

Apples and oranges: Political crops with and against the state in rural China

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Abstract

In this article we bring together conceptual threads from political ecology, commodity geographies and agrarian studies to enable an inquiry into the political nature of crops. This inquiry is underpinned by the idea that crops are not just a means or a target of political projects, but can have effects through their webs of relations, and that their different capacities might mean that they may differently engage in political projects. This article examines how specialized cash crops in rural China are enrolled in state projects. We explore the cases of orange orchards in Hubei and apple orchards in Hebei by detailing flows of capital and expertise, and smallholder-crop relations. Our analysis demonstrates that a political ecology of cash crops can provide insight into the politics of successive state projects that have been rolled out in China's agricultural communities. We argue that through evolving relations with smallholders, the attributes of the crops themselves, and particular market dynamics, robust smallholder-crop complexes have emerged that are currently proving resistant to the latest state project to achieve at-scale, industrialized agriculture. If we take political crops and their relations seriously in the story of contemporary agrarian change in China, we find that apple and oranges, previously with the state, can also come to act against it.

Key words: agrarian change; vegetal politics; commodity geographies; agriculture; smallholders

Résumé

Nous rassemblons les fils conceptuels de l'écologie politique, de la géographie des marchandises et des études agraires dans une enquête sur la nature politique des cultures. Elle est sous-tendue par l'idée que les cultures ne sont pas seulement un moyen ou une cible de projets politiques, mais peuvent avoir des effets à travers leurs réseaux de relations. Elles ont des capacités différentes, ce qui peut signifier qu'elles peuvent s'engager différemment dans des projets politiques. Cet article examine comment les cultures de rente spécialisées dans la Chine rurale sont inscrites dans des projets d'État. Nous explorons les cas des vergers d'orangers dans le Hubei et des vergers de pommiers dans le Hebei en détaillant les flux de capitaux et d'expertise, ainsi que les relations entre les petits exploitants et les cultures. Notre analyse démontre qu'une écologie politique des cultures commerciales peut donner un aperçu de la politique des projets d'État successifs qui ont été déployés dans les communautés agricoles de Chine. Nous soutenons que l'évolution

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des relations avec les petits exploitants, et les attributs des cultures elles-mêmes avec la dynamique particulière du marché, ont produit des complexes robustes entre petits exploitants et cultures. Ceux-ci s'avèrent actuellement résistants au projet de l'État de réaliser une agriculture industrialisée à grande échelle. Si nous prenons au sérieux les cultures politiques et leurs relations dans l'histoire du changement agraire contemporain en Chine, nous constatons que les pommes et les oranges, auparavant "avec" l'État, peuvent également agir "contre" l'État.

Mots clés: changement agraire; politique végétale; géographie des marchandises; agriculture; petits exploitants

摘要

本文结合政治生态学、商品地理和农政研究, 探讨农作物的政治属性。概念上, 我们假设农作物不仅仅政治项目的手段或目标, 反而能够通过其关系网络产生影响, 并且其不同的能力意味着它们可能以不同的方式参与政治项目。本文研究中国农村特定经济作物参与国家项目的方式。以湖北的柑橘园和河北的苹果园为例, 详细分析了资本和技术的流动以及小农与作物的关系。结果表明, 透过经济作物的政治生态, 可以洞察中国连续推出的有关农村社群的国家项目的政治属性。本文认为, 通过与小农关系的演变、农作物本身的属性, 以及特定的市场动态, 强大的小农-作物综合体正在显现, 并且对近来以规模化和工业化农业为导向的国家项目的实现呈现出阻力。钻研中国当代农政变迁中农作物的政治属性及其关系, 我们发现, 曾推动国家项目的苹果和橘子, 也可能反其道行之。

关键词: 农政变迁, 商品地理, 农业, 小农户

1. Introduction

Flex crops, contingency crops, boom crops, GMO-free crops, escape crops, the soybean complex, the coffee crisis: we often describe crops in politicized ways. But how exactly are crops political and what would political ecologies of specific crops look like? Existing scholarship in political ecology, commodity geographies, and agrarian studies provides the basis for an inquiry into the political nature of crops. This article aims to bring together these threads to examine how specialized cash crops in rural China are enrolled in state projects. It does so through two cases: orange trees in a Three Gorges Dam-affected county in Hubei Province, and apple trees in a poverty county² also in Hebei Province. By examining flows of capital and expertise, and exploring the idea of "plantiness" (Head *et al.* 2012) in smallholder-crop relations, we argue that to some degree, orange and apple trees have played and are playing a role in shaping the effects of successive state interventions. We find that one cash crop can be both with and against the authoritarian state.

A framework for examining the political nature of crops in China needs to be assembled from a number of different threads that span political ecology, agrarian studies, commodity geographies, and, to some extent, social and cultural geography. Our starting point is critical work on commodities and markets (Yeh and Lama 2013; Turner *et al.* 2019). We then discuss a parallel body of work on agrarian change and frontier development in rural China, that is beginning to ask questions about how certain crops become enrolled (or fail to be enrolled) in the developmentalist projects of the Chinese state (Yin *et al.* 2019; Zinda and He 2019). As will be discussed, it is common for such studies to foreground commodity chains, livelihoods, and the dynamics of capital accumulation, but not necessarily the crops themselves or their potential capacities. We argue that to do so requires an engagement with questions of materiality; questions that have been discussed in a focused way under the rubric of "vegetal politics" (Head *et al.* 2012; Head *et al.* 2014; Fleming 2017), but which we see as stemming from a much longer scholarly tradition that has interrogated what is political about specific commodities (Mintz 1985) and forests (Prudham 2005; see Peluso and Vandergeest 2020 for an overview of their work on political forests). Drawing these threads

² China has long focused its poverty reduction efforts on 592 designated "poverty counties", primarily in central and western regions. With the current campaign to eliminate absolute poverty in rural China, the label no longer applies after 2020.

together we offer a framework for understanding political crops and use this to explore navel³ oranges in Hubei and Red Fuji apples in Hebei.

