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Spices as the saviour? The complex vulnerabilities of three commodity crop booms and ethnic minority livelihoods in Yunnan's agrarian frontier

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Abstract: *Commodity crops are redefining land use and rural smallholder livelihoods across Asia. These crops often have boom-bust cycles with important implications for the drivers of farmer entry into and exit from particular cash crop opportunities. This paper offers a comparative analysis of the boom-bust processes of three popular spice crops cultivated in Yunnan Province, southwest China. Drawing from agrarian frontiers and rural livelihoods literature, we disentangle the vulnerability contexts associated with black cardamom, cinnamon and star anise production, finding that farmers cultivating these spices face a combination of interlocking forms of vulnerability. Despite the monetary potential that each crop offered during its 'boom', the associated environmental, economic and political vulnerabilities caused most farmers to exit their production, responding with myriad on-farm and off-farm diversification strategies. Using a multi-sited ethnographic approach, we draw on 52 in-depth interviews with ethnic minority cultivators, spice traders and local government officials to untangle the complexities associated with cash crop production in this agrarian frontier, the interwoven vulnerabilities that result in their 'busts' and the coping and adaptation strategies that smallholder farmers employ. Our findings underline the importance of disaggregating farmer vulnerabilities and the need for more nuanced policy responses to adequately support small-scale farmers.*

Keywords: *boom-bust crops, coping and adaptation, ethnic minorities, rural livelihoods, vulnerability, Yunnan*

Introduction

With agricultural boom-bust cycles for different cash crops having been experienced in numerous Global South locations, it is not surprising that both the drivers of boom-bust processes as well as the direct impacts for smallholder cultivators are extremely diverse (see Crook, 2001; McSweeney, 2004; Clough *et al*., 2009; Meyfroidt *et al*., 2014; Belton *et al*., 2017; Filipski *et al*., 2017; Hervas, 2019, 2020). Crop booms are defined as the rapid transformation of large areas of land to mono-cropped or near mono-cropped production, with temporal implications that last beyond a single growing season (Hall, 2011a,b). Similarly, Mahanty and Milne (2016: 180) have noted that a crop boom is 'a critical moment of transformation with accelerated processes of extraction and commodification. It is a unique time and place where critical elements and relations converge to exert a formative influence on peoples' lives and futures'. A large portion of the literature probing the complex economic, political, spatial and environmental dynamics and impacts of crop boom and bust processes has focused on Asia, our study location, where widespread participation in crop booms has fundamentally changed land-use, land-cover and control (see Hall, 2011a; Li, 2014; Borras *et al*., 2018; Cramb *et al*. 2017; Junquera and Grêt-Regamey, 2019; Kong *et al*., 2019). Such studies have analysed links between crop booms and migration (Hall, 2011b; Gatto *et al*., 2015), the effects on rural

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livelihood pathways of cash crops that end up not 'booming' (Vicol *et al*., 2018), producer responses to crop price volatility (Ha and Shively, 2008; Turner *et al*., 2019; Yin *et al*., 2019), the effects of crop booms on smallholder livelihoods and inequality (Cramb *et al*., 2017; Griffin, 2020), and the power of commodity booms to expand and strengthen capitalist modes of production (Li, 2014; Mahanty and Milne, 2016).

In the Asian context, there is a small but important body of literature focusing on crop booms in agrarian frontiers, a political-economic concept that frequently overlaps with a state's borderlands (Taylor, 2016; Junquera and Grêt-Regamey, 2019; Kong *et al*., 2019). Agrarian frontiers are important sites to study changing engagements with crop commodities due to the added constraints and vulnerabilities of environmental enclosures, economic and political marginalisation and – most notably when located in the state's geographical margins – territorialisation (Sturgeon *et al*., 2013; Eilenberg, 2014; Turner *et al*., 2015; Mahanty and Milne, 2016). Simultaneously, studies of rural livelihoods and commoditised crop production in Asia's frontier zones have illustrated the agency and resistance strategies of local populations, many of whom are ethnic minorities in their respective countries (Li, 2002; Turner *et al*., 2015; Taylor, 2016; Yin *et al*., 2019).

