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Fruit booms and investor mobility along the China-Myanmar and China-Laos borders

Xiaobo Hua¹ , Le Zhang² and Yasuyuki Kono³

ABSTRACT. Investment in fruit cultivation is currently transforming agricultural production and rural landscapes in the mountainous region of mainland Southeast Asia, especially in the borderlands and lowlands of this region. Unlike large-scale land acquisitions and investment in previously reported boom crops, e.g., rubber trees and oil palms, investment in fruit cultivation is generally short-term, small-scale, and often informal. Additionally, different from previous crop booms, investors in fruit booms often relocate geographically or spatially to seize opportunities. Research has yet to investigate this aspect of today's investment boom in fruit cultivation. Beyond discussing a certain fruit type in a specific area, this study documents the geographic mobility of investment as the distinguishing characteristic of investment in fruit cultivation in Dehong, Xishuangbanna, Mandalay, and Luang Namtha, all of which are located along the China-Myanmar (Burma) and China-Laos borders. This is achieved through grounded methodological approaches. These sites have become a hot spot of booms in the production of fresh fruit, e.g., banana and watermelon. This investment mobility can be generally divided into the following two types: domestic investors relocating within one country, and foreign investors relocating across borders, thus, (re)locating investment. Comparison and synthesis are employed to show that ecological and social-political constraints drive investor mobility in fruit booms along liberalized agri-trade and regional comparative advantages. This study advances the understanding of associated issues by characterizing and excavating the geographic mobility of investors in the current era of small-scale land acquisitions and investment in fruit booms in a broader scope. These findings expand the theoretical literature on land grabbing and crop booms and help to (re)consider related environmental consequences and well-being of the affected population.

Key Words: *borderland; China; crop boom; mobility; politics; Southeast Asia*

INTRODUCTION

The mountainous region of mainland Southeast Asia covers altitudes that range from 300 to 3000 meters above sea level and includes several sovereign countries, such as Myanmar, Thailand, Vietnam, and China (Yunnan; Kono and Rambo 2004, Xu et al. 2006). This region is crucial because of its high biological diversity, unique indigenous cultures, and as the source of the headwaters of many major river systems (Fox and Vogler 2005). Throughout this region, the livelihoods of most people critically depend on agriculture (Hall et al. 2011). This region generally features two types of terrain: upland and lowland (or hills and plains, respectively; Rush 2018). For farming activities, the inhabitants of these different terrains maintain a variety of contacts, characterized by the exchange of products, while practicing distinct agricultural methods (Rush 2018, Rigg 2020).

During the past number of decades, there has been a proliferation of literature pertaining to large-scale land acquisitions or land grabbing in the mountainous mainland region of Southeast Asia (Hall 2011a, Hall et al. 2011, Magdoff 2013, Friis and Nielsen 2016, Schoenberger et al. 2017). Borrás et al. (2012:850) highlighted that land grabbing is essentially “control grabbing,” which means to “grab the power to control land and other associated resources (such as water), in order to derive benefit from the control of such resources.” Land control changes have significantly affected the livelihoods of local residents, even resulting in the dispossession of local people and enabling rapid environmental transformations (Lazarus 2014, Xu 2020). In this context, Hall (2011a) insightfully suggested that land grabbing studies that focus on land control dynamics could benefit from

engagement with the existing literature on crop booms to better understand agrarian and environmental transformation.

According to Hall (2011a), crop booms rapidly reallocate large areas of land for mono-crop cultivation. This has been seen in the cases of industrial agriculture and tree plantations (Ziegler et al. 2009, Fox and Castella 2013, Schoenberger et al. 2017, Woods 2019). Current crop booms benefit from multiple growing seasons and thus increase the value of the land that is devoted to export production or domestic consumption (Belton et al. 2017, Hall 2011a). In recent decades, because of crop booms, the mountainous mainland region of Southeast Asia has witnessed an unprecedented transformation, from subsistence agriculture to market-oriented agriculture (Hall 2011a, Zhang et al. 2015, Rambo 2017, Hurni and Fox 2018, Vicol et al. 2018). This development is driven by advantageous natural or physical conditions, transport links, increased market access, and trade liberalization (Hall 2011a, Xu et al. 2006, Friis and Nielsen 2016). Consequently, crop booms have been proposed to tilt economic, social, and environment systems toward the “plantationocene” through extractive and enclosed plantations (Kenney-Lazar and Ishikawa 2019).

Geographically, as described by Friis et al. (2019), crop booms in Southeast Asia are “particularly pronounced in the borderlands between the countries where cash crops are largely grown (Laos, Cambodia, and Myanmar) and their neighbors where they are usually processed, consumed, or exported onward (Thailand, Vietnam, and China).” Hua et al. (2021) further argued that borderlands constitute a convergence zone supported by power relations that integrate comparative supply advantages, such as

¹College of Humanities and Development Studies, China Agricultural University, ²School of Geography and Environment, Jiangxi Normal University, ³Center for Southeast Asian Studies, Kyoto University

relatively low land rent, labor prices, and informality, to meet the increasing demand for boom crops. Regarding the types of boom crops, industrial tree plantations in upland areas, cultivating, for example, rubber trees and oil palms, have been extensively investigated, with a particular focus on border areas (Zhang et al. 2015, Friis and Nielsen 2016, Kono et al. 2018, Junquera and Grêt-Regamey 2019).

Discussions on crop booms in the mountainous region of mainland Southeast Asia, however, disregard significant horticultural expansion, especially in the region's lowlands (Pritchard 2021). This mainly relates to cultivating fruits (e.g., bananas and watermelons^[1]) and vegetables^[2] (Zhang et al. 2014, 2017, Friis and Nielsen 2016, Kono et al. 2018, Kubo and Sakata 2018, Zhan et al. 2018, Friis et al. 2019, Pritchard 2021). Horticulture focuses on the small-scale cultivation of high-value produce through the intensive use of resources (Mingochi 1998, Sutton and Anderson 2014).^[3] These practices often come with considerable socioeconomic, political, and environmental consequences. Empirically, through the boom in banana plantations in northern Laos, Friis and Nielsen (2016:117) convincingly showed that investors' forceful small-scale land acquisition strategies have resulted in "strong and longer-term alienation of land from the local communities involved." As Hall (2011a), Liao et al. (2020), and Woods (2020) argued, it is imperative to consider small-scale land acquisitions when addressing social, economic, and environmental outcomes, in addition to large-scale land acquisitions. To fill this knowledge gap, the present study focuses on the ongoing small-scale land acquisitions in the context of the recent booms in fruit investment in Southeast Asian borderlands.

One key feature of fruit booms in this region is that Chinese fruit investment has expanded considerably. Consequently, this region has been (re)shaped as "a fruit supplier to China" (Mills 2018, Pritchard 2021:1). Regarding China-centric fruit production and trade, Pritchard (2021) identified a great variety of fresh fruit in four mainland Southeast Asian countries. For example, this list covers banana and watermelon crops in Laos, mango and watermelon crops in Myanmar, durian and longan crops in Thailand, and watermelon and dragon fruit crops in Vietnam. However, as Mills (2018:168) argued, regarding Chinese overseas agricultural investment, "Southeast Asia has only recently begun to receive attention." Pritchard (2021) further pointed out that the recent Chinese-led fruit booms, as a response to China's increasing fruit demand, are under-researched. The differences between industrial tree plantations and horticultural crop plantations as well as the possible reasons for this under-investigation are discussed further below.