These two empirical cases are drawn from a mixed-methods, interdisciplinary research project examining agrarian change and capitalist restructuring in rural China that focuses on four cash crops: coffee, tea, oranges, and apples. In this article we take up the cases of oranges and apples in detail, drawing primarily on fieldwork in farming communities and nearby towns in Hubei's Zigui County (oranges) and Hebei's Shunping County (apples) in 2019. In Zigui the team interviewed smallholders, a large family farm⁴, village leaders, an orange-processing agribusiness manager, and township and county officials. In apple-growing Shunping the second author interviewed smallholders, two agribusinesses, two cooperatives⁵, a family farm run by a professional farmer, a production manager of a beverage-manufacturing plant, as well as village, township and county officials. The aim of interviews was to understand local production conditions, farmers' practices, commodity chains, and supporting government policies and finance. Our analysis is further informed by a survey in these two sites: in 2019, 155 households in Shunping and 266 households in Zigui were systematically sampled and asked a series of questions about their production, income and expenditure, land use and land transfer, sales, labor, and agricultural inputs. The survey results are used here to provide some background information, but our focus is very much on interview and observation data. Finally, we assembled a range of secondary information on crop histories, previous and current flows of public finance, university partnerships, agribusiness activities, and government policies from media reports, government statistical yearbooks and local government websites.

2. Thinking through political crops

Flex crops, boom crops, and commodity geographies

An entry point for understanding how crops can be political is emerging work on flex crops. In interrogating the flexible uses of particular crops, it recognizes that they are embedded in power relations and have the potential to reshape processes of capital accumulation. Studies of flex crops are predominantly concerned with how the production and commodity chains of soybeans, sugar cane, and corn (see for instance Borras Jr. *et al.* 2016, Oliveira & Schneider 2016) are implicated in changing geopolitics, particularly between the US, China and South America. However, there is limited guidance here for framing an analysis of political crops. Focused on the local dynamics of a more niche cash crop, Turner and others (2019) examine the potential flexing of star anise (*Illicium verum*) – used as a spice and as an ingredient in an antiviral, Tamiflu – in Vietnam. Their study highlights two processes of immediate relevance for our purposes. One is the key role of the state in identifying star anise trees as a long-term economic strategy and using geographical indication certification to establish them as a high-quality specialty crop. The second is how the materiality of star anise trees that require 10-12 years to bear fruit means that smallholders carry the risk of price fluctuations, and therefore treat the tree as a "contingency crop" for unforeseen livelihood circumstances.

Earlier commodity geographies shed further light on the political nature of crops. For instance, Sturgeon (2010) has long documented successive campaigns for state-sponsored cash crops in China's Yunnan Province, most recently rubber. Her work looks at how rubber production has intersected with indigenous knowledge and the governance of ethnic minorities through state campaigns for poverty alleviation. Against the discourse of small-scale farmers as "backward", Dai and Akha farmers were able to capitalize on cross-border ties and become rubber entrepreneurs. Yeh and Lama's (2013) study of the

³ *Citrus x sinensis* navel oranges are typically grown for eating, while *Valencias* are grown for juice.

⁴ Family farms (家庭农场) are a designated New Agricultural Operator in China, larger in scale than traditional smallholdings, and sometimes run by "professional" farmers from outside the village.

⁵ Agricultural cooperatives are also a designated New Agricultural Operator. While two million cooperatives have been registered in China, many are considered fake, and some are considered to be complicit in land dispossession (see Hu *et al.* 2017). In practice, agribusinesses and cooperatives can be closely intertwined, representing the same interests (see Han & Rogers 2022).

caterpillar fungus commodity chain on the Tibetan Plateau argues that this particular commodity both incorporates Tibetan herders into a cash economy and, given the uneven effect of state interventions such as permit sales and household quotas, simultaneously marginalizes them. Further, the authors highlight how important the materiality of caterpillar fungus is to understanding the commodity chain and its politics: it is a highly spatially variable fungus that "resists" cultivation and whose harvest is dependent on factors such as the weather, aspect, and topography. Their analysis reminds us that both intended and unintended effects arise from the interaction between material conditions and local power dynamics.

Apart from Yeh and Lama (2013) and Sturgeon (2010), to what extent has other relevant literature on China considered the political nature of crops? In this section we briefly review contemporary⁶ studies. While there is little explicit discussion of crops as political, studies of the dynamics of capitalist restructuring amid the rise of agribusinesses have nonetheless begun to highlight some of the ways in which crops in China might be political. For instance, in their study of the attempted creation of a grape production base by a large wine company (previously a subsidiary of the Bingtuan) in Xinjiang, Luo and others (2016) outline how households were compelled to plant a certain area with company-supplied grape vine seedlings. The spread of these seedlings can be seen as embodying the sometimes coercive and violent tactics of township officials in their alliance with agribusiness and a trend towards overproduction, the effects of which smallholders ended up bearing. Yan and others (2016) examine how soybeans are implicated in changing political economic relations between China, the US and South America. The authors show that soybean production is in decline in China, that soybean processing is now dominated by foreign capital, and that state tools such as price regulation which dominate other grain markets now have limited effect on soybeans. While not drawing any direct links between materiality and crop-human relations, they do note that the rise of GM seeds patented by Monsanto has shaped the soybean crisis internationally, and provoked a vigorous domestic debate in China over food safety.

Two recent articles consider boom crops in China's southwest frontier. The first is Yin *et al.* (2019), who examine commercial maca (*Lepidium meyenii*) root plantations as a practice of ecological civilization (生态文明), a state project that aims to delink economic growth from environmental degradation. While focused on how southwest Yunnan is repositioned and reimagined through these interventions, the article draws attention to how a unique set of climate and environmental conditions was assembled for maca cultivation, reflecting the commodification of remote, "clean" environments and the reconfiguring of local farmers' relationship with the market. The second is Zinda and He (2019), who explore how walnut trees were aggressively promoted as a development opportunity in an attempt to manage the periphery (again in Yunnan). While not described as such by the authors, walnuts are a kind of "flex" crop, both in their multiple uses but also in their links to health, poverty alleviation, and forest regeneration.⁷ And while not explicitly exploring the potential *capacities* of walnut trees, the authors' analysis does point to the importance of material conditions. There is a long history of cultivating walnut trees in Yunnan; however, local officials pushed new cultivars and cultivation practices. Unlike the older varieties, new saplings poorly suited to local conditions suffered from frost and beetle damage and required intensive management, resulting in highly uneven uptake.

