 2001, China's agricultural labor force has declined by over 50 percent—a loss of over 200 million smallholders, probably the largest in human history. This trend is the most pronounced in livestock sectors: from 2012 to 2021, 62.5 million smallholder units have disappeared. The 150 million remaining smallholders are mostly commodity producers, participating widely in commodity relations to access agrochemicals, machinery, rental land, and wage labor to produce for markets. The ageing smallholder population also face challenges in intergenerational reproduction, which will accelerate its decline.

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Smallholders; peasants; petty commodity producers; capitalist agriculture; vertical integration; class differentiation

Introduction

A wave of recent studies has examined the rapid transformation of Chinese agriculture and documented the rise of various forms of capitalized, large-scale producers and the decline of smallholding family farmers (e.g. Luo, Andreas, and Li 2017; Schneider 2017; Xu 2018a; Yan and Chen 2015; Zhang and Donaldson 2008; Zhang and Zeng 2021). All these studies, however, rely on either qualitative data or small-scale quantitative surveys conducted in one or a few localities. An investigation of the national trends in the decline of smallholders is missing. The qualitative and localized studies have yielded conflicting findings: while most have focused on how land transfers, scale-biased government policies, and market competition all enabled the growth of large-scale producers and pushed smallholders out of agriculture, some have shown that smallholders persisted despite these pressures (Huang, Gao, and Peng 2012; Rogers et al. 2021; van der Ploeg and Ye 2016; Wilmsen et al. 2023). While the inconsistency is not surprising given the great amount of diversity that exists across regions and crop sectors, it further adds to the urgency of identifying the major changes that have happened to China's population of hundreds of millions of smallholders at the national level.

Aside from the decline of smallholders, those who remain in agriculture are the focus of another hotly contested debate. Scholars on the 'capitalist transformation' side of the

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debate argue that the term ‘smallholders’ obscures the growing social differentiation among them as a result of capitalist transformation and that most of the so-called ‘smallholders’ in China have become various types of commodity producers, whose commodity relations with capital have thoroughly transformed their agricultural production and whose livelihoods are deeply integrated into markets (Chen and Jiao 2024; Han and Rogers 2023; Hu and Rahman 2015; Rogers, Wang, and He 2023; Webber 2012; Zhang 2015). Proponents of ‘peasant persistence’, on the other hand, contend that Chinese smallholders are continuing with ‘peasant farming’, which relies on self-controlled resources, eschews commodity relations, and follows a distinctive economic logic, and that they have successfully resisted the incorporation into capitalist agriculture – and by extension, remained largely homogenous (Huang, Gao, and Peng 2012; van der Ploeg and Ye 2016). This is a debate that also needs to be adjudicated with empirical data on how commodity relations with capital and wage labor transform smallholders’ agricultural production and create internal differentiation.

In this study, we use official data from national statistical yearbooks and agricultural censuses, as well as a national survey data set to conduct descriptive analyses to answer two sets of questions: First, what is the magnitude of the decline of smallholders and growth of large-scale producers on a national scale? Second, for those who remain in agriculture, what are the national-level trends in how the penetration of industrial inputs and commodity relations have transformed their production? In doing so, our goals are, first, to provide an aggregate-level empirical assessment of the changes to the smallholder population resulting from the capitalist transformation of agriculture in China; and second, to shed light on the class nature of the so-called ‘smallholders’ and their internal differentiation.

We will discuss in the next section the dynamics that lead to the decline and transformation of smallholders to provide the background. Our aim, however, is not to provide a causal analysis, or to comprehensively evaluate the impact – whether positive or negative – of these changes on former and current smallholders; nor do the data allow that. It is also not our intention to make any normative arguments about what should happen to smallholders or predictions about what the fate of smallholders will be in the future.

Our empirical analyses rely on three data sources. Two of these are official government data: first, a series of statistical yearbooks published by central government agencies, and second, data from the two recent decennial Agricultural Censuses (2006 and 2016), released by the National Bureau of Statistics. The third data set comes from a nationally representative and longitudinal survey, the China Family Panel Studies (CFPS). The CFPS has been conducted biennially since 2010 by the Institute of Social Science Survey (ISSS) of Peking University (Xie and Hu 2014). We use data from the last five waves (2012, 2014, 2016, 2018, and 2020) as the 2010 data lack key information about agricultural households. The CFPS contains both rural and urban samples and collects rich data at the family and individual levels using different questionnaires. For the rural sample, the family questionnaire includes data on the family’s agricultural operation, employment activities, and income and expenses.

Concepts, theories, and background

Those who till the soil

The subject of our study is a deceptively simple population: rural households who use at least part of their family labor to engage in family-organized agricultural production on a

relatively small scale. A label that is widely used to describe this population, especially in the international development and aid circle (Fairtrade International 2013; Fan et al. 2013; Hazell et al. 2010; IFAD & UNEP 2013), is ‘smallholders’ – or, in slightly different ways, ‘small farmers’ or ‘smallholding family/household farmers’.¹ These labels define this population by two characteristics: household as the unit of production and small scale. These are also believed to further lead to, or at least correlate with, some other shared characteristics, ranging from low degree of farm intensification and commercialization, a subsistence orientation, low income, and higher yield per unit of land, to a policy preference for redistributive land reforms (Hazell et al. 2010; Lipton 2009).

When this population of ‘smallholders’ is put under a more critical lens, beneath the surface of homogeneity, significant inequalities and class-based differences reveal themselves (Cousins 2010; Olofsson 2018). To begin with, what constitutes ‘small scale’ is nearly impossible to define: it varies greatly across contexts and is not closely associated with how production is organized. The most widely used cut-off point for being ‘small scale’ is a farm size below 2 ha (Hazell et al. 2010; Lowder, Skoet, and Raney 2016; Rigg, Salamanca, and Thompson 2016). But when it comes to labor use, capital and technology intensification, and market relations, two family-run farms under 2 ha, even in the same locality, can be vastly different. For example, an egg farm we visited in Rongcheng County in Shandong Province, China, owned and run by a father-son team, sits on 6 *mu* (0.4 ha, 15 *mu* equals 1 ha) of rented land and employs two year-round workers. It has three state-of-the-art chicken houses, equipped with automated systems of feeding, egg-collection, temperature control, and cleaning, each costing 400,000 *yuan* in construction and housing 9,000 layer hens. Seventy percent of the feed for their hens is corn, which they buy from neighboring corn farmers. The size of these corn farmers is typically around 20 *mu* (1.3 ha), yet despite their larger farm sizes, these corn-farming smallholders often have to find non-farm wage jobs in the nearby city to make ends meet. Treating the egg farmer and corn farmers both as ‘smallholders’ obscures the dynamics that put them on different trajectories of accumulation and labor commodification.

Despite these differences, one may argue that these producers can still all be considered ‘family/household farmers’ and thus share certain common traits, as the farming operations are family owned, managed, and worked.² This point is emphasized when this population is described as ‘peasants’, a term similar to ‘smallholders’ in its emphasis on internal homogeneity. Seeing them as ‘peasants’ shifts the focus from small scale to the social and economic characteristics determined by households’ being the unit of both production and consumption and their presumed reliance on non-commodity relations for social reproduction (Friedmann 1980). Peasant farming is therefore believed to be based on self-controlled resources, oriented toward meeting family consumption needs, and autonomous in the production process (van der Ploeg 2013). Even here, however, as our examples illustrate, the relationship between the family and the farming operation also varies, so do their degree of autonomy and logic of production: in some cases, the farm goes beyond the family and hires non-family wage

¹See Harriss-White (2023, 296–297) for a long list of labels that have been used to describe this population, offered from different theoretical or political vantage points.

²In this study, we use the terms ‘family’ and ‘household’ interchangeably. In the Chinese context, in most cases, people live in the same household are family members related through kinship (Croll 1987).

labor and must compete in the market to make a profit; in others, the family goes beyond the farm, as some family members must sell their labor in non-farm jobs.

To address the deficiencies in these concepts, scholars have advocated a class-analytic approach that is attentive to the differences among ‘smallholders’ in their commodity relations with labor, land, and capital (Bernstein 2010; Cousins 2010; 2022; Harriss-White 2023; Olofsson 2018; Zhang 2015). Focusing on the underlying dynamics that create inequalities and generate among smallholders a ‘tendency of differentiation into classes’ (Bernstein 2010, 104), this approach sees smallholders as ‘petty commodity producers’, who are further differentiating into those who become capitalist farmers through ‘accumulation from below’, those who meet most of their social reproduction needs through family farming, and those whose farming operation can no longer support their simple reproduction and thus have to find non-farm income sources (Cousins 2010). As we will discuss later, this approach has also been effectively used in analyzing class differentiation in rural China.