Few studies have explained how the characteristics of fruit booms differ from those of other crop booms, with particular focus on the fruits of herbaceous plants.^[4] As indicated by Friis and Nielsen (2016), fruit booms for crops such as bananas are small-scale and short-lived and differ from large-scale and long-term land acquisitions and investments. The concession processes of fruit booms are therefore more informal than those of other boom crops. Banana booms led by small-scale investors^[5] (Friis and Nielsen 2016) typify the flexibility of informal land access (Lu 2021). Small-scale participants with limited institutional support often represent questionable flows of capital into frontier regions

(Lu and Schönweger 2019). Moreover, among fruit crops in a certain area, the emerging development patterns might differ. For example, Bannalath and Nolintha (2021) argued that banana cultivation often involves concessions in Luang Namtha, Laos, which borders China. Meanwhile, the latest Chinese investment in watermelon cultivation follows a contrasting model, implying close relationships between Chinese investors and local residents. In addition, as Kubo (2021:63) mentioned, a "constellation of actors" is working for fruit booms along the China-Myanmar borders, consisting of investors, growers, brokers, and buyers.

The relatively short-term, small-scale, and often informal boom-bust cycle of fruits leads to socioeconomic feedback and interactions between agrarian livelihoods and resident societies (Nghiem et al. 2020, Hua et al. 2021, Kubo et al. 2021). Such cycles also impose palpable environmental and health consequences. In early 2017, the Lao government shut down Chinese-owned banana farms in northern Laos because of the excessive use of pesticides and chemicals.^[6] Therefore, the authors argue that documenting investors' performance during fruit booms is crucial to understanding the links between macro-economic and institutional transformations in agriculture, farm-based livelihoods, and the environment. Such issues also prompt a rethinking of sustainable intensification and responsible agricultural investment (Liao and Brown 2018). Although power relations among participants have been examined, investor-centered perspectives of state sovereignty and institutional land transactions have rarely been adopted (Lu and Schönweger 2019).

Fruit booms for the Chinese market are transforming rural spaces and areas in the Southeast Asian borderlands not only outside China, but also inside the borders of China (Zhang et al. 2014, Borrás et al. 2018, Hua et al. 2021). Plantations of certain booming fruit crops, such as watermelon and banana, are found on both sides along the borders between China and other countries of Southeast Asia. For example, Hua et al. (2021) argued that the fruit booms that occur in China employ a development pattern that is distinct from the booms of Southeast Asia in terms of tenure security, labor-land relations, and transformation of agrarian livelihoods; however, similar environmental consequences emerge. Therefore, for exploring the complex influences fruit booms impose on rural populations, areas, and activities, a comprehensive and comparative perspective must be applied that explores differentiation and concordance of investor practices.

Another key point is that crop booms are inseparable from cross-territorial movements of people and goods. The widely discussed issue of mobility^[7] includes domestic and transnational relocation of investors to boom areas as well as transportation of products and boom-related migration. Institutionally and structurally, these movements reflect national policies with the aim to capitalize agriculture through domestic or foreign investment (Yan and Chen 2015, Ye 2015, Suhardiman et al. 2019, Kenney-Lazar and Mark 2021). Many studies have also explored how crop booms cause local populations to migrate, in the hope of finding better wages (Baird and Fox 2015, Bouté 2018, Hall 2011b) while transferring land to newcomers (Hall et al. 2011).

Spatial, ecological, and socio-political displacement is a much-discussed aspect of most common definitions of crop booms.

Such displacements are always intertwined. For example, governmental policies for expanding rubber plantations triggered shifts in cultivation (Fox and Castella 2013) and influenced livelihoods, carbon emissions, and ecosystems (Fox et al. 2014). Rigg (2014:19) delineated the effect of the rubber boom on labor as “displacement → resettlement → incorporation → proletarianization.” Among these effects, transnational migration represents a new type of path into poverty (Rigg 2014).

For the short-term, small-scale, informal fruit booms in the mountainous mainland of Southeast Asia, a striking feature of associated mobility is that investors in fruit booms relocate geographically or spatially to seize investment opportunities after (short-term) fruit booms have burst. Previous discussions of land acquisitions and agrarian transformations in this region have disregarded such mobility. This form of relocation differs from the mobility features of typical crop booms generated by (large-scale) agribusinesses. For example, Kubo (2021:74) described the experiences and strategies of watermelon investors as the “annual shifting of cultivation^[8] from one field to another” to adapt to the vulnerability of replanting failure in northern Myanmar. A similar trend of “field rotation” by watermelon growers was also reported along the China-Laos border (Bannalath and Nolintha 2021:33).

Existing literature has also taken note of investor mobility, either regarding a certain fruit crop or occurring in a certain place. However, if this topic is addressed in a regional scope, covering both sides of borderlands, or even in a wider scope, many questions remain unanswered. For instance, why are certain investors only relocating within a country, while others choose to cross a border? What kinds of fruit crops do the investors adopt when using divergent practices of mobility? What are the conditions underlying these practices? What can be learned from investor mobility? To address these questions, this study explores and traces the causes of this mobility as a feature of small-scale land acquisitions and investments and how the phenomenon can be interpreted through an investor-centered approach along the China-Myanmar (Burma) and China-Laos borders, where tropical fruits are booming.

The central argument of this paper is that the mobility of fruit boom investors in contemporary mountainous mainland Southeast Asia is driven not only by a liberal agri-food trade market and regional comparative advantages, but also by a series of ecological and socio-political constraints.

FRUIT BOOMS AND INVESTOR MOBILITY IN SOUTHEAST ASIAN BORDERLANDS

As previously discussed, distinct differences exist between commonly defined boom crops (e.g., oil palms and rubber trees) and fruits (e.g., banana). For example, as many scholars pointed out (Zhang et al. 2015, Friis and Nielsen 2016, 2017, Lu 2021), fruit booms are usually small-scale and apply short-term informal rental tenancy, a strategy which differs from earlier large-scale and long-term crop booms (see additional information in Appendix 1). Following this line of argument, this paper extends the discussion in terms of investors’ performance in fruit booms by making two major points. The first point is that most previous crop booms spatially entailed large-scale land acquisitions, because the final production was mostly intended for industrial or multiple uses and global markets. However, as noted, fruit booms are directed to specific consuming countries. The second

point is that investors must continue to invest large amounts of capital and labor, and they rarely profit to any great extent during the initial years after planting. However, compared with this high initial cost, the subsequent operational cost is relatively low. Compared with the initial cost of accessing land and the required capital and labor inputs, fruit booms still rely on high operation cost to maintain growth cycles. The types of decisions made by investors after short-term rental tenancy are rarely addressed.

Fruit crops are becoming much more important for the rural and agricultural development of mountainous Southeast Asia. For example, China’s volume of imported fruits increased at an average growth rate of 11.9% per year over 2001–2015 (Hua et al. 2021). Regarding a specific fruit crop like watermelon, Myanmar’s watermelon exports to China became the top bilateral trade of watermelons worldwide in 2017–2018 (Kubo 2021). In addition to watermelons, commercial banana cultivation has emerged along the China-Myanmar border (Hayward et al. 2020). Previously, commercial banana cultivation was largely located along the China-Laos borderland (Zhang et al. 2014, Friis and Nielsen 2016, Kono et al. 2018, Lu 2021). Currently, watermelon cultivation is booming in northern Laos bordering China and the export value to China increased considerably from 2012 to 2016, with production accounting for about 40% of the total watermelon production in Laos (Bannalath and Nolintha 2021). Based on field observations and reported cases in this region (Bannalath and Nolintha 2021, Kubo 2021), investors in fruit booms relocate geographically to seize associated opportunities. This mobility can be observed both directly and indirectly. Direct booms involve one participant cultivating a single crop in different places. Indirect booms involve participants cultivating either the same or different crops in the same place. This study tracks and describes investor mobility in fruit booms along the China-Myanmar and China-Laos borders at a regional scale, thus exceeding the discussion on a specific country.