What these studies suggest is that crops are often closely entwined with the environmental and developmental projects of the Chinese state, and that they can be a lens through which to understand the rapid changes taking place both in China's rural communities and in global trade networks (see also Day 2022 on tea and Yeh & Li 2022, on crayfish and rice). While materiality does not feature strongly in the conceptual approaches of the studies discussed above, the empirical cases nonetheless affirm that the nature

⁶ The historical links between crops and politics – such as provincial grain tributes (Hinton 1956), Mao-era self-sufficiency stemming from embargoes (Yan *et al.* 2016), and the territorialization of frontier regions through the farms of the Xinjiang Bingtuan (Cliff 2009) – are expansive. That is not to say that these legacies do not live on, particularly in China's enduring targets for self-sufficiency in key grains, but we cannot do justice to these historical geographies here.

⁷ Many of these findings are also reflected in critical studies of China's massive reforestation programs. This literature has long explored questions of land tenure, cultural versus bureaucratic forests, and the effects of monoculture tree species (Xu 2011; Harrell *et al.* 2016; Zinda & Zhang 2018).

of crops – perennial or annual, herbaceous or woody, vulnerable to frost or disease, amenable to pruning or grafting, requiring fertilizers or pest control, cultivated or wild – is critical to understanding exactly how they become enrolled in state projects.

Vegetal politics

To further pursue this line of thinking, we turn to recent scholarship in geography on vegetal politics, which explores "plantiness" (Head *et al.* 2012) as a set of characteristics and capacities specific to plants. As Head and others argue, politics cannot be understood as a purely human affair: "...rather people, plants and many others are entangled in ways that both enhance and constrain each other's lives" (Head *et al.* 2014: 863). While we consider there to be clear limits to how well these ideas translate into a rural Chinese, authoritarian context, this work nonetheless guides our analysis in two main ways.

The first is in understanding that plant capacities are relational achievements (Head *et al.* 2015) and that webs of relationality extend well beyond the farm to transport, trading and processing operations (Head *et al.* 2012). It is in their *relations* with people and other companions such as pests, diseases, soil, insecticides, and rainfall that crops become entangled in political projects and can have political effects. These relations are also explored in Scott's (2017) analysis of the early formation and domestication of agrarian state societies. He argues that the lifeworld of plants can act as a metronome that directs human patterns of physical activity and social organization and that the tempo of a crop varies according to its physical attributes, making them differentially political. For example, the materiality of grain crops makes them leading political crops: they are "visible, divisible, assessable, storable, transportable and rationable" (Scott 2017: 129) and therefore measurable for trade and taxation purposes. The sedentary production of grain and its regular and simple tempo that predictably organizes work life, social life, settlement patterns, rituals and the built environment, means that its producers and consumers are more easily within the purview of state control.

The second is to consider the "plantiness" of commodity crops: "all plants, even agricultural ones, have some plantiness that is independent of humans, or at least beyond the control of humans" (Head *et al.* 2012: 34). For us this means paying attention to the specific crop and its attributes in more detail than is typical of the agrarian change literature, including how it can and cannot be propagated, its growth cycle, the conditions in which it will grow, and the demands of the harvested product. Weisser's analysis of how particular types of trees become entangled in the politics of forestation in Uganda shows that it is "the capacity of trees to be adaptable in the first place that enables their incorporation and subsequent disciplining in forestation programmes" (Weisser 2015: 324). Echoing the work of Lesley Head and her co-authors, Weisser concludes that trees are not simply *means* of political action or *targets* of government interventions but are "efficacious objects that are the key to the politics of forestation" (Weisser 2015: 325). Again, we see limits to how well the idea of efficacious objects translates into a rural Chinese context, but the notion of crop attributes does guide our analysis.

Such discussions are beginning to reshape the way political ecologists engage with plants. Fleming (2017: 26) argues that political ecology still largely treats plants "as aspects of the landscape against which other human and nonhuman actors move", rather than as political subjects. By exploring how resource politics in Kyrgyzstan's mixed walnut-fruit forests are shaped by the distinctive capacity of some plants, Fleming brings political ecology into much closer conversation with more-than-human geographies. Unlike Weisser's (2015) focus on adaptability, it is the "graftability" of certain trees that means they inhabit positions in some political assemblages more easily than others: selectively grafted apple trees in rural Kyrgyz communities support informality and are largely illegible to state actors who wish to more tightly govern the forest. In her work on dwarfing technologies in the US Midwest's apple industry, Legun (2015) considers how rootstock and grafted apple varieties play a role in enabling experimentation and customized landscapes, which are in turn a platform for moving away from larger-scale commodity production. Drawing on the work of Jane Bennett, Anna Tsing and others, she argues that the productive capacities of grafted orchard trees can have effects beyond their technological function: "the modern orchard not only

brings market power into the landscape, but also brings landscape power into the market" (Legun 2015: 316).

When read together, existing scholarship in a number of areas provides a framework with which to investigate the political ecology of crops in their relations with people and other actors. Such a framework begins with the premise that crops are not just a means and a target of political projects but might also have effects through their webs of relations, webs that begin with farmers but also extend well beyond the farm. Further, to fully understand these effects, we must look to the characteristics of specific crops and therefore how they might differently be engaged in political projects. In what follows we outline precisely how Zigui's orange trees and Shunping's apple trees are entangled in local power relations, serving particular state interests. Addressing first oranges and then apples, our analysis begins with the flows of capital and expertise that are critical to putting these crops in place and then explores current smallholder-crop relations.