In this study, we use ‘smallholders’ both as a descriptive term to refer to the population of small-scale³ family farmers who occupy diverse class positions and as a point of departure for our analysis on their transformation. We choose this term for two reasons. First, we use it to critically engage a literature that argues about the persistence of ‘smallholders’ in developing countries (including China) (e.g. Hazell et al. 2010; Rigg, Salamanca, and Thompson 2016), who appear to be resistant to changes brought by capitalist transformation and whose rank grew but their farm size did not. We intend to empirically verify whether in the Chinese case this alleged persistence of smallholders is indeed the case or whether there has been a significant decline in this population as result of capitalist transformation. Second, the data we use, which come from secondary sources, mostly used ‘farming households’ as the unit of collection. In the second part of our analysis that examines the internal differentiation among these ‘farming households’, we use ‘smallholders’ as a descriptive shorthand when referring to this population in totality, but use more specific terms such as ‘petty commodity producers’, ‘capitalist employers’, and ‘pluriactive households’ when we have relevant information to specify them. Although the data give us some purchase on the differences among smallholders – e.g. making dichotomous differentiations based on hiring labor or not, leasing in land or not – there are often not enough details to allow us to accurately identify their class positions. Nor is that the goal of this study: our intention is only to show that capitalist commodity relations have transformed the agricultural production of most smallholders and unleashed dynamics of differentiation; a detailed mapping of the class differences resulting from these dynamics is beyond the scope of this study.

Horizontal and vertical concentration in agrarian transition

Our analyses of the two research questions are guided by a theoretical framework that sees the capitalist transformation of agriculture – i.e. the ‘agrarian transition’ – as a two-pronged process consisting of ‘horizontal concentration’ and ‘vertical concentration’.

³In the secondary data sources we use, ‘small scale’ is defined in different ways, which we will discuss later. In general, most family farms in China are below 2 ha, qualifying them as ‘small-scale’ as commonly defined (Hazell et al. 2010; Lowder, Scoet, and Raney 2016).

These two terms were first proposed by the Soviet agricultural economist Alexander V. Chayanov (1986) to describe and conceptualize the two processes through which capital and capitalists gain control over agricultural production, transform the production process (both socially and technologically), and extract surplus from direct producers. What Chayanov referred to as ‘horizontal concentration’ is the process that Marx but especially Lenin and Kautsky had described: a new rural elite commodified and consolidated land through the process of ‘primitive accumulation’, drove farmers off the land, turning them into ‘free labor’ in the double sense, and then organized capitalist agricultural production based on wage labor and commodity production (Kautsky 1988; Lenin 1964; Marx 2004). Horizontal concentration results in three major changes in agriculture: (1) the rise in scale and technological intensity⁴ in agricultural production, now organized by capitalized large producers, which can be either corporate or family-owned, (2) the decline – and the predicted eventual disappearance – of small family farmers, and (3) the use of wage labor as the primary labor source.⁵

Chayanov is nowadays best known for his thesis about smallholder resilience – based on their household-based economic organization and advantages in labor use – in the face of ‘horizontal concentration’ by capitalist agriculture. However, a much less appreciated but no less important legacy of his is the distinction he drew between two general forms in which capitalism can penetrate and establish domination over agriculture (Banaji 2016; Bernstein 1977). While acknowledging the ‘horizontal concentration’ process described in the classical Marxist tradition, as well as the emerging capitalist farming and landless proletariat that this created, Chayanov was more interested in understanding how the small family farms that continued to persist in Russia in large numbers operated in an economy dominated by capitalist relations (White 2018). He argued that ‘we should expect trading and finance capitalism to establish an economic dictatorship over considerable sector of agriculture’ (1986, 49) through forming commodity relations with smallholders and, ‘having bound these small-scale commodity producers to the market, economically subordinates them to its influence’, a process he referred to as ‘vertical concentration’ (257).

The key insight in Chayanov’s idea of ‘vertical concentration’ is that, even though smallholders may continue to operate in agriculture in large numbers and retain the organizational form of family farming, they become ‘an inseparable part of the capitalist system’ (222) and are no longer autonomous, self-reliant peasants, but rather commodity producers who rely on market transactions to carry out their production. As long as they are vertically integrated into ‘capitalism as a general economic system’ through trading links and financial arrangements, they are not insulated from capitalist relations of production or the resulting surplus extraction by capital, nor can they escape from the market imperative of continuously improving productivity through intensifying capital and technology inputs. He even argues that vertical concentration dominated by capital will lead to the ‘most oppressive form of capitalist exploitation’ (Chayanov 1986, 269).

⁴The rise in technological intensity, also known as agricultural intensification, refers to the increased use of capital and industrial inputs relative to land area for the purpose of raising agriculture productivity. It is an imperative for capitalist producers facing market competition.

⁵Whether this labor force needs to be fully proletarianized or can it be semi-proletarianized is a point of debate between Lenin and Kautsky.

This theoretical framework makes it clear that, while the rise of agrarian capitalism does proceed through horizontal concentration and results in the decline of smallholders, it should not be equated with or measured simply by the number of labor-hiring, large-scale producers, nor is it incompatible with the persistence of smallholding family farming. The transformation of smallholders who remain in agriculture – both in terms of their commodity relations with capital and their production processes – is an equally important part of agrarian transition. This framework requires that we investigate not only the decline of smallholders in the process of horizontal concentration but also the internal transformation of smallholder agriculture as a result of vertical concentration.

Agrarian dynamics in contemporary China

This study aims to empirically document at the national level two outcomes of the agrarian transition in contemporary China: the decline of smallholders, as a result of horizontal concentration, and, for those who remain in agriculture, the transformation of their production, as a result of vertical concentration. Before that, we briefly review here both the broader political-economic context of China's agrarian transition and key dynamics that drove horizontal and vertical concentration.

The de-collectivization reform that was completed in China in the mid-1980s restored the rural household as the unit of farming production and consumption (Croll 1987) and allocated collectively owned farmland as an entitlement to rural households on a contractual basis. Under the new 'Household Responsibility System' (HRS), rural households could sell their surplus on nascent local markets after fulfilling the state's procurement obligations (Oi 1986). Compared to the socialist collective farming practiced during the Mao era, the HRS reform 're-peasantized' Chinese agriculture and rural society (Bramall and Jones 2000).

In the next two decades, rural China underwent rapid changes. Rural industrialization in the 1980s and 1990s drew surplus labor from agriculture into *in situ* non-farm employment in township-and-village enterprises. Starting in the mid-1990s, as urban reform picked up speed, the rural labor force began to migrate to urban jobs on massive scales (Murphy 2002). These successive waves of transfer of rural labor into non-farm wage jobs made labor commodification an accepted norm for rural households. Pluriactivity became a prevalent livelihood strategy for rural households, as their social reproduction became increasingly commodified and dependent on both wage income from non-farm jobs and marketed surplus from farming operations. Much less, however, happened within agriculture production itself: the majority of smallholders who remained in agriculture continued with household-based farming, while their commodity relations were limited to participation in the gradually growing input and product markets. Prior to the early 2000s, *de-agrarianization* of China's rural labor force happened without the *de-peasantization* of agriculture (Bramall and Jones 2000; Zhang and Donaldson 2010).

Fundamental changes to smallholder agriculture only started to take place in the early 2000s, in a new phase that has been called the 'rise of agrarian capitalism' (Zhang and Donaldson 2008, 2010). Huang and Peng (2007) argued that a confluence of three historical trends – declining population growth, massive and expanding non-farm employment, and changing urban diet – provided the conditions for an agrarian transition in which small-scale family farmers intensified their production – often with 'blood and sweat'

capital saved from non-farm wage incomes – to meet rising urban demands for higher-value food products, obtaining higher incomes and a more secure reproduction of their family farming. Based on this increased economic vitality of smallholders and the observation of a minimal level of hired labor in smallholders' total agricultural labor input (1.2 percent), Huang and his co-authors described the agrarian transition in China as 'capitalization without proletarianization' (Huang, Gao, and Peng 2012).