In this paper we draw from these contributions regarding how to best understand smallholder engagement with commodity boom-bust cycles across Asia, and the consequences for local livelihoods, especially those located in agrarian frontiers. The vast majority of these contributions have been based on the analysis of one key booming commodity – such as palm oil, rubber, cassava, shrimp or coffee – and the associated drivers and implications of its specific 'boom'. Alternatively, in this paper we hope to gauge the benefits of taking a comparative approach to three different spice crops and their associated booms and busts in one specific frontier region. We focus on three spices, black cardamom, cinnamon and star anise, grown by ethnic minority smallholders in Yunnan Province, southwest China, and all considered critical to Chinese traditional medicine and a range of regional recipes. Our aim is to undertake a comparative investigation into the complex vulnerabilities farmers in this agrarian frontier face due to their cultivation of these crops within this specific socio-political and environmental context. We also want to focus on the continuity of rural livelihoods, extending our scrutiny beyond the immediate boom-bust period into subsequent adaptation phases and the consequences for the farmers and small-scale traders involved (McSweeney, 2004; Hall, 2011a; Vicol *et al*., 2018; Kong *et al*., 2019). Focusing on Yunnan's frontier region and the boom-bust vulnerabilities and long-term consequences being experienced there also allows us to expand the regional literature on such crops. As Borras *et al*. (2018) note, while China is politically and economically related to nearly every crop boom worldwide directly or indirectly, insufficient attention is paid to crop booms that occur *within* its borders.

This paper draws on 52 in-depth semi-structured interviews completed by the first author with ethnic minority black cardamom, cinnamon and star anise cultivators during 2017–2018 in Yunnan Province. Utilising a multi-sited ethnographic approach, interviews were undertaken in Wenshan and Honghe Prefectures, directly on the border with northern Vietnam. These included: 18 interviews with Hmong (Miao), Yao, Yi and Hani farmers cultivating black cardamom in Jinping County, Honghe Prefecture; 18 interviews with Hmong, Yao and Zhuang farmers who either previously or continue to grow cinnamon in Hekou County, Honghe Prefecture; and 16 interviews with Hmong and Yao minority farmers cultivating star anise in Maguan County and Funing County, Wenshan Prefecture (Fig. 1). Eighteen Han (Chinese majority) traders, state officials and cultivators were also interviewed. Fieldwork targeted 15 villages chosen for being core spice cultivation sites within Yunnan's borderlands. Considering the role that ethnicity might play in farmer decision-making processes and state-farmer relations, we purposefully sampled participants from the five main ethnic minority groups involved with these spices in the region, as well as Han Chinese.

Interviews were conducted in Han Chinese (Yunnan local dialect) or Hmong. Interviews focused on five broad themes spanning: spice growing and cultivation techniques; knowledge