3. Zigui's orange industry after the deluge

Completed in 2012, the Three Gorges Dam affected Zigui County in profound ways. Many thousands of *mu*⁸ of farmland were submerged in 2006, many thousands of residents were resettled outside the county, and extensive construction was needed to rebuild entire towns and villages. Before the Three Gorges Dam was constructed, the region was one of the most densely populated in China, with some 274 persons per km² – 2.7 times the national average (Chau, 1995) and an average land per capita figure of around 0.9 *mu* – significantly lower than the national average of 1.65 *mu* (Chau, 1995). The loss of land (some 238 km² of farmland across the Three Gorges region) further fragmented landholdings, meaning that smallholders farm many pieces of land and have extremely small landholdings (in our site on average 0.09 *mu* of flatland and 1.6 *mu* of sloping land per person – noting that not all households had land inundated by the dam in 2006). Given the extreme upheaval and economic losses facing the population, the risk of social unrest was considerable and, against a backdrop of international attention and concern about the Dam's impacts, there were localized uprisings against the state. Petitions, local demonstrations, attempts to disrupt the resettlement by blocking construction and refusing to relocate were reported in the media. Whether this amounted to a legitimate threat to the state is a matter of conjecture; however, the threat was significant enough that any opposition was dealt with swiftly and often publicly (for example the incarceration of prominent journalist and anti-dam activist Dai Qing). In addition, the State Council made unprecedented efforts to develop the region, creating specialized laws and regulation to support affected residents.

Flows of capital and expertise

There was a strong commitment to supporting those displaced by the Dam to reestablish and improve their livelihoods, with capital and expertise flowing into the region at unprecedented levels. Zigui's orange industry, which began in the 1980s, was expanded in the 1990s and 2000s as one of four key industries targeted in the Three Gorges Dam regional development plan (the others being animal husbandry, tourism and fishing⁹). The construction of the Three Gorges brought with it supporting infrastructure and some 3.8 billion RMB (US\$560 million) in investment, building what is now a key local industry that produces 550,000 tonnes of oranges per year, with an output value of 3 billion RMB (US\$425 million) in 2018. Some 138 of the county's 186 villages now produce oranges. Over time, township governments and the county government have provided funding for infrastructure improvement and transport, and preferential policies such as low-interest loans to support the industry under the Three Gorges Dam post-construction development support fund. The 10-year work plan (ending in 2020) was expected to be extended for another five years. A township official explained to us that the township still receives support for education,

⁸ 1 *mu* = 0.0667 hectare.

⁹ Of these four industries, orange production was by far the most successful. Animal husbandry was rapidly taken up by large industrial farms outside of the region, fishing was banned (first seasonally and later completely) and tourism became the mainstay of large companies often headquartered outside the region.

technology, irrigation and other improvements like bank stabilization on the Yangtze River tributary on which the township lies. The total amount of funding available is 50 billion RMB (US\$7.4 billion).

In preparation for the Three Gorges inundation, Zigui's county government provided saplings and organized the terracing of farmland for orange production. In some villages all land was terraced, at a cost of 800 RMB (US\$118) per *mu*. Some households we interviewed also said that Three Gorges Project Construction Committee organized orange-related training for local farmers focusing on new varieties and pruning techniques. Investment under the 'migrant industry development fund' supported the establishment of an agribusiness that is now a national-level dragonhead¹⁰ company engaged in orange processing. It was initially provided with 50 million RMB (US\$7.4 million), along with tax breaks, discounted electricity and construction land. This support only ceased in 2019 and was predominantly used to subsidize infrastructure construction, including the processing plant and land terracing. The Vice Director of this agribusiness told us that many processing companies set up in this way were not profitable and closed down. This company, however, now has a profit of around 1 billion RMB (US\$147 million) per year, selling fresh oranges to the domestic market and Southeast Asia, and canned goods to the Middle East, Russia, South Africa, and the US.

Flows of capital to the orange industry continue: the county government is overseeing upgrading to a new variety of navel oranges (Lunwan 伦晚) that sell for a higher price. Whereas previously free cuttings and fertiliser were distributed, now households are offered 1000 RMB (US\$147) to replace existing varieties with Lunwan. In addition, as a demonstration county for transitioning to organic fertilizers, Zigui is receiving 20 million RMB (US\$2.9 million) over three years to replace synthetic fertilizers with an organic fertiliser to be delivered through a drip irrigation system. This system is being trialed on a large family farm in one of the villages we visited. This large farm also received 23,000 RMB (US\$3,387) from the county government to partly fund a mechanized track that can be used to load oranges at harvest and bring them down the steep slopes. No smallholder farms we visited used these technologies, but many had begun combining (mixing) organic and synthetic fertilizers.

The Three Gorges Dam therefore catalyzed the development of a highly specialized navel orange economy in Zigui, extending from production to transport, processing, and marketing. These flows of capital have had long-lasting effects: in the past five years, average gross income of households in our field sites increased from 33,000 RMB (US\$4,859) to 75,000 RMB (US\$11,044), with 93 per cent of households citing agriculture as their most important source of income (fairly unusual in China's villages where off-farm income is generally more important, and indicating the profitability of Zigui's eating oranges). As we explain below, this success shapes the way that orange trees in Zigui now intersect with another massive state intervention: attempts to "scale up" agriculture. But first, we turn to the question of expertise, and explain how forms of technical knowledge are central to understanding how orange trees came to be on Zigui's farms in their current form.

In the 1980s a professor from Huazhong Science and Technology University (a high-profile university located in Wuhan, Hubei) visited Zigui and "discovered" a local variety of navel orange. Based on this orange and other navel varieties (Robertson and Luoqi 罗脐), the professor developed new varieties for each season. This development took place in a demonstration village in Guojiaba Township, which is downstream of the villages we visited, but since then, one of the villages in our study has also become a key site for technical demonstration projects. County officials explained to us that Zigui is now one of the few counties that can produce oranges all year round. With the recent upgrading of varieties (again using demonstration villages initially), households are gradually replacing Luoqi with Changhong (长红), Yuanhong (圆红) and Lunwan (伦晚), which are considered better suited to the local environment. Part of the impetus for changing to these varieties is to avoid direct competition with extensive orange-growing areas in Jiangxi Province.