Aside from the severe underestimating of the extent of hired labor, a point we address later, this view neglected two fundamental changes in Chinese agriculture: first, the rise of large-scale capitalist producers, which often comes with the expulsion of smallholders from agriculture; and second, the internal differentiation among these capitalized 'smallholders'.

The rise of large-scale producers was made possible by changes in rural land-right institutions, which started with the emergence of local farmland rental markets (Kung 2002; Zhang, Ma, and Xu 2004). Large-scale land transfers brokered by local governments that consolidated large tracts of farmland from individual smallholders and made them available for outside investors became increasingly common after 2010 (Ye 2015; Zhan 2017). Driving these institutional changes is the central government's ambitious agenda of 'agricultural modernization', which, guided by a belief in the superior economic efficiency of large scale, saw agribusinesses as the new leading force in the next phase of China's agricultural development (Schneider 2015; 2017; Zhang and Donaldson 2008). In these state-brokered land transfers, although some sorts of heavy-handed measures were often deployed to mobilize the compliance of a minority of holdouts, the majority of smallholders, whose income now depended primarily on non-agricultural sources, more or less willingly cooperated and opted for the land rent as a replacement for their meagre farming income (Gong and Zhang 2017; Luo and Andreas 2020; Xu 2018a). A direct outcome of these land transfers is the horizontal concentration of farmland in the hands of large-scale producers and exit of smallholders from agriculture.

In addition to brokering land transfers, both the central and local states also devoted resources to foster the growth of 'new agricultural operators' (NAO) – a category that in addition to agribusinesses also includes farmers' cooperatives, which in China are mostly private agribusinesses in disguise (Hu, Zhang, and Donaldson 2017) and certified large-scale 'family farms'. Zhang and Zeng (2021) summarized these practices as 'politically directed accumulation', in which local states selected actors who either have accumulated non-agrarian capital or possess political capital and capitalized their large-scale farming operations by transferring public resources to them, creating a new class of capitalist producers. Rural China did not have a landlord class – thanks to the socialist land reform – that could turn itself into the new agrarian capitalist class. But, aided by these state policies and drawn by the prospects of rising profitability in agrifood markets, all sorts of non-local and non-agrarian capital entered agriculture to operate large-scale capitalist production (Schneider 2017; Xu 2018a; Yan and Chen 2015; Zhang and Zeng 2021).

In other parts of the agrifood system, agribusinesses expanded even faster than in agricultural production. On the upstream, foreign and domestic agrochemical companies now not only dominate the production of all sorts of industrial inputs, but have also penetrated deeply into the countryside through extensive distributive networks and have entirely replaced the erstwhile exclusive state distribution system (Chen 2018). On the downstream, the 'supermarket revolution' in urban retail generated demands for larger

suppliers and for consolidation throughout the agrifood supply chain (Hu et al. 2004; Waldron, Brown, and Longworth 2010). Even in the newly emerged e-commerce segment, corporate giants controlling the platforms have integrated backwards and pushed out smallholders from operating as e-commerce merchants (Feng 2024). The result of these development is the rise of a system of ‘capitalist vertical integration’ that Chayanov feared.⁶

Aside from the entry of new players, the smallholder population itself is also going through a morphosis. In the literature, we find two opposing views regarding the smallholders operating in this transformed agrifood system. Philip Huang and his co-authors (Huang 2021; Huang, Gao, and Peng 2012) describe these smallholders as ‘modern peasants’. While they are aware of the commodity relations that these modern peasants have to participate in, they continue to see them as operating outside capitalist agriculture – which they equate with labor-hiring, large-scale producers – and capable of resisting the expansion of the latter. Other proponents of this ‘peasant persistence’ view go even further in emphasizing peasant smallholders’ resistance to capitalist commodity relations. Van der Ploeg and Ye (2016) argue that, for today’s ‘peasants’ in China, ‘the farming domain is primarily a non-commodity domain’ and remains ‘grounded on self-controlled and autonomous resource base’ (35). This means that even though rural households often have members who commodify their labor and pursue higher incomes through migratory wage work, their family farming does not follow a commercial logic in that it ‘is not explicitly *perceived* nor *organized* as an economic activity’ but ‘seen as integral parts of social life’ (van der Ploeg and Ye 2016, 9). Following a unique economic logic of ‘labor-consumption balance’, also proposed by Chayanov (1986), peasant smallholders do not compete with capitalist producers such as NAOs on labor productivity, but rather aim to maximize net output from family land to satisfy family consumption needs.⁷

Scholars critical of this ‘peasant persistence’ view have sought to demonstrate the *capitalist transformation* that smallholders in China have undergone. A focus in this research is what has been described as the ‘relentless internal differentiation’ among smallholders as petty commodity producers (Bernstein 1977). Once smallholders have integrated various commodity relations in their agricultural production and social reproduction as a result of vertical concentration, they face the economic discipline imposed by external market forces and increasing market competition presented by the NAOs. As these large capitalist producers continue to drive down market prices of agricultural outputs while raising the intensity of inputs, smallholders must either keep up with the capital and technology intensification and productivity increase or expand their farming scale – neither of which is easily obtainable – or their farming income will continue to decline. When that reaches a point that is financially unsustainable, many would have no choice but to terminate family farming and rent out their farmland, either to NAOs or other smallholders (Huang 2015; Xu 2018b; Zhang and Zeng 2022).⁸ That this process has generated differential outcomes among smallholders and placed them in different class positions

⁶See Schneider (2017) and Zhang and Zeng (2022) for detailed discussions on corporate dominance and vertical integration in the pork commodity chain, where these trends are probably the most pronounced.

⁷This is Chayanov’s famous theory of ‘peasant economy’, which argues that peasants, in order to meet family consumption needs, will continue to spend labor beyond the point of diminishing returns (i.e. ‘self-exploitation’) to increase land output.

⁸This is a case where vertical concentration leads to horizontal concentration.

has been repeatedly confirmed with qualitative data (Yan and Chen 2015; Zhang 2015). The broad contour of differentiation among Chinese smallholders is similar to the pattern first found in Russia by Lenin (1964) and later elsewhere (Bernstein 2010; Cousins 2010). Zhang (2015), for example, has described these new agrarian classes as: the ‘entrepreneurial farmers’ who, through ‘accumulation from below’, now hire year-round labor and engage in expanded reproduction; the ‘commercial farmers’ who, as petty commodity producers, have intensified their production and can rely on it to meet most social reproduction needs; and the ‘dual-employment households’ who have to pursue pluriactivity to supplement insufficient farming income. In addition, there is also a growing population of farm workers who are proletarianized to different degrees and in various forms (Zhang and Donaldson 2008).

A key point of contention between these two opposing views is the use of commoditized inputs in household farming production. Following the ‘peasant persistence’ view that, contrary to vertical concentration, smallholders are mainly reliant on self-supplied resources, we would expect them to, first, rely on family labor and minimize labor hiring, and second, as they are not pressured by market competition to increase labor productivity, minimize the use of labor-replacing agrochemicals and machines manufactured by agro-industrial capital, which both increases production costs and reduces their autonomy.⁹ The empirical analysis that follows will test these hypotheses.

Horizontal concentration and decline of smallholders

China’s smallholder population declined by 200 million from 2001 to 2021

We start the investigation with examining the changes in the overall rural population and employment structure. Since the start of this new century, the rural resident population in China – defined as spending at least six months in the past 12 months in rural areas – has declined from 795.6 million in 2001 to 498.4 million in 2021 (see Figure 1). This 37.3 percent decrease reflects the country’s unprecedented rapid pace of urbanization, a process that has been widely noted (Bai, Shi, and Liu 2014). However, a related but not identical change – one that is equally unprecedented in human history but much less known – is the decline of China’s agricultural population, which consisted mostly of smallholders. During the same period, the agricultural labor force has declined at an even faster rate – a 53.1 percent decrease from 364 million in 2001 to 170.7 million in 2021. In just two decades, China’s agricultural labor force has been more than halved—a loss of 194 million. In the most recent decade from 2012 to 2021, the agricultural labor force has declined by a third, a loss of 85 million.