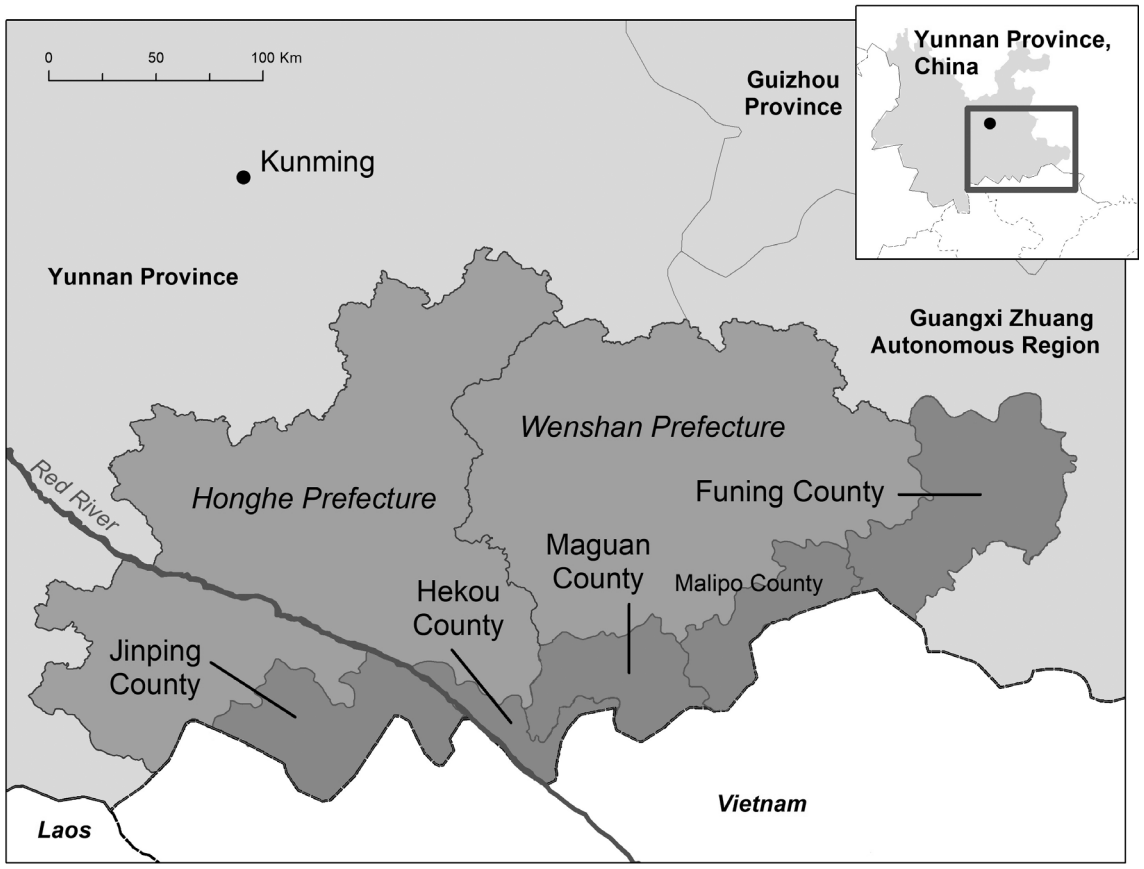

Figure 1. Location of the spice case study sites in Yunnan's frontier region, southwest China

acquisition and sharing; traders and market interactions; specific details of the impacts of different shocks and subsequent coping and adaptation strategies; and commentaries regarding state interventions. We processed our data as a team using thematic and axial coding. This research is further supported by observations and interview data gained from fieldwork regarding ethnic minority livelihoods and spice cultivation in these borderlands, in both Yunnan and upland Vietnam, by the third and fourth authors since 2009.

Next we outline the conceptual framing for this study, drawing from literatures on agrarian frontiers and rural livelihoods, with a focus on vulnerabilities and livelihood diversification in relation to agricultural commodities. We then introduce the study sites, communities and spices before briefly outlining specific policy measures creating the current boom-bust agricultural landscape for spices in Yunnan's southeastern borderlands. By taking a comparative approach to analysing the onset and decline of black cardamom, cinnamon and star anise we come to appreciate that there are precise sets of opportunities that drive each 'boom' and then vulnerabilities that subsequently result in each crop's 'bust'. We identify a range of economic, environmental and political vulnerabilities, with this disaggregation allowing us to focus on the particular coping and adaptation strategies of impacted farmers. While the fact that farmers face multiple vulnerabilities when attempting to grow cash crops might not be surprising in itself, the intricate interplays linking specific vulnerabilities are seldom discussed in the boom-bust literature, which tends instead to focus on one underlying vulnerability. Our findings thus suggest the need for more integrated and complex policy responses if they are to truly support small-scale farmers; responding to one axis of vulnerability is not sufficient.

Conceptualising spice smallholder livelihoods and vulnerability in an agrarian frontier

Within the agrarian frontier literature, a small but important body of literature considers how agricultural expansion occurs in borderlands. These borderlands are often considered by state governments as needing greater security and closer control for the purposes of upholding national sovereignty (Eilenberg, 2014). In Asia, such areas are often (albeit not always) populated with ethnic minority populations, adding further complexities if the government judges such populations to be less loyal, or lacking a 'national consciousness', than the national ethnic majority (Eilenberg, 2014: 158; see also Xu *et al*., 2005). Frontier development is often regarded by states in Asia as a means to integrate areas deemed 'zone[s] of not yet' into the national economy (Tsing, 2003: 5100; see also Agergaard *et al*., 2009; Scott, 2009). State imaginaries frequently consider these 'lawless, undeveloped and uncivilised' regions to be prospective safety valves to relieve population pressure elsewhere and to enhance agricultural output as part of an agrarian strategy; processes that can also be considered devices of territorialisation (Shrestha *et al*., 1993; Johnston, 1995). Such agrarian frontiers are neither natural nor indigenous, being based instead on a complex construction of capitalism and state-making (Tsing, 2003). Nonetheless, local actors do not necessarily accept state control as hegemonic, and 'alternative claims in different spaces' can occur, with different approaches to land-use, land-access and agrarian livelihood decision-making often rooted in local social structures, cultural norms and economic struggles (Sowerwine, 2004: 99; see also Scott, 1985).