¹⁰ Dragonhead (龙头企业) is a term used for many agribusinesses in China as they are seen to lead the agricultural modernization process. Agribusinesses may go through a certification process to be labelled as county-, provincial- or national-level dragonheads based on their output, profit, landholdings etc.

The agribusiness established with Three Gorges-related investment plays a key demonstration role on experimental land in one of Zigui's villages. A demonstration orchard in this village was used to show the effects of spacing trees to improve productivity, reducing the number of trees per *mu* from 120 to 60. The increase in orange output was said to be significant (from 30kg per tree to 80kg per tree) and the method was subsequently adopted throughout the villages we visited. The agribusiness also works with Huazhong Science and Technology University on advanced processing and on-farm technologies. The University is involved in the installation of the mechanized tracks on large farms. It is expected that external expertise will trickle down to households through demonstration projects. While this may work for lower-cost changes such as organic fertilizers and tree thinning, it is unclear how expensive new technologies are supposed to become widely available. But, as we discuss below, households are certainly in the process of changing over to new varieties.

Smallholder-crop relations

In recent years China's central government has issued a number of policies, guidelines, targets and legislative changes aimed at consolidating farmland and encouraging the transfer of operation rights to larger-scale operators. These so-called "new agricultural operators" include agribusinesses, large-scale family farms, and farmer cooperatives. Specific targets include achieving "appropriate-scale" farming on 40 per cent of farmland by 2020 (State Council 2016), while specific mechanisms include preferential subsidies for larger operators that are not accessible to smallholders (Linghor-Wolf 2011). The gradual loosening of controls over the leasing of household contracted land to other entities has been extensively discussed elsewhere (see Zhan 2019) as have the implications of these changes for class stratification and inequality in rural communities (see Zhang & Donaldson 2008; Zhang 2012; Gong & Zhang 2017).

However, despite these concerted efforts that are filtering down through every level of government in China (including in Zigui's county and township government¹¹), orange production in Zigui is still overwhelmingly dominated by smallholders, most of whom are choosing *not* to lease out their land to larger-scale operators. In this Section we explore why this is the case, and how orange trees play a key role. The significance of this may seem minor at first. But with land transfer to large-scale operators accelerating, subsidies and other policy supports being directed to large-scale operators, and academics spruiking the benefits of widespread land consolidation (see Duan *et al.* 2021), we would expect to see some fundamental shifts in the organization of farming in Zigui and Shunping.

Zigui's orange trees are labor intensive, requiring fertilizer and pesticide application multiple times per year and trace elements less frequently, replacing insect pheromone traps every year, monitoring soil conditions, monitoring for pests and fungal disease, irrigating if there is a dry stretch (using hand-held pumps drawing water from local streams or the river), and intensive harvesting. All of this work is done on very steep farmland where farmers move between fields on narrow paths and narrow terraces (see Figure 1). Most farmers in Zigui have multiple varieties of oranges, hence these activities need to be tailored to particular groups of trees at different times of the year. Further, given the potential to change varieties to respond to market demand while maintaining existing rootstock, smallholders do the work of grafting. An older woman we met in one village was growing four varieties of saplings outside of her house that she would later graft onto Luoqi rootstock that she considered better suited to the local climate. Another woman was planning to graft Lunwan onto all of her existing trees. But the nature of these activities is sporadic, and during winter, there is minimal work. Further, grafting involves a five year wait to harvest, which demands diversification within the orchard and alternative income sources: one family's approach was to maintain 4 *mu* of mature trees while grafting 3 *mu* over to Lunwan. The demands of Zigui's orange trees seem to align well with flexible smallholders – smallholders who at different times of year can work off-farm, draw on remittances, draw flexibly on family labor, intensify their own labor, and hire migrant labor.

¹¹ Our discussions with local officials suggested that there was pressure to achieve at-scale orchards (at a much more modest scale than grain farms of course) and to prioritize cooperatives, family farms and agribusinesses in this process. One official suggested that more rapid change was coming in the "next five years."



Figure 1: A terraced orange orchard. Source: authors.

Fruit sales are another lens through which we can understand how smallholder-crop relations might hold back the state project of scaling up. One woman explained that she can sell any small fruit dropped by the tree for 1.5-2 RMB (US\$0.22-0.29) per half kilo to a salesperson who comes to town. We saw many houses with these small fruit laid out to dry on the pavement: they are used in making cough medicine. For their main crop, smallholders have little incentive to sell through the cooperative to the major agribusiness. The agribusiness offers a relatively low price as it wants lower quality oranges for processing into drinks and canned foods. Zigui's orange trees produce large, high-quality oranges, which smallholders prefer to sell to their existing network of local agents, negotiating the best price year-to-year. Smallholders also sell a small portion of their harvest online through informal Wechat networks: online sales fetch an even higher price. Given that local agents arrange collection, smallholders do not need to have access to their own trucks, cold storage or other infrastructure; the kinds of "modern", "industrialized" technologies promoted by the government's scaling-up drive.

The Zigui county government officials we interviewed lauded local farmers' "strong spirit" that enables them to make a living from what are difficult growing conditions. But our analysis demonstrates the importance of understanding smallholder-*crop* relations and what these relations reveal about the failure to enroll Zigui's farms, farmers and trees in land transfer, industrialization, and large capitalist enterprises. The attributes of these orange trees matters: they thrive with a specific set of inputs, close monitoring and the accumulation of locally-specific knowledge. Their needs peak at particular times of year, meaning they suit highly adaptive household labor. They are a long-term investment, taking many years to produce marketable fruit, but they are also *flexible*, allowing for the grafting of new in-demand varieties onto locally adapted rootstock. Through their relations with these trees and as their orchards evolve to meet changing demand, Zigui's smallholders have developed a highly profitable livelihood that is currently not very amenable to the government's scaling up goals.

4. Rooted in the Taihang Mountains: growing apples in Shunping

Located at the foot of the Taihang Mountains, Shunping County is administered under the prefecture-level city of Baoding in Hebei Province. Shunping was identified by the central government as a national key poverty county in 1986 and was officially "lifted out" of poverty in mid-2019. The county

has ten townships, including four in plain areas and six in mountainous areas. Although the climate in Shunping's mountainous area is described as suitable for growing apples, most villagers have long grown grains like wheat and corn. Nonetheless, over the past decades, many villagers have turned to planting fruit trees and they built up specialized orchards. Shunping now has 80,000 *mu* of apple orchards¹², with an annual output of 135,000 tonnes (see Figure 2).