However, this approach is intertwined with numerous challenges. Data availability, reliability, and quality are major issues. As Kubo et al. (2021) highlighted, official data for cross-border fruit trade from Myanmar into China is unreliable. Similarly, scholars have widely used the UN Comtrade database to access data on the fresh fruit trade. However, as Pritchard (2021) argued, many fruits are not grown in Southeast Asia (because of unavailability). With regard to data on cross-border trade, “trade and customs bureaucrats may have incentives to over- or under-measure official trade volumes in order to adjust duties” (Pritchard 2021:6). In addition, unofficial or informal investment and trade are not captured by official statistics, and this causes data discrepancies (Kubo 2021). Therefore, for examining fruit booms, Pritchard (2021) suggested generating insights from “grounded methodological approaches” including surveys, observations, and qualitative interviews. The present study followed this approach.

Except for the challenges associated with data traceability, it is difficult to track investor mobility because fruit booms contain complex and multiple forms of organization on the ground and on both sides of borderlands. Examples are how domestic and foreign investors negotiate land renting and adapt to governmental policies. In this context, Kubo et al. (2021) gave an example where certain Chinese entrepreneurs registered as Myanmar companies since 2016 in response to tightened surveillance of illegal aliens by the Myanmar government.

Returning to the specific research question, existing theoretical findings are helpful for a better understanding of the potential factors contributing to investor mobility. Recent studies have demonstrated investor mobility on land leasing because of replant failure, which is a risk associated with the cultivation of many fruits (Bannalath and Nolintha 2021, Kubo et al. 2021). This implies that both economic and ecological (or agronomic) factors are crucial for field rotation. However, this does not mean that this problem inevitably drives investors to relocate and launch new farms because replant failure could be mitigated by technical innovations, such as grafting in watermelon cultivation, which has been applied in northern Laos. Alternatively, this could be solved by selecting more fertile and suitable land types for continuous cultivation, such as cultivating watermelon in alluvial land in northern Myanmar (Bannalath and Nolintha 2021, Kubo et al. 2021). Therefore, the authors argue that many theoretical considerations related to investor mobility are currently separately and inadequately addressed; a more nuanced and pluralistic account of mobility in relation to fruit investment is needed.

With investor mobility in mind, a specific question is posed: Why do fruit investors move, or more specifically, what are the forces pushing them to move? Whether such mobility is instigated by outside investors (Lu and Schönweger 2019), local smallholders (Zhang et al. 2014), or multi-party cooperation (e.g., contract farming), crop booms displace traditional farming and present an example of agricultural intensification (Hall 2011a, Behrman et al. 2014).

Theories of agricultural intensification explain how and why land use is intensified. Generally, agricultural intensification can be defined in two ways. First, agricultural intensification is applied as altering land use makes it possible for farmers to cultivate an area more frequently (Boserup 1965). Second, intensification is defined as “essentially the degree to which technology is applied to land so as to economize its use, while gaining roughly equal or greater output per hectare” (Allen and Ballard 2001:157). Agricultural intensification theories argue that increasing population drives agricultural intensification together with soil fertility, technological changes, and land tenure (Boserup 1965). When addressing intensified agriculture in specific locations, ecological considerations must be integrated (Brookfield 1972). The conceptualization of agricultural intensification emphasizes the use of labor and new agricultural techniques, as well as factors related to population growth and institutional settings, while the locations of land and labor are disregarded. As Huang et al. (2012:148) argued, “Higher value agricultural products ... involve intensification of both capital ... and labor. ... Fruits ... use more hired labor.” However, the crucial variable of labor intensification still remains poorly understood. In addition, it has been noted that informal land leasing arrangements are central for accessing land for watermelon and banana cultivations in northern Myanmar and Laos, respectively (Bannalath and Nolintha 2021, Kubo 2021, Lu 2021), but does not cover the land leasing practices supported by governmental policies (Hua et al. 2021). Therefore, this paper highlights the role of labor and land conditions in the mobility of fruit investors.

Apart from insights gained from theoretical considerations, there are three reasons why theories of agricultural intensification cannot fully explain the mobility associated with fruit booms in

the mountainous mainland region of Southeast Asia. First, these theories are mainly land based and disregard land rental markets; the identities of the various participants are also mainly ignored. The authors argue that different participants adhere to divergent types of logic for using land, such as subsistence orientation or market orientation. Second, conventional theories of agricultural intensification are commonly depicted as an active decision to seek fertile arable land for feeding a growing population while neglecting passive motivations, such as replant failure in fruit cultivations. Third, these theories generally disregard transnational land investment and apply an apolitical perspective. Considering access to land and transnational cooperation, diverse forms of land access have been practiced, such as attracting investment through concessions and informal negotiation with local authorities through social power relations. Therefore, this paper revisits the actor-oriented politics of mobility to explore investor mobility in fruit booms.

According to the conceptualization of Cresswell (2010), mobility can be understood as entanglements of movement, representation, and practice that produce social relations, which in turn, create and distribute power. Cresswell classified the politics of mobility into six elements: force of motive, velocity, rhythm, route, experience, and friction. With those elements in mind, several points deserve attention. First, it is necessary to study investment motivation and experience together with theories of agricultural intensification. As mentioned, the demand for fresh fruit in China is increasing. Based on official statistics, Huang (2016:340) traced a dramatic change in the food consumption of Chinese people “from the traditional 8:1:1 ratio (grain to vegetables⁹) to meat, respectively) toward a ratio of 4:3:3” for the past several decades. This argument is important because it shows a strong motivation for investment in higher agricultural products in response to structural changes in food consumption, such as fruits. However, this argument lacks concern for temporal and spatial dimensions. As Kubo et al. (2021) argued, many fruits, like watermelon, are cultivated in mainland China, while the target of transnational watermelon investment in the mountainous mainland of Southeast Asia is aimed at the off-season fruit market. Therefore, it is important to examine which group is interested in investing in off-season fruits, as well as the motivations of that group. Second, it is crucial to explore the economic and agronomic nature of boom crops because these factors determine the velocity and rhythm of associated mobility. As mentioned, replant failure is a crucial point deciding fruit planting cycles, which can be overcome. This suggests that investors may consider multiple factors when deciding how often they can relocate. Third, tracing the routes along which mobility is channeled requires an understanding of how investors access land and markets. Existing literature has focused heavily on this point along the China-Myanmar and China-Laos borders through the framework of the global production network (Friis and Nielsen 2016, Bannalath and Nolintha 2021, Hua et al. 2021, Kubo 2021, Kubo et al. 2021, Pritchard 2021). In this context, the space and production of informality in this region are mainly emphasized, which presents a strong motivation for investor mobility. For example, market institutions play an important role in the tremendous growth of fresh fruit investment and export (Kubo 2018). As Kubo (2018) argued, brokers (commission agencies) and wholesale markets facilitate access to export markets in border areas by providing

an interface between producers and Chinese buyers. In addition, many studies only focused on a certain boom fruit crop in a certain place, while knowledge on investors' spatial behavior at a regional level remains limited. Fourth, exploring when and how investment in crop booms ceases is crucial. Apart from relevant agronomic reasons, other factors including social conflicts caused by fruit booms and concomitant governmental restrictions on foreign investments should also be considered.