The livelihood decision-making of residents in Yunnan's agrarian frontiers includes the mobilisation of composite bundles of assets so as to be able to benefit from new opportunities or to cope when experiencing lost access to certain options (Chambers and Conway, 1991; Ribot and Peluso, 2003). Since the early 1990s, conceptual approaches to livelihoods have been developed as a counter-option to existing impact assessment models that tended to focus on tangible and measurable variables such as employment and financial income (Whitehead, 2002). Instead, livelihood scholarship draws attention to the complexity to be found in livelihood asset portfolios containing both tangible and intangible components. These are often thought of as being combined in an asset pentagon consisting of natural, social, financial, physical and human capitals (Ellis, 2000). While this approach was initially criticised for focusing on economic elements and making livelihood complexity 'manageable' for development actors, more recent work has responded to such critiques by bringing contextual elements such as culture, local belief systems and ethnicity into the picture too (De Haan and Zoomers, 2005; Thulstrup, 2015).

The livelihood framework's attention to the vulnerability context is directly relevant to this study. This context includes shocks (e.g. extreme weather events; pests; policy changes), trends (e.g. economic and resource shifts) and seasonality (e.g. seasonal employment opportunities or price fluctuations); all factors that can impact livelihood strategies and outcomes in important ways (Ellis, 2000). Vulnerability is argued to be both differentiated and mediated by a broad array of sociocultural variables including, but not limited to ethnicity, gender, age and household size, resulting in individuals or households mitigating their vulnerability to shocks, trends or seasonality through diverse responses (Adger, 2006). Of these, coping strategies are the most immediate and are frequently involuntary, short-term responses to a sudden crisis (Department for International Development (DfID), 1999; Ellis, 2000). On the longer term, adaptive strategies and deliberate changes might come into play in adjusting to external stresses (Nelson *et al*., 2007). It is important to remember the degree to which factors such as ethnicity or exposure to market integration can play a key role here, with differential access to power and resources contributing to how individuals and households respond to adverse livelihood impacts (Adger, 2006). Such factors are central to our analysis of spice commodity livelihoods in Yunnan's south-eastern borderlands which have been especially buffeted by environmental and political shocks and trends.

When individuals and households adopt new livelihood strategies and mobilise the material and immaterial livelihood assets they can access in novel ways, livelihood diversification occurs (Ellis, 2000). This diversification might span on-farm and/or off-farm strategies that

actors unfold in response to new stressors in their vulnerability context, or with the aim to tap emerging income-generation opportunities (Chambers and Conway, 1991; Rigg, 2006). Some of these diversification tactics also involve entry tickets that not all actors can afford (Martin and Lorenzen, 2016). How diversification decisions are made and which paths get adopted have been largely overlooked to date, and as Bouahom *et al*. (2004: 615) note, the fluidity of livelihoods and 'the extent to which livelihoods are being constantly reworked, particularly when the wider economic context is fluid, is often underplayed'.

Contextualising smallholder spice cultivator livelihoods in Yunnan's agrarian frontier

In Chinese political discourse, Yunnan is often described as a province that possesses 'old revolutionary base areas, the ethnic minority areas, and the borderlands' (Liu and Lyu, 2020: 307). Two of the 16 prefectures in Yunnan, Wenshan and Honghe are the focus of our paper (Fig. 1). Situated directly on the border with Vietnam, the mountainous landscapes of these two prefectures are populated by numerous ethnic minority populations, predominantly Hani, Hmong (Miao), Yao, Yi and Zhuang, along with Han Chinese (Michaud *et al*., 2016). Traditionally, ethnic minority farmers here have pursued semi-subsistence agricultural livelihoods while cultivating either dry or wet rice as their staple food, maize as a complementary food and increasingly, cash crops as sources of monetary income (Champalle and Turner, 2014; Rousseau *et al*., 2019). Politically, the 'civilising centre' has been attempting to 'transform or "civilise" the peripherally located people on the ethnic frontiers' including this 'geographical periphery' for decades (Xu *et al*., 2005: 7). Frontier development schemes have long been displayed on propaganda billboards across the province's borderlands epitomising socialist visions of modernity and echoing political slogans from the central state calling for 'scientific' (*kexue*) or 'civilised' (*wenming*) development (Rousseau and Turner, 2018). These testify to the state's promotion of specific 'ecological modernisation' narratives regarding how this rural environment should be managed (Yeh, 2009).