Flows of capital and expertise

Red Fuji was introduced into China after the Ministry of Agriculture arranged for researchers to visit Japan in 1980. Baoding-based Hebei Agricultural University (HAU) soon received 4,000 scions for growing Fuji apples. HAU started selecting experimental fields in nearby counties, including rural Shunping (*Hebei News* 2020). In 1983, influenced by HAU researchers, a small number of Shunping farmers started growing Red Fuji. Some other villages joined apple tree planting in the early 1990s. Villages arranged the purchase of saplings, paid for by individual farmers. By the mid-late 1990s, the total area of Shunping's apple orchards had reached 50,000 *mu*.

Two changes in the 2000s are notable. First, there were technological and managerial improvements, particularly the adoption of dwarfing varieties. In 2004 HAU researchers finished field experiments of a so-called "Three-Excellent Fuji" (3E Fuji, 三优富士) cultivation system, which is described as adopting excellent Fuji varieties, excellent rootstocks and excellent cultivation technologies (including the promotion of dwarfing trees). In 2005-2006, this system was first applied to the development of 100 *mu* of apple orchards in one of Shunping's villages, which was selected after negotiations with HAU researchers who arranged free distribution of saplings. As these new apple orchards became more profitable, more and more villagers gradually joined in growing 3E Fuji. Now, the original demonstration village has about 2,000 *mu* of apple orchards, and some villagers have further rented 600 *mu* in other villages to expand their orchards.



Figure 2: Shunping's apple orchards. Source: authors.

Second, soon after China joined the World Trade Organization in 2001, the central government decided to strategically adjust the country's agricultural structure to enhance its comparative advantage.

¹² Red Fuji is the dominant amongst Shunping's many apple varieties. Other main varieties include Wanglin (Orin), Guoguang (Ralls Janet) and Dounan (Tonami) apples.

One aim was to form industrial belts of superior agricultural products (优势农产品产业带) to increase the competitiveness of China's agricultural production and the income of Chinese farmers (Ministry of Agriculture 2003a). As a result, the Ministry of Agriculture (2003b) released a 'Regional Layout Planning of Superior Agricultural Products', which for apples sketched two specialized regions – one on the Loess Plateau, and one near the Bohai Bay that included parts of Hebei. The second Regional Layout Planning was released in 2008¹³, which clearly included Shunping as advantageous for apple production (Wang 2013, p. 20).

These documents outlined development directions such as improving and upgrading varieties, and specific targets, such as volumes of outputs and exports. The 2008 document specified that the apple-producing region that included Shunping should focus on fresh fruit production while the other region would grow apple varieties for both fresh sales and processing. The 2008 document further urged the development of farmers' specialized cooperatives and industrialized operation, including the establishment of dragonhead companies and farmers' cooperatives which, since 2013, have been identified in central government policies as the key actors to scale up China's agriculture.

Meanwhile, although these central government documents were not linked with direct support like subsidies, Hebei Province responded with its own policy support. For example, in 2012, the provincial government released its *Opinion on Accelerating Fruit Industry to Strengthen the Province*, designating 4 million RMB (US\$589,000) by 2015 to support new fruit varieties (including apples) through experimental base development and another 4 million RMB for the introduction of new varieties and purchase of large-scale equipment. City-level investment to support production base development and input purchases (mainly pesticides and fertilizers) was planned separately. Though not to the same scale as the Three Gorges, this indicates the ongoing availability of government fiscal support for developing Shunping's apple industry.

More recently there have been interweaving flows of capital into Shunping's apple industry. First, a small number of rural entrepreneurs are developing new dwarfing orchards through founding cooperatives and agribusinesses. These people are mostly returned businessmen or former village officials. For example, a returned businessman who acted as village Party Secretary started land transfer in 2013, first renting 100 *mu* for 30 years at a rate of 400 RMB (US\$59) per *mu* per year. This entrepreneur continues to lease in more new land every year. By 2019, he had developed 3,000 *mu* of apple orchards, mostly adopting the 3E cultivation system. Although he managed land transfer through a cooperative, he uses an agribusiness to invest his own money into sustaining the cooperative's operation, especially for the payment of land rent and expenditure for developing new orchards.

Second, as harvest generally starts five years after planting, this agribusiness was planning to start futures trading, for which it received 200,000 RMB (US\$29,454) in fiscal support to build large cold storage facilities in 2019. The funding is channelled through a poverty alleviation scheme under which Shunping (poorer) is partnered with an external local government (richer). In return for this funding, the agribusiness promised to distribute six per cent of its futures trading profits to the county's poor households every year.

Third, there is additional finance to support Shunping's apple orchards as the result of joint efforts between the county government, an apple-specialised dragonhead company and HAU researchers, with HAU setting up an experimental station within the agribusiness' orchards. The main purpose of the station is for HAU researchers to keep experimenting with different apple technologies and to support the University's practical teaching. The county government provides 300,000 RMB (US\$44,186) annually to help maintain the operation of the station. In exchange, HAU researchers commit to deepen their collaboration with the agribusiness as well as to provide technical consultancy to local apple farmers. Thus, this station has become a platform for continuous extension and regular transfer of expertise.

In summary, Shunping's Red Fuji dwarfing apple orchards are the result of a succession of state-building, agricultural, and poverty alleviation policies, including the government-mandated introduction of

¹³ Subsequent planning documents were released in 2013 and 2018, but did not emphasize apple production as much as the first two.