RESEARCH SITES AND FIELDWORK

In post-Cold War Asia, since the 1990s, the role and purpose of borders have changed, in order to safeguard national sovereignty as well as to facilitate exchange in the name of growth (Saxer et al. 2018). Plans for regional integration and trade liberalization, top-down government, institutional supports, and improved infrastructures (e.g., well-built highways) have significantly attracted and promoted the flows of capital, people, and technology. For this, cross-border fruit investment and trade is one example, which contributes to improved accessibility to markets, improved farming conditions, and regional economic growth. As discussed, lowland areas along the China-Myanmar and China-Laos borders have become a hotspot of fresh fruit booms (Zhang et al. 2014, Friis and Nielsen 2016, Hua et al. 2021, Kono et al. 2018, Kubo et al. 2021, Pritchard 2021). Therefore, four lowland sites along the China-Myanmar and China-Laos borders were chosen for fieldwork: Xishuangbanna Dai Autonomous Prefecture and Dehong Dai and Jingpo Autonomous Prefectures in Yunnan Province, China, the Mandalay Region in Myanmar, and Luang Namtha Province in Laos (Fig. 1, hereinafter referred to as Xishuangbanna, Dehong, Mandalay, and Luang Namtha, respectively).

Briefly, Xishuangbanna extends for 966.3 km along the Laos-Myanmar border. Dehong in western Yunnan Province shares a 503.8 km boundary with Myanmar (bordering the states of Kachin and Shan). Mandalay, in the geographic center of Myanmar, is called "the dry zone" because it receives little rainfall throughout much of the year. Its primary livelihood centers around the cultivation of rice, wheat, maize, peanuts, sesame, cotton, legumes, tobacco, chilies, and vegetables (UNDP Myanmar 2015). Although Mandalay does not share a direct border with territorial China, it is a key node for cross-border agri-trade with China through the Mandalay-Lashio-Muse-Ruili Corridor (Kudo 2006). A large number of Chinese expatriates in Myanmar live in Mandalay; this is indicative of the presence of active cross-border social networks between China and Myanmar (Maung 1994). Luang Namtha in northern Laos borders both China and Myanmar and is a prime producer of sugarcane, rubber (International Monetary Fund 2008), and rice (Friis and Nielsen 2016). For the four selected sites, cultivating paddy rice is a crucial livelihood activity of local people; rice farming has transformed toward becoming market-oriented commercial agriculture, in response to fruit booms, since the 2000s (Fig. 2). Based on existing literature, Figure 2 depicts the temporal dynamics of crop patterns, highlighting several booming fruits. In addition, Figure 2 also notes the embedded business models in terms of the land-labor nexus and investor-smallholder relationships, such as contract farming in Luang Namtha and Mandalay.

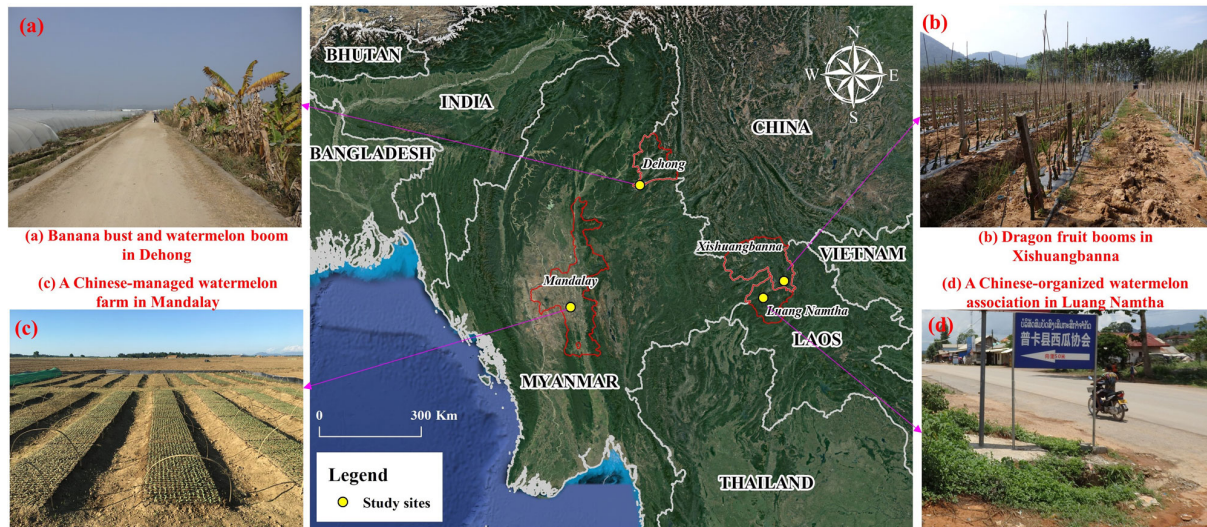
As highlighted in previous sections, tracking fruit investors' activities along these two borders is associated with complex

patterns of land acquisitions, multiple participants, and uncertainty (e.g., armed conflicts and seasonality). In addition, official data are largely unreliable and do not enable easy tracking of fruit investment and trade. Therefore, this study followed the suggestion of Pritchard (2021) and mainly adopted qualitative interviews. In addition, considering the published findings for research syntheses and comparisons and the restrictions imposed on fieldwork because of the ongoing COVID-19 pandemic, this study also uses secondary sources.

Specifically, three authors conducted extensive fieldwork along at least one side of the China-Myanmar and China-Laos borders. The first author conducted a village study in an area where bananas and watermelons boomed from August to September 2017, and from January to February 2018, in lowland Dehong (Ruili City) along the China-Myanmar border. The study included a household survey and key-informant interviews (of both current and retired village heads) that explored the history of fruit booms in the village, land-labor arrangements by investors, and associated agrarian changes. The first author also randomly, qualitatively, and informally asked investors about the situations on fruit farms they manage from other provinces in China. For fruit booms in Mandalay, the first and third authors visited Mandalay in November 2017 to obtain a better understanding of cross-border fruit investment and trade managed by Chinese investors in Myanmar. They conducted random informal interviews with four Chinese and Burmese investors and traders engaged in the muskmelon and watermelon booms. Their field work explored how fruits in Myanmar are tied to the Chinese market and how investors had engaged in fruit investment there. Two Myanmar muskmelon investors were interviewed in Tada-U Township, and two Chinese investors in watermelons were interviewed in the townships of Madaya and Myittha. During this visit, a Burmese translator was hired. With the help of a Chinese watermelon investor, the first author conducted a key-informant interview with the manager of Changhe Company (mainly engaged in the import and export of goods, mostly agricultural products) in Ruili in January 2018 to better understand the whole process of watermelon trade from Mandalay to Ruili.