In Yunnan's southeast prefectures, ethnic minority farmers have longstanding and culturally embedded relationships with nature which have become increasingly complex in recent years. Many local minority populations have strong animist traditions including the worship of sacred trees, forests or mountains, yet the rights of communities to continue these practices have become increasingly monitored and regulated by different authorities making forest management extremely contested (Xu and Ribot, 2004). Forestry management policies and institutions have also changed frequently in recent decades, leading to unclear classifications of forested areas and ambiguous implementation and control of forested areas (Zhou and Grumbine, 2011; He *et al*., 2020).

A variety (or jumble) of national programmes and policies since the 1990s have impacted local residents' access to land on which they can grow spices including black cardamom, cinnamon and star anise. In particular, four political campaigns are centrally relevant for the farmers we focus upon here. The first is the 'Returning Farmland to Forests Programme' (more commonly known as the Grain for Green programme). This nation-wide reforestation and ecological restoration initiative was introduced in the late 1990s so that 'cultivated lands in environmentally fragile areas are retired from crop production (mainly grains), and converted to pasture or forest' (OECD, 2011: 229; see also He and Sikor, 2015). Once described as the largest ecological programme in the world, Grain for Green ended in 2007 as planned, but has resulted in a number of negative long-term impacts for small-scale farmers' livelihoods in mountainous Yunnan (Weyerhaeuser *et al*., 2005; Delang and Yuan, 2015). Second, National Nature Reserves (NNRs) were initiated in China in 1956 but have rapidly increased in number in recent years (Zhou and Grumbine, 2011). These reserves have often been planned and implemented in a bureaucratic, top-down manner, and conflicts between the strict regulation of NNRs and local people's livelihoods and resource access have frequently arisen (Zhou and Grumbine, 2011; Yeh, 2013). Third, the China Western Development policy, implemented from 2000, aimed to introduce new infrastructure, economic investment, and improve the welfare for the region's population

through accelerated urbanisation and other land cover changes (Lai, 2002). The economic investment has included cash crop programmes that have generally been large-scale, top-down projects, designed and enforced by different levels of government, with important ramifications for minority livelihoods (Goodman, 2004). Fourth, since 2003, the government has initiated a new series of reforms of the country's collective forest sector called China's Collective Forest Tenure Reform. This reform 'included incentivising individual households to sustainably manage the former collective forestland to generate income' (He and Sikor, 2017: 30). This has impacted not only formal tenure rights but also the way that tenure rights are implemented and structured on the ground (He and Sikor, 2017).

Not only do spice cultivators have to navigate this complex policy context, including a range of incentives and restrictions in Honghe and Wenshan Prefectures, they also need to tend to the specific characteristics of each spice crop, and negotiate the specificities of the commodity chains they partake in. Briefly turning to each spice's characteristics, black cardamom (*Amomum tsao-ko*) is a perennial crop that has been utilised by ethnic minority groups in the Sino-Vietnamese borderlands for generations for cooking and to treat a range of medical ailments (Rousseau *et al*., 2019). Black cardamom is endemic to this region and requires high elevation, closed-canopy forest cover, as well as cool and humid climates to thrive (Aubertin, 2004; Turner *et al*., 2015). Since the 1990s, as domestic and international market demand has increased, it has become a dominant cash crop for many ethnic minority farming households in the region. Cinnamon (in this region possibly *Cinnamumum cassia*[1]) is an evergreen tree that grows best in warm humid climates. It takes about four years for the bark to be commercially viable (taken from pruned small branches as the tree continues to grow). After about 10 years the trees mature and cultivators fell them and peel the bark to sell.[2] It is thought that Hekou's cinnamon trees were originally introduced as diplomatic gifts from Vietnam during the 1950s and 1960s (Hekou County Government, 2015, 2017). Cinnamon has since been promoted as part of cash crop projects to alleviate poverty, and as part of the Grain to Green programme (interviews, Hekou County, Honghe Prefecture, 2018). As with black cardamom, star anise (*Illicium verum*) has been grown in these borderlands for generations as part of many farmers' composite livelihoods. A subtropical evergreen tree, it usually prefers high humidity and normally starts to yield fruit after about 10 years (Turner *et al*., 2019). Star anise is a frequently used condiment in Chinese cooking, is important for traditional Chinese medicines, and is an ingredient in cosmetics and various alcohol beverages (Han and Ning, 2006). Together, these three spices are key ingredients in a range of traditional Chinese medicines, and are combined in Yunnan's famous Crossing the Bridge noodles (*guoqiao mixian*) and Vietnam's breakfast *phở* noodle soup. Nonetheless, farmers attempting to cultivate these spices in Yunnan's frontier regions have faced numerous vulnerabilities analysed next.