Red Fuji varieties in the 1980s, the national-level planning of regional specialized crops in the 2000s, and then the attempted scaling-up of agriculture and intensified poverty alleviation activities of the 2010s. There are layered and relational politics between rural entrepreneurs, the local university, the government and smallholders. Apart from direct government interventions to "modernize" agriculture, rural entrepreneurs are business-motivated actors who are expanding the county's apple orchards, while HAU has facilitated the planting of particular varieties and the expansion of dwarfing orchards through its experiments and education practices in the field. The rural entrepreneurs and the university are thus enrolled in the government-initiated push to scale up agriculture. While experimentation and customised landscapes have elsewhere been found to reduce larger-scale commodity production (Legun 2015), in Shunping, they are part of a concerted effort to serve the state's political project of realizing larger-scale agriculture.

Smallholder-crop relations

Despite all of the activities described above, like in Zigui, the majority of Shunping's farmers grow apples independently. Of the 155 households we surveyed within a cluster of five apple-producing villages, 136 respondents (87.7%) indicated that their household decides what to grow (not the government, the agribusiness or the cooperative), and two thirds of them (84 respondents) were growing apples on most of their land. Only six households indicated that they had changed their main crop or main variety since 2013. In terms of income in 2018, as shown in Table 1, the average per capita income (gross) of apple producers is higher than the average of the total sample, no matter whether agriculture is the most important income source for the household or not. Thus, apples appear to be playing an important role in sustaining rural livelihoods in Shunping, though not as intensively or lucratively as in Zigui. In this section we discuss why this is the case and how the materiality of apple trees matter.

Similar to orange trees, apple trees need fertilizers and pesticides several times per year. Instead of using insect pheromone traps, however, apple farmers in Shunping use paper bags on individual fruit to reduce the need for pesticides and to get good fruit color. Labor is required for thinning, bagging, bag removal, picking, pruning, as well as manual weeding, irrigation and fertilization in the orchards. Nearly one third of our respondents (27.1%; 42 respondents) indicated the need for extra labor, and the overwhelming majority of them (40 respondents) hired workers either in the village or from outside. Salary for periodic work like weeding and fertilizer application is usually 80 to 100 RMB (US\$11-14) per person per day, while for bagging and bag removal the payment ranges from 150 to 160 RMB (US\$22-23.5) per person per day. One farmer estimated that for bagging only, the cost is over 1,000 RMB (US\$147) per *mu* annually, including labor expenses and the cost of the bags. Bagging is described as the most intensive labor work, because of the time pressure. Considering sunlight and temperature conditions, to grow nicely colored apples, farmers need to bag all young fruit within two weeks after the flowering season ends in early summer and then remove the bags in autumn to prepare for harvest. In this way, Shunping's apple trees entangle pests, sunlight and temperature. The attributes of these trees, in turn, affects human relations, particularly the need for and cost of labor to grow high quality apples.

		Average gross income per capita (RMB)	N	% HH
Full sample		10,479.0	155	100
Growing apples on most land		11,060.8	97	62.6
Farming, most important source of income in 2018	All	9,205.4	72	46.5
	Growing apples on most of land	9,959.3	58	37.4

Table 1: Average incomes of different groups of households, Shunping. Source: Author survey.

Shunping's apples are sold as fresh fruit. Two thirds of our participants sold to middlemen without contracts as their main sales channel, while one fifth of the participants sold directly in a farmer's market or on the roadside. A villager told us that middlemen usually transport fresh apples to Beijing's Xinfadi wholesale market. While the at-scale agribusiness has partnerships with supermarkets in nearby cities, they also sell fresh fruit and are reluctant to sign sales contracts given the uncertainty of annual outputs. Villagers also sell through informal channels like WeChat for supplementary sales. Thus, given their own networks, Shunping's apple producers tend to reject unnecessary contract constraints.

Furthermore, while nearly one third of our participants indicated that they are cooperative members, hardly any of these cooperatives manage sales and they lack opportunities to transfer land for expansion. Notably, a leading cooperative which transferred 800 mu land within Shunping failed to rent more land within the county, and subsequently leased 1,000 mu land in the neighboring Tang County.

Shunping's smallholder-crop relations, shaped by government efforts over several decades, have changed little in response to the recent push to scale up agriculture. The added impetus of the poverty campaign being linked to scaling up has not resulted in a wholesale shift in the way production is organized. Like Zigui's oranges, the attributes of apple trees matter in that smallholders rely on their accumulated knowledge, they have flexible sales channels, and they can respond to changing labor demands. Smallholders in Shunping generally do not need to use "modernized" facilities like cold storage or to engage in futures trading as envisioned by at-scale agribusinesses. While new agricultural operators like cooperatives are willing to transfer land to develop larger-scale orchards, smallholders seem to be resisting such changes. And while Shunping's Red Fuji apples have not yet enabled a livelihood as profitable as oranges in Zigui, they are still sustaining local livelihoods in important ways, to the extent that smallholders have shown little enthusiasm for the government's scaling up goals.

5. Discussion and conclusion

In his exploration of the agro-ecology of early states, Scott (2017) argues that unlike legumes and tubers, cereal grains have specific qualities – simultaneous ripening, visible and assessable yield, divisibility, easy transport – that made them more amenable to serve as a basis for taxation. Apples and oranges are not by any stretch of the imagination paradigmatic political crops, nor do we consider them anti-authoritarian crops, but that does not mean that they do not, through their relations, have an effect on state interventions in rural China.

Both Zigui and Shunping are mountainous and were until recently designated poverty counties. Before the building of the Three Gorges Dam, this part of Zigui was inaccessible apart from by boat, and economically marginal. Shunping, despite its proximity to Beijing, remains relatively poor. From the stories of state capital, successive interventions and state-backed expertise we have described, it is clear that oranges and apples have been used by the state to develop and enrich these marginal places as part of larger-scale regional planning, and at least in the case of Zigui, to head off potential social unrest. Unlike in Weisser (2015) and Yeh and Lama's (2013) studies, apples and oranges are not illegible, nor are they resistant to cultivation. They have more in common with the temperate fruits described in Hung and Hsiao's (2018: 351) study of highland Taiwan, which form part of "a political project to convert unruly mountain landscapes into legible and controllable agricultural territory." In this way apple and orange trees have been *with* the state – deeply entangled with state projects and reinforcing state sovereignty – and they appear in the landscape in their current form (thinned, grafted, diverse orange trees and dwarfing Fuji apple trees) largely because of state capital and expertise.