Along the China-Laos border, the second and third authors conducted fieldwork in two villages of Xishuangbanna. The authors mainly focused on livelihood transitions. This fieldwork included household surveys and key-informant interviews, and lasted from 2010 to 2012, when the introduction of banana plantations reconfigured both agrarian livelihoods and environments. Because of their good connections to local households, all three authors (re)visited the indicated villages in May 2019 and interviewed two village heads about agrarian changes after the banana boom-bust cycle and asked how local smallholders make a living from the land. During their (re)visit to Xishuangbanna, the three authors crossed from Xishuangbanna into Luang Namtha, Laos, where the third author conducted long-term studies. Many studies have portrayed the rubber and banana booms in Luang Namtha (Friis and Nielsen 2016, Lu 2021), while information on the new boom fruit, watermelon, is also available (Thongmanivong and Fujita 2006, Thongmanivong et al. 2009, Junquera and Grêt-Regamey 2019, Bannalath and Nolintha 2021). Laotian smallholders were randomly interviewed (by the third author in Thai). Chinese

Fig. 1. Area studied. Notes: (a) Banana bust (right) and watermelon boom with greenhouse (left; Dehong, 6 February 2018). (b) Dragon fruit cultivated by one villager who rented land in a neighboring village (Xishuangbanna, 28 May 2019). (c) A Chinese-managed watermelon farm in Mandalay (photo taken 20 November 2017). (d) A Chinese-organized watermelon association in Luang Namtha (photo taken 30 May 2019).



investors engaged in watermelons (and vegetables) in Viengphoukha District were also randomly interviewed. Here, the authors also visited a Chinese-organized watermelon association and interviewed one manager. In addition to qualitative data collected through interviews focusing on the main research question, the authors also drew on prior studies on these areas to test arguments.

FRUIT BOOMS ALONG THE CHINA-MYANMAR AND CHINA-LAOS BORDERS

Booms in fruit investment inside China

Here, the findings in Xishuangbanna and Dehong inside China are combined under the same institutional settings. Land rentals in rural China developed steadily during the 2000s and have been actively promoted since 2003 (Hua et al. 2020). In 2004, commercial banana plantations were introduced in the study site of Xishuangbanna (Zhang et al. 2014). Lowland paddy fields were converted to banana monoculture. Zhang et al. (2014, 2017) described two types of banana cultivation: investor-managed and village-managed (Fig. 2). In this studied village, almost all smallholders adopted banana cultivation within a very short period (2008–2010), while the previous cropping pattern (since the 1980s) was paddy rice in the rainy season and watermelon in the dry season (especially after the implementing of improved farming techniques, e.g., grafting). From 2008 to 2010, the high profitability of banana plantations attracted both local farmers and outside investors. The contractual land rental for banana cropping was typically five years. Banana booms also prompted local smallholders to hire laborers and rent land from other villages. Generally, this inter-village mobility is driven by high profits, generated by banana booms.

During the (re)visit to the area in 2019, banana cultivation had nearly disappeared since 2016 and local smallholders had replaced

banana with other boom fruits such as dragon fruit and passion fruit. During this (re)visit, the authors traced local inter-village land rentals for cultivation of new fruits. For example, smallholders in one village had rented land in a neighboring village to cultivate dragon fruit after the banana bust (Fig. 1-b), and paid RMB 22,500/hectare per year on a 3-year contract (USD 1 = RMB 6.24 in 2015).

During the post-banana period, cultivating dragon fruit became popular; the market had already developed as smallholders acquired agricultural inputs from nearby markets. This implies that dragon fruit or other fruit crops are booming in this region. Economically, cultivating dragon fruit yields RMB 105,000–120,000/hectare, and based on the interviews, dragon fruit cultivation is much easier than banana cultivation. For example, fertilizers are rarely used early for dragon fruit (roughly one application every month), but their use is intensified later (every 20 days).

After the banana bust in Xishuangbanna, smallholders sought new cash crops. The logic behind crop selection following banana cultivation was that the minority of innovators among farmers found better ways of operation. If one smallholder was successful, others imitated the actions taken, which reflects a common agricultural custom (Brookfield 2001). Land rental exemplifies inter-village mobility during locally managed short-term and small-scale fruit booms.

Commercial cultivation of bananas has expanded in lowland Dehong since 2011. Over 80% of surveyed households rented paddy fields to investors from China's Sichuan and Hunan Provinces, typically for 6 years at RMB 18,000/hectare of land rent annually. One key informant noted (see Appendix 2 for more information): “These investors had formerly completed their land rental contract for commercial banana farming in

Fig. 2: General information on four study sites.

	Luang Namtha	Xishuangbanna	Dehong	Mandalay
Environmental variables	• Tropical monsoon climate	• Tropical and subtropical monsoon climate	• South subtropical monsoon climate	• Tropical wet and dry climate
Major crop patterns	1990 • Paddy rice	• Paddy rice	• Paddy rice	• Paddy rice
	1995 ↓	↓	↓	• Paddy rice • Watermelon
	2000 • Paddy rice • Watermelon	↓	↓	↓
	2005 • Paddy rice • Watermelon • Banana	• Paddy rice • Banana	↓	• Paddy rice • Watermelon • Mango
	2010 ↓	• Banana	• Paddy rice • Banana	↓
	2015 Onwards	↓	• Paddy rice • Watermelon • Sweet corn	Onwards
	2020	↓	↓	↓
Major business model in fruit cultivations				
Sources	(Bannalath and Nolintha 2021, Friis and Nielsen 2016)	(Kono et al. 2018, Zhang et al. 2014)	(Hua et al. 2021)	(Kubo 2021, Kubo and Htun 2021, Kubo et al. 2021)

Xishuangbanna and then moved on to Mangshi City (capital of Dehong) around 2007–2010 and to Ruili ... The banana cannot be continually cultivated.”

Unlike smallholders in Xishuangbanna, smallholders in Dehong neither cultivated commercial bananas nor worked as hired laborers (Hua et al. 2021). Investors hired workers from Myanmar bordering on Dehong, and provided housing for them in makeshift accommodations near the farm. To govern cross-border migration, a Foreigners Service and Administration Center was set up in Dehong (Ruili City) in 2013 to legitimate and regularize migration and long-term residency of workers from Myanmar (Hua et al. 2019).

Observations in 2017 and 2018 (the final year for banana contracts) confirmed that most banana trees had contracted the Panama disease (Fig. 1-a). According to the village head, investors did not maintain production. However, investors from Zhejiang Province converted certain plots into watermelon cultivation, demonstrating in-country mobility. Conversion from bananas to watermelons is still ongoing, illustrating how investors must relocate to launch new banana farms. Investors rented land for two years and began cultivating watermelons around October (dry season) for two seasons, each lasting seven to eight months. According to investors, watermelon cultivation is prone to suffer replant failure over two years in this location. They will not return land to the lessors until the rental contract expires. As with banana

cultivation, watermelon investors hire laborers only from Myanmar because their wages are lower than those of local Chinese workers. One key informant commented about land-labor relations, “Nowadays, land is invested in short-term crops (also) because the (political) situation in Myanmar is very unstable.”

The case study of Dehong indicates that banana investors relocated for land and labor purposes. Crop diseases or replant failures and political instability affect mobility and fruit crop choices. Although watermelons grow faster than bananas, both crops follow the same developmental trajectory. Displacement of crop types indicates that Dehong has been the focus of mobile fruit booms.