Virtually all these millions of people who left agriculture were smallholders, while the number of large-scale producers and the labor force they employed have increased. From the 2nd Agricultural Census of 2006 (NBS 2009), we know that among all agricultural employment, only 1.95 percent (6.8 million) were employees of NAOs, while the rest were self-employed smallholding family farmers (see Table 1). In the 3rd Agricultural Census of 2016 (NBS 2019), this population of NAOs’ wage employees increased to 10.9 million, comprising 3.5 percent of the agricultural labor force. The 2016 Census also

⁹We would also expect these peasant smallholders to practice multi-cropping instead of mono-cropping to meet the diverse food needs of the family. But since we do not have data to test this, this will be left out of consideration here.

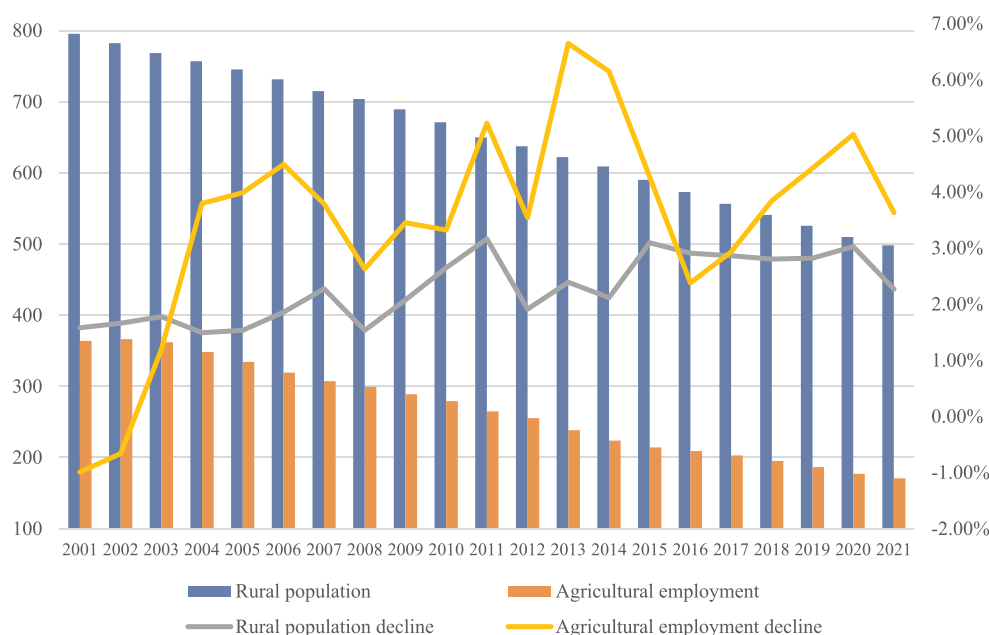


Figure 1. Decline in rural population and agricultural employment, 2001–2021. Source: China Rural Statistical Yearbook 2021 (NBS 2022).

Table 1. Employment and land leasing, by types of agricultural operators, 2006–2016.

	2006		2016				Total		
	Non-household operators		Farming households	Large-scale households	Non-household operators				
	%		%	%	%	%			
No. of units (thousands)	395	0.2	203,451	97.1	3,980	1.9	2,043	1.0	209,474
Labor force (millions)	6.8	1.95	290.4	92.4	12.9	4.1	10.9	3.5	314.2
Leased farmland (thousand ha)			7,316	27.9	11,826	45	7,113	27.1	26,255

Sources: The 2nd and 3rd National Agricultural Censuses (NBS 2009; 2019).

reported the employment of 12.9 million persons in nearly 4 million large-scale family farms.¹⁰ ‘Large-scale family farms’ were defined as those with over 100 mu (6.7 ha) for operations with one annual harvest, or 50 mu for those with two or more harvests.¹¹ The 2006 Census did not collect any data on large-scale households, most likely because of their negligible presence then; a direct comparison is therefore not possible.

The combined labor force in these two categories of large-scale producers reached 23.8 million in 2016 and constituted 7.6 percent of total agricultural employment. Although there is no national data for more recent years, by all indications, the number of NAOs and the size of their hired labor force continued to grow, most likely at a faster pace than before. Putting all these together, we can deduce that in 2021, a

¹⁰The total labor force employed in agriculture reported in the 2016 Census (314 million) is significantly higher than that reported in the Statistical Yearbook (209.1 million).

¹¹A different set of criteria apply to livestock production.

substantial proportion of the remaining 170.7 million agricultural labor force – in the range between 25 and 43 million¹² – were operators and employees of NAOs (including large-scale family farms), not smallholders. This further reduces the number of smallholders to below 150 million individuals. Thus, the loss of smallholders over two decades – from 364 million in 2001 to less than 150 million in 2021 – is in all likelihood greater than *200 million*, a staggering number. This must be the most massive decline of smallholders – within such a compressed timeframe and at a national level – in human history.

We are not claiming that all the 200 million smallholders were driven out by horizontal concentration. Far from it. The rapid urban expansion that turned farmland to urban uses ended countless smallholding farms;¹³ smallholders also abandoned their farmland to migrate to cities. The close interconnection between urbanization and smallholder decline is probably why these two processes have been bundled together in previous studies and why the dramatic decline of smallholders has not been explicitly pointed out. More fine-grained data are needed to disentangle the effect of horizontal concentration from that of urban expansion on smallholder decline. While the data above do not allow us to do that, several points, however, can help shed some light on this.

First, the total amount of farmland in China, despite rapid urbanization, only declined slightly (1.6 percent) from 130 million ha in 2001 to 127.9 ha in 2021 (NBS 2022), as urban conversion of farmland was often compensated by reclamation of new farmland. Whose land got taken, who controlled the newly reclaimed land, and where both happened are complicated issues well beyond the scope of this paper; the point here is that, on a national scale, loss of farmland cannot be the major cause of the halving of the smallholder population.

Second, from the fact that employment in large-scale producers (both household and non-household operators) has increased from 1.95 percent to 7.6 percent between 2006 and 2016 and the increase in their land scale has to be bigger, we can conclude that horizontal concentration in agriculture played an important part in causing smallholder decline. The land transfer data presented in Table 1 best illustrate the horizontal concentration of farmland. In 2016, of the entirety of 134.9 million ha of farmland in the country, 26.3 million ha (20 percent) were transferred to other users. Of these transfers, nearly three quarters – 72.1 percent – went to large-scale households and non-household operators, while only a quarter went to smallholders,¹⁴ a clear indication of horizontal concentration. In the literature, how much of the farmland transfer happened between smallholders and how much went to large-scale producers has been a point of debate. While most scholars saw land transfer as an indication of horizontal concentration and the rise of large-scale capitalist producers, Philip Huang (2021, 32–33) argued that the majority of land transfer took place among smallholders who were relatives or friends

¹²This population grew from 6.8 million in 2006 to 23.8 million in 2016. That translates into an annualized growth rate of 13 percent. Assuming the same growth rate is kept in the next five years, this population would reach 42.5 million in 2021.

¹³There is no reliable estimate of the number of rural residents who have lost land ('landless farmers'). The estimates we found in the literature vary widely; none came from reliable sources, some not even traceable – see Walker (2008) for an example.

¹⁴Land transfers among smallholders can go from land-poor to land-rich or the other way around. The national data do not differentiate these two types. Previous research (Kung 2002; Zhang 2008), however, has shown that land transfers increased land inequality, not surprising given that the initial land distribution in rural China was highly egalitarian.

Table 2. Decline of smallholders and land expropriation, 2012–2020.

Year	Agricultural households	Decline from last wave			
		Number	%	Households with land expropriation	
				Number	%
2010	7,798	–	–	–	–
2012	7,257	541	6.9	–	–
2014	6,815	442	6.1	71	16.1
2016	6,686	129	1.9	65	50.4
2018	6,252	434	6.5	88	20.3
2020	4,656	1,596	25.5	65	4.1

Source: CFPS, 2012–2020.

Note: The 2012 survey did not collect data on land expropriation.

and thus did not necessarily translate into growth of NAOs. First, we should clarify that even land transfer to other smallholders reflects the internal differentiation among commodity producers and still constitutes horizontal concentration, only in a more gradual manner. Second, the census data unmistakably show that most of the transfers concentrated land in large-scale capitalist producers.

Third, we at least know that, while in 2012, 40.1 percent of the rural population was still employed in agriculture, by 2021 that rate has declined to 34.3 percent (calculation based on Figure 1). This decline clearly shows that even among rural residents, independent of urban expansion, a greater proportion has exited agriculture.