Disaggregating spice cultivation vulnerabilities

Our results highlight three distinct forms of livelihood vulnerabilities affecting spice cultivators in the Yunnan context, which we have termed environmental, economic and political vulnerabilities. We disaggregate our findings by spice crop next before interpreting the many different strategies interviewees employed to cope with and/or adapt to the specific vulnerabilities associated with each crop.

Black cardamom

Elderly farmer interviewees recounted a long history of small pockets of black cardamom in Honghe Prefecture, mostly cultivated for medicinal use. Then, in the early 1980s, a small number of cardamom cultivators were invited to be involved in a state plan to grow cardamom in protected forests. Nonetheless, the greatest expansion of cardamom cultivation came in the mid to late-1990s when many farmers started to recognise cardamom as a possible income opportunity to meet growing cash needs, with children's education costs and farm inputs being their most pressing concerns. By the early 2000s, the boom in black cardamom cultivation had already resulted in important rising incomes, but stricter implementation of the state's forest protection laws started to halt

further expansion in forested upland areas. By the late 2010s, a combination of specific environmental vulnerabilities, overlying longer-term economic vulnerabilities, has led to the near bust of black cardamom cultivation in Yunnan's borderlands.

Black cardamom vulnerabilities: Snow and stockpiling. Cardamom is particularly vulnerable to extreme weather events, which farmers noted have increased in prevalence and magnitude across these borderlands, with much of the black cardamom cultivated in Yunnan succumbing to increasing cold spells, snow and hail. Cultivators declared that it had not snowed for 30 years before 2014, but since then snow had fallen nearly every year, with 2016 being the worst cold weather disaster in living memory. Many cultivators lost their entire cardamom crop during these extreme weather events, whether growing a few *mu*[3] of cardamom or over 50 *mu*. One elderly cultivator recalled:

> Natural disasters have limited my ability to cultivate cardamom. I can't remember ever seeing so much snow when I was a child. Now there's been snow every year for the past few years, and hail storms are becoming more frequent. There was even a hail storm three days ago! I don't know any solution to solve this disaster, to help save the dying cardamom. (75-year-old Yi male farmer, Adebo Township, Jinping County, Honghe Prefecture)

Farmer interviewees shared a sense of overwhelming helplessness with regards to how to reduce their environmental vulnerability. One cultivator noted: 'In my opinion, the most threatening disaster for the farmers here is snow. But I don't think there's anything that can be done to solve this problem' (60-year-old Hani male farmer, Maandi Township, Jinping County, Honghe Prefecture). The elderly cultivator introduced above added:

> How could we save them? The area of cardamom production is so huge. I don't think there's any way to protect them. My cardamom is all planted on sloped lands and in valleys, it would be impossible to try and cover them with plastic. (75-year-old Yi male farmer, Adebo Township, Jinping County, Honghe Prefecture)

Farmer interviewees noted that just a few days of snow or frost was enough to kill black cardamom shrubs, rendering their plantations unproductive for at least four years. This has contributed to dramatic price fluctuations, a common form of economic vulnerability we found associated with black cardamom (see also Rousseau and Xu, 2020). Cardamom prices spike with extreme weather events, but then the return of more regulated weather patterns generates more competition and thus lower prices for the crop.