Booming muskmelons and watermelons in Mandalay

Burmese-managed muskmelon farming

Developed roads and unconventional forms of value chain governance (Kubo 2018, Kubo et al. 2021) have transformed Mandalay into a major cultivator of watermelons and muskmelons that are exported to China among Mandalay, Muse^[10] (in Myanmar), and Ruili (in Dehong). One Burmese contract farmer interviewed in Mandalay had been engaged in cross-border trading since 2012 through an agency in Muse. The agency provided him with seeds, fertilizer, pesticides, and mulch, for which he paid at harvest (see Fig. 2). He rented two parcels of

land during the dry season (September to March) to grow muskmelon. At the first location, he rented 1.2 hectares (Fig. 3) for 1 million Myanmar kyat/hectare (RMB 1 = kyat 200). In this location, one crop season may last three to four months (two seasons for cultivating muskmelons), during which he hired laborers from neighboring villages. Per hectare, the required workforce was two male and five female laborers. At harvest, he arranged for the commission agency to supply trucks to transport all produce to Muse.

Fig. 3: Muskmelon cultivation in Mandalay by Burmese investors. Notes: Photos were taken on 19 November 2017. (a) Presents the frame for growing muskmelons. (b) Presents workers hired from neighboring villages processing and packaging muskmelons for truck transport to China. Each truck transports 17 tons, departing in the evening and reaching Muse, Myanmar by morning.



After the muskmelon harvest, the farmer relocated to the second location, where he rented eight hectares for kyat 1.5 million/hectare, and cultivated muskmelons from December to March. Land there belongs to *Kaincun* or *Kaing* (in Burmese, *Kaincun* or *Kaing* is alluvial or riverine land that is inundated during the rainy season [Takahashi 2000, Kubo 2021]). In terms of land type, this land is more fertile because of the proximity to a river, illustrating that resource status may influence the mobility route. Social networks enabled him to find both land and labor. None of the smallholders in the villages where he rented land and labor can start a similar enterprise.

Trends among local Burmese muskmelon investors parallel trends in Xishuangbanna and Dehong. Domestic investors utilize inter-village and in-country mobility to find suitable land for investment. Contract farming responds to China's fruit trade market.

Chinese-managed watermelon farming

As argued above, in the fruit trade between China and Myanmar, watermelons are more important than muskmelons (Kubo 2018). According to a 2017 report, watermelon from Myanmar comprised 80% of China's off-season watermelon market.^[11] In Mandalay, investors from the border area and inland China (e.g., Shandong Province) were interviewed. According to one Chinese investor from Ruili, who had cultivated watermelons in Mandalay since 2013, Chinese traders have been investing in watermelon cultivation there for nearly 20 years. This demonstrates the long history of investment partnerships and the role of social networks in obtaining land. This investor rented 200 hectares in three locations divided into 10 land plots (approximately 70 hectares per location and 13–20 hectares per plot [see one plot of *Kaincun* in Fig. 1-c]). Watermelons are cultivated there from October to

December and from November to February. The investor sells watermelons from March to April. He signed a six-month contract with village heads and plans to relocate when the contract expires.

He paid kyat 80,000–160,000/hectare in rent to local smallholders. Agricultural inputs (seeds, fertilizer, plastic film, and labor) were mainly imported from Ruili at a cost of approximately kyat 10 million/hectare^[12] (RMB 45,000/hectare). Warehouse rental in urban Mandalay (used for storing resources and machinery) was kyat 23 million/year. Watermelon investment requires intensive labor inputs, which generate job opportunities for the local and neighboring villages (Fig. 4). For field management, the investor hired 10 skilled farmers,^[13] who were experienced in cultivating watermelon, from Shandong, Guangxi, and Hainan Provinces. He and his Chinese partners must register with Mandalay immigration. He said:

It is relatively difficult to find enough (Burmese) laborers, because a lot of laborers have moved to Thailand or China for job opportunities. I maintain around 200 hectares per year, mainly depending on the number of laborers I can hire and the number of skilled farmers I have I mainly focus on agricultural production rather than trading or marketing to mainland China, which is too complicated. In Mandalay, I know some Chinese investors with whom I often exchange information about land, agricultural inputs, etc.

After the contract expires, this investor must relocate because watermelons are prone to disease, and yields will decline if the same plot is replanted. After growing watermelon in one location, the land cannot be replanted with watermelons for at least three years. This Chinese investor even has experience in renting land for watermelon in remote Naypyidaw, which is even further away from China than Mandalay. This case suggests that mobility is common and frequent. Decisions to move must consider farm size, labor availability, land suitability, and social networks.

Fig. 4. Local Burmese villagers seeding on a Chinese-managed watermelon farm in Mandalay (photo on November 20, 2017)



Banana and watermelon investment in Luang Namtha

Empirical studies on banana booms in northern Laos (Friis and Nielsen 2016, 2017, Lu 2021) capture agrarian change. Friis and Nielsen (2016, 2017) described changes in land and livelihoods in a village in Luang Namtha. Since 2008, Chinese investors in this area have cultivated bananas for export to China on paddies formerly devoted to rice. They reported that their motivation was the increasing fruit demand in China. Investors who contracted with local organizations (typically for six years) included small Chinese companies, private investors, and joint ventures. Social networks provide connections with Laotian society, indicating the prevalence of informal land rentals (Lu 2021). Skilled farmers who are experienced in cultivating bananas can be hired from China, and this was the case in Mandalay. Banana cultivation there intensified, and lasted for three seasons of 10–14 months (Friis and Nielsen 2016).

According to customs data, the Lao banana exports to China have grown dramatically from 43,000 tons in 2014 to 250,000 tons in 2016.^[14] Because of the absence of economic opportunities in the overcrowded areas of southern China, the Chinese government financially supports such outsourcing to Laos, where the land and climate suit off-season cultivation of fruits for Chinese markets.^[15] However, prices fluctuate because bananas are vulnerable to disease (Friis and Nielsen 2017).

In early 2017, the Lao government shuttered Chinese-owned banana farms in northern Laos, including Luang Namtha, because of their excessive use of pesticides and chemicals.^[16] These actions engendered resentment by Chinese investors and companies. The Lao government encouraged local smallholders to grow sugarcane, cassava, or vegetables, all of which require fewer chemical inputs than bananas.^[17] The Lao government recognized that the cultivation of bananas may compete for land used for the cultivation of cash crops and rice, the ultimate benefits of which go mostly to Chinese entrepreneurs.^[18] In northern Laos, renting land is complicated. As stated by Lu (2021:434), “the effect of the provincial bans has been the exodus of many Chinese banana investors across northern Laos.” Although it is difficult to track banana investors who left after the Lao government banned further expansion, Hayward et al. (2020:17) noted that “[t]he restrictions in Laos contributed to new investment in Myanmar, with increases also noted in Thailand and Cambodia.”

During the recent visit by the authors to Viengphoukha District in Luang Namtha, few banana farms were encountered, and watermelon farming had been developed. Forty investors from different Chinese provinces belonged to a watermelon association there (Fig. 1-d). According to a Chinese investor from Hunan, who had operated in Laos since 2014, investors there cultivated watermelons only during the dry season (which is one season, lasting from October to April), for which they rented approximately 660 hectares at RMB 10,000/hectare (LAK 12 million). They hired local Laotians (mostly male) at RMB 50 per eight-hour day. In 2019, they harvested approximately 45 tons/hectare, and prices fluctuated from RMB 4.2 to RMB 2.1/kilo. He stressed, “It is very important to have a good relationship with local government.” According to one interviewed Laotian smallholder, different Chinese investors rent land in his village every year. This observation implies that investors still migrate or move to exploit opportunities.