Last, we also used the CFPS data to see how many smallholders in the sample left agriculture due to land expropriation (Table 2).¹⁵ The CPFS, as a panel study, traced the same sample over multiple waves, allowing us to know changes to their agricultural production. An interesting pattern emerges. 2016 was an exception, when the rate of smallholder decline dipped to the lowest point of 1.9 percent, while the proportion among these who experienced land expropriation reached the highest level of 50.4 percent. But even then, half of the households left agriculture for other reasons. In the rest of the decade, the rate of decline remained at around 6 percent and land expropriation was a minority experience. Other dynamics such as horizontal concentration in agriculture must have played a far more important role. In the most recent 2020 wave, we see a radical change: of the 6,252 agricultural households in 2018, more than a quarter of them had left agriculture by 2020, a rate of decline almost four times as high as before, yet only 4 percent of these ‘dropouts’ experienced any land expropriation during this period, the lowest of all time. We suspect that the declining profitability of petty commodity agriculture was the main cause of this sharp decline, a point we will elaborate later.

The massive decline of smallholders in China indeed forms a sharp contrast with the experiences of other national smallholder populations in the Global South, where smallholders persisted or even multiplied in number (Fernandes 2013; Harriss-White 2018; Rigg et al. 2018). In a widely cited recent study of the persistence of smallholders in East and Southeast Asia, Rigg, Salamanca, and Thompson (2016, 118) erroneously claimed – without citing any relevant data – that in China, similar to other Asian countries, ‘we are not seeing more people leaving farming altogether with the subsequent

¹⁵The dual-track land system in China – all urban land is state-owned while most rural land is collectively owned – determines that for urban expansion to take rural land, rural land must first be ‘expropriated’ by the state.

amalgamation of smallholdings into larger units of production'. They cited an estimate of 450 million smallholders (farm size < 2 ha) worldwide around 2014, with China accounting for 193 million, as evidence of the persistence of smallholders, not realizing that at least 100 million Chinese smallholders had already disappeared from this population by that point. The analyses here should put that claim to rest once and for all.

In [Figure 1](#), we also plot the decline rates of both the overall rural population and agricultural labor force. The agricultural labor force only started to decline in 2003, confirming the previous finding that agrarian transition through horizontal concentration is a relatively recent phenomenon that began in the twenty-first century ([Zhang and Donaldson 2008](#)). Since then, however, except for 2016, the rate of decline of agricultural employment has consistently surpassed that of the overall rural population (confirming the finding from CFPs data that 2016 was an aberration), indicating that the horizontal concentration in agrarian transition is a process independent from urbanization and progressing at a faster rate.

As mentioned earlier, the total amount of farmland in China stayed more or less the same. Even though NAOs have greatly increased in number and expanded in scale, by 2016, nationwide only 5.3 percent of all farmland (7.1 million ha out of 135 million ha) was transferred to non-household operators ([NBS 2019](#)).¹⁶ The vast majority of farmland was still farmed by rural households, most of whom are smallholders. Thus, compared to 2001, the average scale of household farmers in 2021, whose number has declined by half, must have *increased significantly* over the past two decades, with some (nearly 4 million by 2016) even expanding to large scale. An often repeated finding in the development literature is that smallholders' farm sizes 'have fallen in many developing countries' ([Hazell et al. 2010](#), 1352; [Lipton 2009](#)). Studies that have found this trend of declining farm size in China, however, either used pre-2010 data ([Lowder, Scoet, and Raney 2016](#)) or erroneously excluded land transfers in their analysis ([Wu et al. 2018](#)). Our finding here debunks that misconception.

With a much-reduced labor force, Chinese agriculture in 2021 produced 70 percent more gross product than in 2012 and over four times more than in 2001 ([NBS 2022](#)). The smallholder population has declined significantly, but those who remain have increased their scale and significantly raised their productivity, a clear indication of agrarian transition. Farm size, despite the recent growth however, remains small. A crude calculation using data from the 2016 census – 128 million ha of farmland farmed by 203.5 million household units ([NBS 2019](#)) – gives us an average farm size of 0.6 ha (10 *mu*), still smaller than that in many developing countries ([Lowder, Scoet, and Raney 2016](#)).

Radical changes in the livestock sector

Livestock farming is the sector where these trends of smallholder decline and horizontal concentration are the most pronounced ([Jian 2010](#); [Schneider 2017](#); [Zhang and Zeng 2021](#); [2022](#)). The three dynamics that drive horizontal concentration all converge in the livestock sector: it is the least dependent on land for scalability; it faces the most stringent environmental regulations; and it has the highest level of capital and technology intensity, giving agribusinesses the advantage ([Zhang and Zeng 2021](#)). No surprise that the contrast between the growth of NAOs and decline of smallholders – the twin processes of horizontal

¹⁶Except for the state-owned farms that have been around for decades, these new non-household operators did not receive any allocation of village-owned farmland; all their land had to come from land transfers.

Table 3. The decline of smallholders in livestock sectors, 2012–2021 (millions).

Year	Pig (< 50)	Broiler chicken (< 2,000)	Layer hen (< 500)	Dairy cow (< 50)	Beef cattle (< 10)	Sheep and goat (< 30)	Total
2012	51.9	24.4	16.2	2.02	12.1	17.6	124.22
2021	18.8	18.0	8.6	0.45	7.0	8.9	61.75
Rate of decline	63.8%	26.2%	46.9%	77.7%	42.1%	49.4%	50.3%

Sources: China Animal Husbandry Yearbook 2012 (MOA 2013); China Animal Husbandry and Veterinary Yearbook 2021 (MARA 2022).

concentration – is the most clearly observed in livestock sectors. In 2012, nearly 51.9 million pig farms were operating at the smallest scale with an annual output below 50 head (see Table 3). Given this small scale, it is safe to assume that the vast majority – if not all – of these small producers were rural households. Similarly, another 24.4 million smallholders operated the smallest broiler chicken farms (annual output below 2,000 birds). A decade later, the number of smallholder pig farmers declined by nearly two thirds to just 18.8 million, while that of smallholders in broiler chicken production dropped 26 percent to 18 million. The same trend of rapid decline is also found in all other major livestock sectors, including layer hen, dairy cow, beef cattle, and sheep and goat (see Table 3). Altogether, 62.5 million smallholder units disappeared from these six livestock sectors, a reduction by half. There is no data on their current employment status. A very small proportion of them could have expanded their scale and become larger producers.

This trend is further confirmed by the rapid growth of agribusinesses of the most massive scale in all but one sector (see Table 4). The largest increases are found in the producers of pigs, broiler chickens, and layer hens (eggs): the number of producers with annual output of 50,000 head of pigs or 1 million broiler chickens, or an annual stock of 500,000 layer hens, all at least quadrupled. Beef cattle is the only exception to this trend. The overall size of the beef cattle industry, however, also declined from 80 million head in 2012 to 67 million head in 2021. Put together, the exit of 62.5 million smallholders and the rapid rise of super large-scale producers unmistakably indicates the progression of horizontal concentration in livestock sectors.¹⁷

Unfortunately there are no comparable data on other agricultural sectors such as grains, perennial tree crops, horticulture, and aquaculture. The only data related to the growth of NAOs are those from the two Agricultural Censuses, already reported in Table 1: the number of NAOs increased from 395,000 in 2006 to 6,023,972 in 2016 (including both large-scale family farms and non-household operators), a fourteen-fold increase, a trend similar to those in livestock sectors.

Previous qualitative studies showed that, in addition to the significant influence of local political-economic conditions, there are also unique dynamics related to the production characteristics in each sector. For example, in the more labor-intensive and relatively profitable sectors of horticulture and tree crops, horizontal concentration is slower and smallholders more resilient (Rogers et al. 2021; Wilmsen et al. 2023). On the other hand, the easiness of mechanization and strong incentives from the state have spurred

¹⁷The numbers of producers in the other scale categories between these two extremes follow an interesting pattern: they all first increased, but then declined, with the smaller categories starting the decline earlier. In other words, the bigger producers have been progressively replacing not just smallholding household producers, but also smaller scaled-up producers. For a case study that illustrates this dynamics, see Zhang and Zeng (2022).

Table 4. The increase of super large-scale producers in livestock sectors, 2012–2021.