Many farmers argued that they experienced further economic vulnerabilities due to their unequal relationships with wholesalers. One farmer explained that he and his neighbouring farmers were too far from a physical marketplace to sell their cardamom directly given high transport costs. Therefore, they were reliant on intermediaries and had no bargaining power in the sale price they received. Stockpiling by intermediaries or large-scale wholesalers was another common concern among farmers in regards to price fluctuations. As another cultivator remarked:

> The price of cardamom is always changing. It was 100 yuan (15 USD) per kilogram in 2016, then 80 yuan (12 USD) in 2017 and now only 60 yuan (9 USD) per kilogram (2018). I think the main reason for the fluctuation is price manipulation by buyers and wholesalers. Sometimes they buy all the cardamom and then stockpile it to create higher sale prices. (38-year-old Yao male farmer, Jinhe Township, Jinping County, Honghe Prefecture)

Such stockpiling demonstrates the highly uneven power imbalances along the black cardamom commodity chains, creating instances of distrust and further economic insecurities for cultivators.

Responses to black cardamom vulnerabilities. Farmer responses to the environmental and economic livelihood vulnerabilities associated with black cardamom cultivation included both on-farm and off-farm livelihood diversification. Interestingly we found that older and poorer interviewees tended to pursue on-farm

diversification, whereas younger and wealthier respondents often focused on off-farm diversification.

One on-farm diversification strategy was raising goats. In one village in Muchang Township, Maguan County, this had been initiated at the household level among households that had experienced their cardamom crops dying from extreme weather events. Alternatively, 25 households in a village in Maandi Township, Jinping County, had taken a collective approach to raising goats as a response strategy. The most common alternative crops to black cardamom being established were two different sub-species of *sharen* (砂仁, *Amomum villosum* Lour.; a different species but same genus to black cardamom). However, farmers who had moved to goat rearing as well as *sharen* cultivation noted that these alternative activities were also vulnerable to extreme weather events, recalling instances of 100 goats dying during the extreme cold spell in 2016 and lost *sharen* crops. Farmers had also switched to banana plantations, usually in fields where they had previously grown rice and maize, at lower altitudes than their cardamom fields. Banana plantations have indeed been booming throughout Honghe and Wenshan Prefectures since the early 2000s, yet the rapid spread of fusarium wilt (commonly known as 'Panama disease') has decimated these recently converted areas. Therefore, these on-farm strategies to cope with the environmental vulnerability of black cardamom were often unable to generate greater stability. Other crops that farmers noted they had started cultivating either in addition to cardamom or as an alternative included *chong lou* herb (重楼, *Rhizoma paridis*), a traditional medicine used for treating cancer, and *da qing ye* (大青叶/板蓝根, *Isatis indigotica*, also known as Isatic root or Chinese indigo), a traditional medicine used for treating respiratory infections and other conditions. The majority of farmer interviewees who had diversified on-farm had found that these diversifying options were unable to meet their cash needs, and had their own associated environmental and economic vulnerabilities. This led some farmers, especially younger generations, to pursue off-farm diversification strategies instead, or to create a household livelihood portfolio combining both.

Off-farm cash income-generating activities were diverse across black cardamom cultivators, often including multiple activities, or as one farmer described his approach of cultivating cardamom and owning a tourism business, 'not putting all my eggs in one basket' (42-year-old Hani male, Maandi Township, Jinping County, Honghe Prefecture). Depending on the village, the most common off-farm diversification activities included working for other farmers, tourism or construction employment, opening small businesses within the village or out-migration for urban-based wage labour. One 39-year-old Hmong male farmer noted:

> Since the severe weather started, I can't count on cardamom cultivation anymore. But there are no good alternatives in our village, which is why I work so many different jobs. I own a shop, repair motorbikes, sell gasoline and work as a day labourer for the forest reserve. All this is still not enough. I only make 40,000–50,000 yuan (6,000–7,500 USD) per year in total, and it costs me almost 30,000 yuan (4,500 USD) per year just to pay for my son and daughter's tuition, food and accommodation! (Maandi Township, Jinping County, Honghe Prefecture)

Another young interviewee detailed his struggles to meet his family's cash requirements:

> My cardamom has survived the recent harsh weather as it's planted on lower lands, but it's not enough to live on. The price of cardamom fluctuates a lot and this keeps us farmers in a poor position. My children are getting older and living costs are rising. I cultivate three different plots of cardamom and work in wage labour but it's not enough. It's not easy to find a way to make enough money. My family is going to try to open a small restaurant in the city (about an hour away). (29-year-old Yi male farmer, Adebo Township, Jinping County, Honghe Prefecture)