Both the results of this survey and secondary sources in Luang Namtha indicate that banana investors must relocate farms because of governmental bans, and thus, watermelon cultivation is becoming dominant. Cross-border watermelon investment and trade have intensified paddy rice and agrarian landscapes in Laos. The fact that investors leave Laos for other locations in Southeast Asia indicates the existence of social-political constraints, friction, and resulting compromises. The emerging watermelon boom is similar to that in Myanmar, showing investor mobility only over the dry season, when investors search for available and affordable land and labor to satisfy the increasing fruit demand in China via cross-border trade.

DISCUSSION AND CONCLUSION

Influenced by regional integration, trade liberalization, and institutional support (Table 1), fruit booms are rapidly transforming agricultural production and the rural landscape in contemporary mountainous mainland Southeast Asia, especially in the borderlands and lowlands of this region. Many aspects of this situation are already known. For example, smallholders in Xishuangbanna have cultivated watermelons since the 1980s (Zhang et al. 2014). Since the early 2000s, Chinese smallholders have rented lowland paddies in northern Laos during the dry season to grow watermelons for export to China (Kono et al. 2018, Thongmanivong and Fujita 2006). Social networks have long facilitated the locating of suitable land along borders between China and Southeast Asian countries. As Cresswell (2010) showed, contemporary mobilities could reflect an historical perspective or a sense of movement. Nonetheless, today’s fruit boom has unique features, conditions, and mechanisms.

Existing literature has highlighted the identifying features of fruit booms, including their small-scale and short-term nature, frequent utilization of informal land acquisitions, and the space of production and trade created by such informality (Friis and Nielsen 2016, 2017, Kubo et al. 2021, Lu 2021). The presented case studies highlight that investors from China and neighboring Southeast Asian countries relocate for trans-regional and transnational agricultural investment along the China-Myanmar and China-Laos borders. The increased geographical mobility of investors differentiates today’s fruit boom from earlier crop booms in this region (e.g., rubber trees and oil palms).

This study advances the understanding of associated issues by characterizing and excavating in a broader scope the geographic mobility of investors in the current era of fruit booms. In particular, how investor mobility distinguishes this boom from previous crop booms is outlined. Mobilities in fruit booms are driven by ecological and social-political constraints alongside a liberalized agri-food trade market and regional and comparative advantages for production. This study contributes to the rapidly maturing theoretical literature on small-scale land acquisitions in the context of the recent booms in fruit investment in East and Southeast Asia.

Investor mobility is a multifaceted concept. Domestic investors relocate for investment purposes within one country, while foreign investors cross borders to invest and trade, often for just a single growing season. Through a lens that combines agricultural intensification theories and actor-oriented politics of mobility, this paper explores the causes of this mobility by focusing on the role of labor and land conditions and the elements related to fruit

Table 1: Boom fruits along the China–Laos and China–Myanmar borders

	China-Laos border		China-Myanmar border	
	Luang Namtha	Xishuangbanna	Dehong	Mandalay (to Muse)
Institutional background	Turning land into capital to attract foreign investment	Developing and promoting the rural land rental market in pursuit of agricultural modernization		Promoting economic liberalization and attracting foreign investment
Crop booms	Bananas to watermelons	Bananas to dragon fruit, passion fruit	Bananas to watermelons	Watermelon and muskmelon
Duration	6 years to 6 months [†] (dry season)	5 years to 3 years	6 years to 2 years	6 months [†]
Participant	Chinese investors	Local Chinese villagers	Outside Chinese investors	Local Burmese investors and Chinese investors
Labor	Local Laotian villagers	Local or neighboring Chinese villagers	Burmese workers	Local Burmese villagers
Spatiality of investment	Transnational	Intervillage (Local)	In-country	In-country and transnational
Land rent (RMB/hectare)	10,000	22,500	18,000–22,500	4,000–8,000
Labor cost (RMB/day)	50	80–100	900 RMB/month	20–25

Source: Authors' interviews

Note: [†] Investors rent land from local villagers for 6 months after rice harvesting.

booms. These causes have not been adequately interpreted by previous theoretical findings.

Institutionally and structurally, this mobility falls under national policies with the goal to capitalize agriculture through domestic or foreign investment (Yan and Chen 2015, Ye 2015, Suhardiman et al. 2019, Kenney-Lazar and Mark 2021). In this context, remote borderlands represent the confluence of capital, people, and technology (Hua and Kono 2020).

As indicated in Table 1, land rent in China is much higher than in Myanmar and Laos. According to Hua et al. (2021) and Zhang et al. (2014), fruit investors, regardless of whether they are outsider investors or local smallholders, can only obtain a few hectares of land in Dehong and Xishuangbanna. This is much less land, comparatively speaking, than would be acquired through investments in Mandalay and Luang Namtha. Beyond land suitability (paddy field or alluvial land) and business model, land availability is a crucial factor driving investor mobility.

Cases in Mandalay, Luang Namtha, and even Dehong show that labor availability contributes to perpetual accumulation at a compound rate (Harvey 2010), as evidenced by the dominant involvement of local or cross-border workers (with low wages) in fruit booms. According to observations in Mandalay, for example, one Burmese worker was hired solely to transport Burmese workers between nearby villages and a watermelon farm. Even in China, transnational labor migration from Myanmar influences fruit booms. Most fruit cultivation is high value-added, as well as capital- and labor intensive; Huang (2016) referred to this phenomenon as “dual intensifying.” Theories of agricultural intensification suggest that relocating domestically or transnationally opens access to both land and relatively cheap labor.

First, apart from land and labor conditions, other elements related to fruit crops also need to be addressed. The nature and extent of mobility chiefly depend on agronomic factors. For example,

investors relocate to Myanmar and Laos for their beneficial climates (a six-month dry season) and access to suitable water and soil resources (e.g., locations near rivers or alluvial land). In Dehong, although the watermelon business model is different (Table 1), Hua et al. (2021) highlighted that state-led land consolidation improved the irrigation system. This shows a similar trend compared to the locations to which investors tend to relocate. In addition, replant failure in many booming fruits (e.g., banana and watermelon) determines the duration of land rentals and mobility of investment, thus imposing an intricate ecological constraint. This result corresponds to the findings that production may move from one place to another in response to a more favorable climate or market forecast (Farina 2000).

Second, mobility reacts to exogenous circumstances, such as the prevailing political situation and the COVID-19 pandemic (Han 2020). The political situation influences investor mobility as a form of friction and compromise, and examples thereof are banana bans and political stability (Ra et al. 2021). In November 2016, fruit trade was seriously affected by conflicts flaring up in northern Myanmar, which caused market instability and traffic blocks. Investors may thus move to different locations for fruit trade to avoid uncertain or unpeaceful externalities. This may also lead to many Chinese investors relocating fruit farms within China, rather than crossing borders into Myanmar or Laos, in spite of the fact that land rent and fruit investment costs are higher in China. The banana ban in northern Laos caused an exodus of Chinese investors, and new banana farms emerged in other Southeast Asian countries (Hayward et al. 2020, Lu 2021). It has been reported that Cambodian banana export to China via sea ports is growing rapidly since 2019^[9]. However, how fruit investors manage to rapidly establish cooperation partnerships and the impacts of fruit booms on the agrarian societies in these emerging areas remains unclear and further work is required. Regarding the COVID-19 pandemic, Ruili (Dehong), as a key node for the cross-border fruit trade between China and Myanmar, has experienced three separate periods of lock down

before September 2021. Consequently, cross-border watermelon investment and trade have crashed (Kubo et al. 2021).