Year	Pig (> 50,000)	Broiler chicken (> 1 mil.)	Layer hen (> 500,000)	Dairy cow (> 1,000)	Beef cattle (> 1,000)	Sheep and goat (> 1,000)
2012	187	372	23	1,261	1,007	5,994
2021	849	1,792	162	1,491	902	11,084
Increase rate	354.0%	381.7%	604.3%	18.2%	–10.4%	84.9%

Sources: MOA 2013; MARA 2022.

the rapid growth of large-scale NAOs in grain production (Gong and Zhang 2017; Yan and Chen 2015). National trends of smallholder decline in these sectors will have to wait for future studies when new data become available.

Vertical concentration and transformation of smallholder production

Unlike horizontal concentration, which pushes smallholders out of agriculture and concentrates their land in larger units, vertical concentration, on the other hand, while preserving the smallholder family as the unit of production, integrates it into vertical commodity relations with capital, which then allows the latter to reshape smallholders' production process and extract surplus. A key process in vertical concentration is 'appropriationism' – capital appropriating labor and biological processes in agricultural production and replacing them with industrial technology and inputs controlled and produced by capital (Goodman, Sorj, and Wilkinson 1987). Appropriationism not only reduces smallholders' autonomy in production and dictates the production process through setting the technical parameters of agrochemicals and farm machines, the commodity relations it establishes also allow large agro-industrial corporations to extract surplus from smallholders through unequal trading relationships. When implemented to the extreme, such as that in broiler chicken contract farming where all inputs are supplied by agribusinesses and all outputs controlled by them, appropriationism can reduce smallholders to merely 'disguised wage laborers' (Wilson 1986).

To measure how vertical concentration is transforming smallholder agricultural production, we focus on two related issues: first, the use of industrial inputs and technologies such as agrochemicals and farm machines, which reflects both capital's increasing control over the production process through appropriationism and the market imperative that smallholders face in raising their productivity; and second, labor hiring and land rental by smallholders, which shows the penetration of commodity relations and the transformation of 'peasant' smallholders into commodity producers.

Most smallholders are petty commodity producers

Tables 5 and 6 summarize the use of commodified inputs in smallholders' agricultural production based on the CFPS data. The sub-samples used here are rural households who reported having family-based agricultural production in the past 12 months.¹⁸ The data do not have information about the scale of each household's operation, but given

¹⁸There is a small sub-sample (between 150–246 across the years) who only had livestock production. Their production cost structure is significantly different from the rest. We excluded that sub-sample from these analyses here.

Table 5. Smallholders' participation in labor hiring, machinery rental, and land leasing.

	Labor hiring		Machinery rental		Land leasing		No participation		Sample size ^a
	Number	%	Number	%	Number	%	Number	%	
2012	2,426	33.4	— ^b		1,200	16.5	—		7,257
2014	1,160	17.4	2,860	42.9	1,186	17.8	1,372	20.6	6,665
2016	1,179	18.1	3,041	46.7	1,212	18.6	1,181	18.1	6,512
2018	1,287	21.4	2,735	45.5	873	14.5	1,252	20.9	6,006
2020	952	21.3	2,256	50.6	614	13.8	779	17.5	4,461

Source: CFPS.

Note: ^aIn each wave, there were a few hundred cases that did not respond to these questions and were thus excluded from this analysis. ^bThe survey did not collect information regarding machinery rental in 2012.

that in the 2016 Agricultural Census, large-scale family farms were less than 2 percent among all farming households, it is safe to assume that most in the samples were smallholders.

Table 5 reports the percentages of smallholders who participated in three types of commodity relations that are indicative of either the penetration of capitalist relations into their production (labor hiring and land rental) or their vertical integration into agro-industrial commodity chains (machinery rental). 'Machinery rental' was the term used in the CFPS survey, but the standard practice in rural China is not renting machines and then operating them on one's own, but rather paying commercial machinery service providers to complete certain jobs (Chen and Jiao 2024). The percentage of smallholders who used any hired labor in their production fluctuated over the years, but in recent years has stayed around 20 percent. While this may appear lower than some would have expected, we need to take into consideration that a lot of the work in smallholding agriculture, especially in grain production, which occupied 70 percent of all cultivated farmland in 2020 (NBS 2022), has now been mechanized and requires minimal labor input. We will return to this point later, but the next two columns in Table 5 already show that half of all households rented farm machinery to save or replace labor. Our own fieldwork and other qualitative studies both find that labor hiring and machinery rental are both methods of expanding or replacing family labor but employed in different production conditions: hiring labor in sectors with high labor-intensity and low levels of mechanization (e.g. horticulture and perennial tree crops), but renting machinery services in those with low labor-intensity and high levels of mechanization (e.g. grains) (Zhang, Du, and Zhu 2022). Table 5 also shows a relatively stable level of land leasing (between 14–19 percent) among agricultural households, which expanded their scales.

More importantly, consistently over the years, only a small minority (around 20 percent) had no participation in any of these three key markets of commodified inputs. Almost all smallholders in this minority still had to buy agrochemicals from the market: those who did not report any expenses in agrochemicals were consistently below 0.5 percent (fewer than 10 cases) in any given year. Our fieldwork observations show that there are two sub-types among these smallholders who relied mostly on their 'self-controlled and autonomous resource base' (land, labor, and farm implements) in agricultural production: first, those who can be properly considered 'peasant producers', and second, pluriactive families who use the farming operation – mostly done by elderly family members – to provide food for self-consumption but rely on other income sources, especially wage incomes, to meet social reproduction needs. We do not have exact

Table 6. Itemized production costs (yuan/year) and percentages in total production cost (%).

	Agro-chemicals ^a		Labor wage ^b		Machinery rent ^b		Land rent ^b	
	Avg. cost	%	Avg. cost	%	Avg. cost	%	Avg. cost	%
2014	7,506	76.2	3,923	17.9	999	9.4	2375	12.7
2016	8,377	74.3	4,284	14.9	1278	10.5	3494	15.2
2018	7,991	70.7	4,814	19.5	1327	11.4	3462	11.6
2020	9,571	64.5	6,355	16.8	2114	12.1	7394	18.2

Source: CFPS.

Notes: ^aThese include fertilizers, pesticides, herbicides, medicines, seeds, feeds, and young animals. Calculations in these two columns are based on the entire agricultural household sample. ^bOnly households who hired labor, rented machinery, or rented land are included in these calculations. The respective sizes of the sub-samples are shown in Table 5. As these four cost items were calculated for different samples, their percentages do not add up to 100, nor are they comparable to each other.

data on the size of the ‘peasant producer’ category, but it is clear that they only constitute a small minority in Chinese agriculture today.¹⁹ We suspect that this population is more concentrated in ethnic minority areas in northwest and southwest China, where the geographic remoteness and cultural and language barriers make it difficult for them to seek off-farm employment, while more abundant land resources allow them to meet social reproduction needs solely with farming activities (more often pastoral than agricultural).

Table 6 summarizes the costs of four main types of inputs in smallholders’ agricultural production (2012 data were excluded due to missing variables). The average costs of agrochemicals, which were calculated for all agricultural households, consistently constituted the largest item in total production cost, greater than all the other costs combined, although its proportion declined slightly over the years. Since only a minority of households participated in labor hiring, machinery rental, and land leasing, respectively, as shown in Table 5, we only calculated the average costs for those who had these activities and the respective percentage each represented in those households’ total production cost. For example, in 2020, for the 952 households who hired labor, the average wage cost was 6,355 yuan, which constituted 16.8 percent of their average total production cost; and for the 2,256 households who rented machinery in 2020, the average rental cost was 2,114 yuan and constituted 12.1 percent of their average total cost. All three costs rose steadily in absolute terms, but the increase in machinery rental cost as well as its percentage in total production cost is the most consistent among the three. This trend confirms the finding from qualitative studies that observed the rapid consolidation and scaling-up of commercial machinery service providers and the increasingly unequal market relations that smallholders now have with these monopolistic players (Chen and Jiao 2024).

Our goal here is not to do a detailed accounting of the cost structure of all smallholders, but rather to illustrate two points: First, the high costs smallholders paid for agrochemicals, which they almost universally used, reflected the deep penetration of appropriationism in smallholders’ production – both in the sense of labor processes (such as weeding and composting) replaced by industrial inputs and labor products appropriated by industrial and commercial capital through the sales of agrochemicals. Second, the substantial costs

¹⁹The 2016 Census data in presented Table 1 (column 2) show that the 203.5 million farming households only employed a labor force of 290.4 million individuals (1.4 person on average), indicating that most farming households had members in non-farm employment.