However, the stories of apples and oranges also demonstrate how through evolving relations with smallholders, including the gradual build up of smallholders' specialized knowledge and technical skills and the material needs of the plants themselves, both crops can now be said to be *against* the state. Oranges perhaps more noticeably given the almost complete specialization in Zigui's villages, diversification of varieties with different harvest times, and a more lucrative market for oranges, and, paradoxically, sustained state investment post-Three Gorges Dam. Not as political subjects in themselves, but through their complex

webs of relations (that extend to smallholders, sales people, fertilizers and pesticides, hired laborers, online sales platforms and consumers), orange and apple trees have come to constrain the most recent state project of agricultural scaling up. Despite the concerted efforts of state actors and a very clear agenda at the central government level, smallholder orchards continue to dominate both landscapes because they support viable agricultural livelihoods. The varieties currently in place require close attention, regular inputs, and flexible labor to wrap, unwrap, prune, pick, spray, graft, dig, observe: this "metronome" of the lifeworld of plants (Scott 2017: 20) and the "multiple rhythms" of harvest (Tsing 2015: 24) shape the physical activity and organization of smallholding in Zigui and Shunping. We argue that the mutualistic relationship between crop and smallholder is currently subverting the Chinese state's goal of achieving industrialized, modernized, scaled-up production. Head and co-authors argue that "attending to human-plant relations provides new insights into and framings of the political" (Head *et al.* 2014: 864), while Fleming calls for a "political ecology more alive to planty considerations" (Fleming 2017: 33). What, then, does a political ecology of crops bring to our understanding of complex processes taking place in rural China?

First is to reinforce Weisser's (2015) insight that crops are not just a target of political projects, but can be key to understanding the politics of (in his case) forestation programs in Uganda. What we have demonstrated in this article is that a political ecology of cash crops provides insight into the politics of the successive state projects that are repeatedly rolled out in China's agricultural communities. In our case this is not a universal politics, but is distinctly Chinese, revealing the sustained government intervention, regional development planning, extensive state capital, readily mobilized technical expertise, and persuasive skills of local officials needed to push county-wide specialist crops. While the role of the state in establishing specialized cash crops is well documented (Sturgeon 2010; Luo *et al.* 2016; Turner *et al.* 2019; Yin *et al.* 2019; Zinda & He 2019; Han & Rogers 2022; Day 2022), the role of state-aligned universities and technical experts in state-making projects is not always recognized: the early development of both apples and oranges in these counties points to the critical role that this expertise can play in catalyzing particular crop-smallholder relations.

Zigui's orange trees and Shunping's apple trees do not just provide interesting insights into local politics. They are, in their relations with humans, active in this politics, and what our analysis shows is that they can be active in their singular woody matter, through the fruit they produce, and in their collective orchard forms. Perennial fruit trees are not easily moved or replaced, but are to some degree flexible in that they are amenable to grafting and their spacing can be tweaked to improve productivity. To establish well as saplings and to thrive long-term, they demand the attention of experienced farmers and many different inputs and activities throughout the year. The trees may take many years to produce marketable fresh fruit, but once they do, this fruit can be sold in many different forms to different buyers (see below) and can prove highly profitable. They are not as delicate as other horticultural crops, so can be readily transported and if needed, put into cold storage. In orchards like Zigui's with mixed varieties, successive harvests mean that labor needs peak several times a year and inputs need to be carefully coordinated, but the diversification is clearly advantageous for smallholder livelihoods. Shunping's orchards are predominantly one variety, hence have one intensive autumn harvest, but other needs spread throughout the year. That is not to say that large-scale orange and apple orchards would not adopt many of the same practices, but that in these two cases (with these attributes and in these specific locations), the state's goals of scaling up agriculture are proving difficult to achieve. Robust smallholder-crop complexes have emerged in these two places and are so far holding up against a sustained state project to achieve more industrialized, at-scale agriculture. If we take political crops and their relations seriously in the story of contemporary agrarian change in China, we find that crops that were previously *with* the state can also come to act *against* it.

While our fieldwork and analysis focused on crop-smallholder relations, our findings certainly highlight the key role that market actors play in the webs of relations that oranges and apples are embedded in, and in making these crops amenable to smallholder production. Smallholders can choose to sell their produce to cooperatives or agribusinesses, but overwhelmingly do so to middlemen and local agents who come directly to villages, and, to some extent online, through their own informal WeChat networks. These strategies show how smallholders in China can be deeply connected to markets without the state playing a mediating role. For future research we note that these floating agents who negotiate with individual farmers

are important but poorly understood actors in China's rural transformation. But again we would emphasize that the choices available to Zigui and Shunping farmers in selling their fresh fruit are linked to the characteristics of the crop: intermediaries may not be able to play such an important role in, for instance, grain crop sales, or a horticultural product that requires immediate processing.

Second, a political ecology of crops tells us that crops do not have to be transboundary, flex or boom crops to be political. While much of the exploration of commodity geographies in China has taken place in border regions such as Yunnan and Tibet, often with a focus on the incorporation and/or marginalization of ethnic minorities (see Sturgeon 2010; Yeh & Lama 2013; Yin *et al.* 2019; Zinda & He 2019), here we have common fruit trees, producing fruit mostly for domestic consumption, grown by Han Chinese farmers in China's 'heartland.' By attending to their attributes, we nonetheless find complex webs of relations and the variable enrolment of crops and smallholders in state projects – apple and orange trees too have interesting stories to tell. This is a dynamic political ecology: Zigui's orange trees and Shunping's apple trees are currently in peak production, but they will begin to decline over time and future orchards may have very different characteristics and crop-smallholder relations. The current robustness of smallholder orcharding is also enabled by consistently strong demand and prices for both crops: we do not know what impact COVID-19 or recent extreme weather in central China has had on crop prices and therefore the viability of these farmers' livelihoods. To conclude, while it is certainly not novel to say that the developmentalist projects of the Chinese state have heterogenous outcomes across China's vast territory, political crops might help us to better understand and more precisely define these uneven geographies.

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