Third, mobility responds to the capacity of investors and potential for competition. As one Chinese investor in Mandalay noted, the number of hectares rented depends on the availability of skilled farmers and laborers, as well as the financial capacity of investors. Both considerations affect investors' geographical mobility and explain why investors in Mandalay and Luang Namtha rented plots in different places. Consequently, the route and scope of investor mobility are likely associated with the plot size investors can access. To further address this point, future studies should document details about investors' personal experiences and their resulting decisions.

Despite debates about whether large-scale land acquisition reduces poverty and creates job opportunities (Li 2011), the observations of this study indicate that fruit booms generate employment and provide smallholders with opportunities to learn skills from Chinese investors. Some of these smallholders have become independent watermelon growers since Chinese traders rented land in Mandalay. As one Burmese muskmelon investor noted, "I have grasped the skill for cultivating muskmelon. If someone wants to learn how to cultivate it, I really want to share the experience with him." It is also likely that Chinese investors may face more challenges and frictions in accessing land in Myanmar in the future, which may cause further investor mobility.

This paper has implications with regard to the influences of fruit booms and investor mobility on environmental concerns and the well-being of the rural population. In this context, three points are addressed. First, fruit booms are connected to relatively high capital and intense labor requirements. As mentioned above, overuse or misuse of chemicals during fruit booms has provoked governmental concern and has even led to a ban on fruit investment in northern Laos. As discussed, these political and ecological constraints have caused investor mobility. Scholars should consider environmental issues that may reverse the influence of mobile investment and partnerships. Investigations of sustainable intensification measures and mobile agricultural investment should compare interests of stakeholders with the needs of the environment (Petersen and Snapp 2015). As Liao and Brown (2018) critically argued, maintaining ecosystems services and improving smallholder livelihoods should be incorporated with increased productivity when (re)thinking sustainable intensification. Second, a further environmental concern is that irrigation water is very likely to be or to become polluted, because of the fertilizers and chemicals applied to soil. Such pollution may threaten aquatic plants and animals, as well as non-target crops, eventually causing rural non-point source pollution. For example, Kubo (2021) highlighted that this issue, which was caused by Chinese watermelon investment in Mandalay, provoked a ban on watermelon cultivation in paddy fields in 2006. Third, informality is an important driver for investor mobility in fruit booms. This point, however, is related to the weaknesses associated with border control and regulations. For example, Kubo and Htun (2021) reported that Myanmar authorities apply simple phytosanitary inspection for live insects to many fruit shipments in the mango trade between China and Myanmar. Even inside China, implementation of such a policy

is inconsistent with strict regulations on sanitary and requisite phytosanitary measures. Therefore, more detailed information related to fruit quality and safety and the associated social-ecological consequences should be obtained in the future.

[1] Although watermelon is occasionally classified and sold as a vegetable, from an economic perspective, this paper classifies it as a tropical fruit (Yaacob and Subhadrabandhu 1995, Kubo and Sakata 2018).

[2] See a news article about Southeast Asia's flourishing vegetable businesses: <https://asia.nikkei.com/Business/Now-blossoming-across-Southeast-Asia-The-vegetable-business>

[3] See the definition provided at <https://www.cropsreview.com/what-is-horticulture.html>

[4] In general, fruit grow on woody plants and herbaceous plants. This paper mainly focuses on the fruits of herbaceous plants.

[5] Here, "investor" is defined to include both domestic and foreign investors or entrepreneurs and local smallholders seeking financial returns. For certain investment business models, the investor is de facto the same as the "producer" or "grower."

[6] See <https://thediomat.com/2017/04/whats-behind-the-china-banana-ban-in-laos>

[7] In this study, mobility is regarded as the movement of people, ideas, or goods across territories (physical mobility; Gregory et al. 2011).

[8] Although it might be ambiguous to use the notion of "shifting cultivation," which is widely used for rotational farming by clearing land and leaving it to regenerate, especially in the tropics, this notion clearly portrays the process of investor mobility.

[9] It is necessary to highlight that here, "vegetables" does not mean vegetables only. It is a summary of a series of higher value agricultural products represented by vegetables.

[10] More information on value chain arrangements for watermelon exports from Myanmar to China and the role of brokers for such arrangements in Muse (a specific place called "Muse 105 Mile Border Trade Zone") can be found in Kubo et al. (2021).

[11] See <https://www.producereport.com/article/myanmar-watermelon-nabs-chinas-season-market-share>

[12] Around 4000 kyat/day for one worker included.

[13] Here, "skilled farmers" has a similar meaning as "agro-technicians" used by Kubo et al. (2021). The term "skilled farmers" is used because the interview showed that these farmers have obtained rich experience in previous fruit cultivation (e.g., in their hometown before).

[14] See: <https://www.producereport.com/article/china-driven-banana-boom-laos-faces-uncertain-future>

[15] See: <https://southeastasiaglobe.com/laos-banana-plantations/>

[16] See <https://thediomat.com/2017/04/whats-behind-the-china-banana-ban-in-laos>

[17] See <http://kpl.gov.la/En/Detail.aspx?id=23032>

[18] See <https://www.rfa.org/english/news/laos/plantations-04122017154559.html>

[19] See: <https://english.cambodiadaily.com/business/cambodia-directly-exports-1st-cargo-of-bananas-to-china-148884/> and <https://www.freshplaza.com/article/9261516/cambodian-banana-export-to-china-grows-rapidly/>

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Data Availability:

The data code that support the findings of this study are available on request from the corresponding author.

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Appendix 1

Appendix 1 depicts features and durations of representative boom crops. The average economic duration of crop booms is three decades, depending on natural conditions and field management. That indicates that boom-bust crop cycles persist for decades after land rental contracts are signed. However, fruit booms have brief growth cycles and it will not take long for deriving benefit after planting.

Appendix 1. Growth period of representative crop booms

Boom crop	Growth period	Source
Oil palm	"The oil palm starts producing about 3–4 years after planting and is in full production at an age of 8–10 years. The average economic life of an oil palm is about 30 years."	(Ilaco 1981)
Cocoa	"Tree grown from leaf cutting start to produce cocoa pods after 3–4 years, and those from seeding after 5–6 years. Trees from leaf cuttings are in full production after 5–7 years, and those from seeding after 7–12 years. The average economic life of a cocoa tree is about 30 years."	(Ilaco 1981)
Coffee	"The coffee plant takes approximately 3 years to develop from seed germination to first flowering and fruit production. [...] A well-managed coffee tree can be productive for up to 80 years or more, but the economic lifespan of a coffee plantation is rarely more than 30 years."	(Wintgens 2004)
Rubber	"Tapping begins when the trees have attained a certain girth [...], which is usually the case after 6–7 years. Seedlings start producing 1 year earlier than buddings. The economic life of a plantation is 25–30 years."	(Ilaco 1981)
Bananas	"The crop starts producing after 9–12 months. The stems are cut as soon as they have produced a bunch."	(Ilaco 1981)
Watermelon and muskmelon	"Harvesting can be done 60–75 days after planting, following the agronomic inputs outlined. The fruits are ready for harvest once the tendrils below the fruits have dried off or if there is a "hollow" sound when the fruits are lightly tapped."	(Yaacob and Subhadrabandhu 1995)

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Appendix 2. Domestic mobility pathway by Chinese banana investors.

Source: Authors' key informant interview.