Table 7. Average costs, revenue, and profit in smallholder agriculture (yuan/year, %).

	Production costs	Revenue	Profit	Profit rate (%)	Self-consumption		Sample size
					Value	%	
2014	9,642.6	11,580.4	1,937.9	16.7	3,472.7	30.0	6665
2016	11,260.1	12,333.3	1,073.2	8.7	2,982.1	24.2	6512
2018	11,255.8	10,472.8	-783.1	-7.5	2,828.9	27.0	6006
2020	14,698.9	14,064.3	-634.7	-4.5	3,628.0	25.8	4461

Source: CFPS.

paid for the commodified inputs of wage labor, machinery, and land showed that for the large majority of smallholders (the 80 percent of the sample that had at least one of the three), their agricultural operations were commercial enterprises. Once they paid so much for these costly productive inputs at market rates, then they also had to compete in the output market and strive to at least recoup these costs. Put simply, they were no longer ‘peasant producers’ who were insulated from competitive markets and could follow their own economic logic of ‘labor-consumption balance’.

The ‘squeeze’ that smallholders faced as commodity producers between the rising costs of commodified inputs and stagnating or even declining output price can be seen from the profitability data presented in [Table 7](#). The overall production cost increased steadily over time, a trend we already observed in [Table 6](#), but smallholders’ total revenue fluctuated, resulting in the declining profit rate. Juxtaposing the declining farming profits and rising costs of industrial inputs, we have here at least *prima facie* evidence that the increased use of industrial inputs allowed capital to extract more surplus from smallholders. Furthermore, in both 2018 and 2020, on average, agricultural producers in the sample suffered net losses. The 7.5 percent loss rate in 2018 probably explains why the highest exit rate – 25.5 percent of all agricultural households – was observed after that year ([Table 2](#)). By the same token, the 4.5 percent loss rate in 2020 would portend another major wave of smallholder exit. Another important finding revealed in [Table 7](#) is that smallholders consistently sold the bulk of their farming outputs on markets, while the self-consumed portion, on average, declined from 30 to 26 percent. Given the small average farm size of these smallholders (0.6 ha according to our calculation based on 2016 data), a family can hardly meet self-consumption food needs even with all the outputs from the entire farm; that on average at least 70 percent of outputs were sold on markets means that for most smallholders, the farming production was never meant for self-consumption but was instead a commodity production. In sum, most of the smallholders in our sample (at least 80 percent) are petty commodity producers.

The 2016 3rd Agricultural Census also provided data on the use of farm machines and agrochemicals by various types of producers in grain production. Results are summarized in [Table 8](#). The general pattern is clear: smallholders in grain production relied heavily on farm machinery. Only the transplanting of rice seedlings, due to the technical difficulties in mechanizing it, remains largely a manual-labor process – it was mechanized in only 13 percent of all rice-growing areas. All the other main labor processes in grain production have become heavily mechanized. Not surprisingly, wheat production, which concentrates in the plains in northern China, has the highest rate of mechanization. Most smallholders either cannot afford or do not have the economic rationale to own farm machines; they instead use commercial machinery services. Two new developments in the

Table 8. Smallholders' mechanization and use of chemical fertilizers, 2016.

	Degree of mechanization (% of farmed area mechanized)			Use of chemical fertilizer (kg/ha)		
	Ploughing	Sowing /		Farming households	Large-scale households	Non-household operators
		Transplanting	Harvesting			
Rice	77.3	13.0	73.1	767	762	823
Wheat	93.8	81.1	90.9	850	761	779
Maize	69.3	64.5	54.8	827	746	775

Source: NBS 2019.

machinery service industry since 2016 are worth noting (Chen and Jiao 2024). First, the machinery service providers have become increasingly specialized and grown significantly in scale to the extent that now even large-scale producers opt for contracting their services rather than owning farm machines. Second, these service providers now offer complete service packages to both smallholders and large-scale grain producers to the extent that the only laboring, if any, left for smallholders to do is irrigation. The significance of this latter development is that smallholders' utter reliance on commodity relations in grain production contradicts every expectation of the so-called 'peasant producers': rather than toiling in the field to increase their farming output, they paid for commercial machinery services to reduce their own labor input as much as possible, either to avoid drudgery or free up their labor for other employment.²⁰

The right-side panel in Table 8 compares the use of chemical fertilizers by the three types of grain producers. What may surprise many is that smallholders almost consistently surpassed both large-scale households and non-household operators in their use of fertilizers. The only exception is non-household producers' heavier use in rice production. Multiple factors – for example, smallholders' lack of knowledge in fertilizer application – may contribute to this outcome (Rogers, Wang, and He 2023), but these facts help further dispel the myth that smallholders in China today are still 'peasants' who rely on family labor and traditional farming knowledge and techniques to do labor-intensive and ecological friendly farming.

Prevalent use of hired labor

A key point of contention in the literature on China's agrarian transition is the proportion of hired labor in all labor input in agriculture. Huang, Gao, and Peng (2012, 13), using the 2006 Agricultural Census data, argued that 'hired agricultural year-workers' accounted for 3 percent of all labor force and that the proportion of hired labor only amounted to 1.2 percent of total labor input by family farmers. They used this extremely low level of the use of hired labor to argue that capitalization in Chinese agriculture proceeded 'without proletarianization' and that Chinese agriculture was still predominantly based on family labor. The degree of proletarianization of China's rural population is not a point we can engage here, except for pointing out that most of the proletarianized rural labor went to cities instead of working in agriculture.²¹ We do, however, dispute their calculation of the proportion of hired labor in total agricultural labor input.

²⁰See Hu and Rahman (2015) for a case study that explains the dynamics that generate this kind of behaviors.

²¹See Zhan (2019) for a counter argument about the degree of proletarianization.

Table 1 shows that large-scale non-household operators hired 10.9 million workers in 2016, comprising 3.5 percent of the agricultural labor force, similar to Huang's calculation. However, there are also 4 million large-scale family farms employing 12.9 million persons – each on average having a labor force of 3.24. If we assume that each of these 4 million large-scale farms hired just one year-round wage worker, then the total number of agricultural wage employees would reach nearly 15 million, 4.8 percent of all of the agricultural labor force. Given that most family farms were managed by one person or a married couple, each hiring one wage worker is a reasonable assumption but likely an underestimate.

Given the seasonal nature of agricultural production, most labor hiring is not of full-time, year-round employees, but of casual labor. We have also previously shown that among smallholders in the CFPS sample, around 20 percent hired labor and 50 percent used commercial machinery services, which essentially is hired labor, but mechanized (Table 5).²² The combined proportion of households who used either one, in 2020, is 60 percent.

For this population who hired labor, how important was the hired labor vis-à-vis their own labor input? Most of the labor hiring by smallholders in rural China is that of casual labor paid either hourly or daily wages or at piece rates; their labor time is basically the time they were paid to work. But family members' own labor time used in agricultural production is notoriously difficult to measure, largely due to the discrepancy between labor time and the 'production time' of animals' and plants' biological processes (Mann and James 1978). In calculating the annual labor days worked by self-employed farmers, Huang, Gao, and Peng (2012, 13) used 'an average of 250 days', a huge overestimate which then resulted in the severe underestimate of the proportion of hired labor in total labor input.

The 2022 Rural Statistical Yearbook (NBS 2022) provided the breakdown of product costs in multiple crop sectors, summarized in Table 9. For all six listed crops, labor time is only a small fraction of total production time: for example, the average labor time for the three main grains (rice, wheat, and maize) is 4.3 days, while the overall production cycle can take six months. Even in the most labor-intensive production – sericulture and apples – the labor time is, respectively, 35.6 and 32.8 days, while each production cycle lasts months.²³ Based on these more realistic measures of total labor input, the Yearbook also reported the wage costs of hired labor and imputed wage equivalent of family labor, which can tell us the proportions of hired labor in total labor use. These averages were calculated for all producers, including those who did not hire labor. The results, presented in the last row in Table 9, vary greatly across crop sectors (the highest is 36.6 percent in apple production and the lowest is 7.6 percent in pig farming), but are all well above the 1.2 percent that Huang, Gao, and Peng (2012) estimated. A recent study by Zhang, Du, and Zhu (2022), also using official statistics, found similar patterns: the

²²For example, traditionally in wheat producing regions in northern China, farmers hired migrant 'wheat harvesters' who carried sickles. Now that population has been replaced by migrant machine operators who drive combines (Xu 2021).

²³It is not clear how these figures of 'average labor time' relate to the scale of production. Increased scale would certainly increase overall labor time, but the relationship is not linear, and if it increases labor productivity, it can also decrease the per unit labor time. Also, as most of the increased production is done concurrently, increased scale tends to lead to more labor hiring.

Table 9. Family labor, hired labor, and production time, 2021.

	Grains ^a	Cotton	Sericulture	Apple	Pig	Broiler chicken
Labor time (days)	4.3	9.4	35.6	32.8	3.7	3.3
Production cycle	6 mths	6 mths	2–3 mths	4–6 mths	162 days	71 days
Labor cost (yuan) ^b	414.0	954.8	3,363.7	3,366.9	350.5	319.5
Family labor (yuan) ^b	370.6	676.8	2,892.5	2,134.0	323.6	248.0
Hired labor (yuan) ^b	43.3	277.9	471.2	1,232.9	26.8	71.5
% hired labor	10.5	29.1	14.0	36.6	7.6	22.4

Source: NBS 2022.

Notes: ^aThese figures are averages across rice, wheat, and maize. ^bThese are per unit costs. For the first four, the unit is *mu*; for pigs, it is per pig, and for chickens, per 100 chickens.

highest rate of hired labor in total labor input is found in citrus production, which in 2018 surpassed family labor input and reached 52.8 percent.

The exact proportion of hired labor in total labor input is actually a relatively minor issue; it obviously varies depending on the households' endowment in other productive resources. If smallholders' use of hired labor remains low, it is mostly because three things hold it back: their scale is too small to warrant additional labor; agricultural profitability is too low to allow for wage hiring; or there is a shortage in the supply of wage labor. The important thing is that for most smallholders in China today who are petty commodity producers, the commercial logic now prevails in their production. This means that, first, markets for all productive resources (land, labor, agrochemicals, and farm machinery, for example) are now all well developed; and second, households can access these resources through commodity relations to optimize their economic outcomes. So, when their land scale is too small relative to their labor endowment, they can either lease in more land to expand farming or transfer out family labor to non-farm employment. But if they need more labor, they can either hire wage labor or purchase labor-saving agrochemicals and machinery services. In other words, most smallholders in China today have abandoned the 'peasant logic of production' of relying just on 'self-controlled and autonomous' resources to meet the needs of self-consumption and social exchanges – and when those needs are not met, they would cling on to the family land and continue to put in more family labor, endure more drudgery even to the point of 'self-exploitation', without resorting to commodity exchanges. Thus, continuing to conceptualize this type of smallholder agriculture as 'modern peasant economy' (Huang 2021; van der Ploeg and Ye 2016) obscures the fact that most of them are now commodity producers vertically integrated into agro-industrial commodity systems dominated by capital.

Conclusion

Qualitative studies in the literature that investigated the 'capitalist transformation' of Chinese agriculture have repeatedly and consistently showed the commercial logic that smallholder households in rural China now operate under (Chen and Jiao 2024; Han and Rogers 2023; Hu and Rahman 2015; Rogers, Wang, and He 2023; Xu 2018b; Zhang 2015; Zhang, Du, and Zhu 2022). As their livelihoods have become thoroughly commodified, they had to allocate family labor to maximize labor income, which in most cases means shifting the younger, more productive family labor from agriculture to non-farm jobs. These were the household-level dynamics that drove the massive rural-to-urban

labor migration. The out-migration of rural labor, while helping accelerate horizontal concentration, increase farming scale, and raise labor productivity in agriculture, also increasingly resulted in a labor shortage in agriculture, which was further exacerbated by the aging of the 'left-behind' farming labor force (Ren et al. 2023). Smallholder farmers then had to increase their expenditure in commodified, labor-saving or -replacing inputs such as agrochemicals, farm machinery, and wage labor, with the expectation that these would also increase their output and help them make a profit. Their farming operations became petty commodity production vertically integrated into commodity systems dominated by capital and subjected to the latter's control and appropriation.

A process of internal differentiation among these petty commodity producers ensued. For those with inferior productivity, the increased squeeze from rising input costs and declining output prices made their farming operations financially unsustainable. The choices were often renting out their land to NAOs or other households. Some older farmers who faced few alternatives outside farming could also retreat to more subsistence-oriented 'peasant' farming. On the other hand, when both external and internal conditions were favorable and smallholders were able to maintain a competitive level of productivity and relatively equal market positions, especially in more labor-intensive sectors such as horticulture and perennial tree crops, their operations could also thrive, allowing them to accumulate from below and shift to expanded reproduction (Rogers et al. 2021; Wilmsen et al. 2023; Xu 2018b).

The national level data we analyzed in this study bear out all these micro-level findings from qualitative studies. They confirm that both the horizontal concentration that reduces the smallholder population and the vertical concentration that integrates smallholders into commodity systems and subjects them to capital's domination are national-level trends.

In all likelihood, both trends will continue or even accelerate. Another dynamic that powerfully shapes the persistence or decline of smallholders is intergenerational reproduction. We do not currently have data available to investigate this dynamic at the national level; however, local-level observations indicate that the rapid ageing of smallholders will further weaken their competitiveness and economic viability. The average age of the agricultural labor force in the CFPS data, for example, increased from 48 in 2014 to 51 in 2020. In our fieldwork in the apple-producing region of Shandong Province, we witnessed elderly farmers first down-shifting to less labor-intensive cherry production, before finally abandoning farming altogether. Their orchards were often left idle as other farmers in the village were also too old to expand. In other labor-intensive productions such as vegetables and aquaculture, petty commodity producers in Shandong now rely heavily on migrant labor – either from the grain-producing regions within the province or from ethnic minority regions in southwest China. But those labor pools are also declining due to ageing and low birth rates. This dynamic obviously varies across crop sectors. In grain production, the increased use of commercial machinery services despite the rising costs is in part driven by the ageing of smallholders, many of whom are no longer physically capable of doing the demanding farm work. The low profitability of grain farming further means that the younger generation is not coming back to inherit the smallholding enterprises. Thus, the ageing process among smallholder grain farmers will further accelerate the horizontal concentration that is already well underway. In other labor-intensive sectors, however, it remains unclear whether it will be the younger generation or capitalist large-scale producers who will take over from the ageing smallholders.

We are, however, *not* making a linear argument that would predict an eventual disappearance of all smallholders. Not only there is the possibility of accumulation from below, but large-scale producers also depend on petty commodity producers and pluriactive families for the supply of casual labor. It is also well known that, instead of directly engaging in farming production, agro-industrial capital often prefers to reside in upstream and downstream segments and extract surplus from petty commodity producers through commodity relations (Chayanov 1986).

Finally, our analysis of the transformation of – and especially the internal differentiation among – ‘smallholder family farmers’ in China also points out the need to both update our conceptual categories and redesign research instruments. A unique term in the Chinese context that is both sticky and tricky is ‘*nongmin*’. This term used to be widely used in the policy discourse by the elites to ‘stand in for the ills of China’s agrifood system’ (Schneider 2015, 331) and in the academic literature as the translation of ‘peasants’. In recent years, however, it has been replaced, at least in the agrarian studies literature, by a different translation of ‘peasants’ – ‘*xiaonong*’, which literally means smallholders (Huang 2021). In our view, the reason for this is that there are now significant discrepancies among the multiple layers of meaning – e.g. as administrative, social, identity, and occupational categories (Schneider 2015) – that were once contained in the term *nongmin*. In today’s popular vocabulary, *nongmin* has become largely a social and cultural identity label, but decoupled from residential or occupational status (and thus is best not translated into any non-Chinese terms). Thus, in the research literature on agrarian political economy, *xiaonong* has become the preferred term to refer to the socio-economic category of smallholders or peasants. This change is also reflected in the collection of official statistical data: rural household registration status was no longer used; instead, data on agricultural employment – either as the number of individuals (*nongye congye ren yuan*) or that of households (*nongye jingying hu*) – were collected and released. But as our analysis here shows that these categories based on the idea of a homogenous population of *xiaonong* – or smallholders – are still too crude instruments for studying rural changes in today’s China. It is equally important to know, for those employed in agriculture, whether they are independent petty commodity producers, small employers, or employees, and for those small-scale farming households, whether they rely solely on family labor, hire labor, do non-farm jobs, or use some combinations.

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All data used in this research are from public sources, and the use of these does not require ethical approval.

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