Another response strategy to the economic vulnerabilities associated with cultivating black cardamom was to promote customary laws supporting its collective management while resisting fluctuating and unfair purchase prices from intermediaries. This included regulating harvesting and sales timing. While there has been success with similar programmes for other

crops in the region, this had only been adapted for black cardamom in two of our study sites. These villages had created 'Cardamom Associations', whereby all village households cultivating black cardamom worked together to ensure stable prices, agreeing not to sell cardamom before a mutually agreed upon date once everyone's cardamom had matured. While not combating environmental vulnerabilities, this approach could potentially help other villages in the region reduce their economic vulnerabilities.

Cinnamon

Of our three case study spices, cinnamon has had the fastest boom-bust cycle. The planting of cinnamon was encouraged in the early 1990s as part of government collective reforestation projects and was quickly adopted by farmers on forest reserve land, with seedlings provided by the government via the Honghe Research Institute of Tropical Agricultural Science.[4] At the time, cinnamon was seen as the 'new saviour' by both provincial and prefectural governments as well as by farmer households with the price booming while citrus trees and pineapple had recently failed as cash crop options. The altitude across much of Hekou is also too high to grow rubber, a cash crop becoming popular elsewhere in the province. However, by the end of the 1990s, the vast majority of cinnamon in Nanxi Township had been felled and replaced by bananas, while this happened in the early 2000s in Yaoshan Township (both in Hekou County). These replacements were due to intricate feedback loops between political, economic and environmental vulnerabilities associated with cinnamon cultivation.

Cinnamon vulnerabilities: The politics of production and ecological downfalls. Among our three case study crops, unique to the case of cinnamon were important political vulnerabilities; yet these were also intimately tied to economic and environmental vulnerabilities. Despite the fact that the majority of cinnamon production had been directly or indirectly prompted by the government, primarily through the Grain for Green ('Returning Farmland to Forests Programme') noted earlier, shifting government policies and priorities then placed cinnamon cultivators in vulnerable positions. This was largely due to a lack of clarity, with the government providing subsidies and seedlings for planting cinnamon but then subsequently prohibiting the felling of cinnamon trees in the name of 'environmental protection', deciding that the trees would become part of local forest reserves instead. Many farmers thus participated in the programme without realising that they would not have the ability to harvest their cinnamon trees nor use the land for other crops once they had accepted the subsidy. For example, as a 51-year-old Hmong male farmer complained: 'We were encouraged to grow cinnamon on sloped land as it was too high to cultivate rubber, but now with the prohibition I can't harvest any of my 800 trees. There are so many cinnamon trees here that are just abandoned' (Nanxi Township, Hekou County, Honghe Prefecture). These political vulnerabilities are closely tied to the bust of cinnamon as a cash crop in these borderlands. As a 43-year-old Yao male farmer added: 'Ever since my family's land was placed within the reserve, I don't plant any trees anymore. It is not worth it to plant anything if I can't harvest from it' (Nanxi Township, Hekou County, Honghe Prefecture).

The 'Returning Farmland to Forests Programme' was also closely related to economic-environmental vulnerabilities in locations where farmers *were* permitted to fell their trees, such as Yaoshan Township. Cultivators here noted that the government encouraged cinnamon planting but failed to provide relevant forest management guidelines. This led to farmers planting trees too close together, on land that was too steep, or on barren soils that could not support successful growth. Farmers commented that such conditions caused their exit from cinnamon cultivation since they could not obtain a good selling price. Of the farmers who could fell their trees, most did so as soon as possible due to the poor condition of their plantations, for whatever price was attainable.

> My family had over 600 cinnamon trees. We sold them all about seven years ago after they had been growing for about 10 years. A buyer came and offered me 700 yuan (105 USD) for all of them, and I had no choice. The trees were planted way too close together and were growing terribly so I knew I would never get a

> better price. It was better to get the cash. (50-year-old Zhuang male farmer, Nanxi Township, Hekou County, Honghe Prefecture)

Due to rising costs of living and economic needs, cinnamon's decade-long growth cycle was often considered too long for farmers to wait, and other cash crops with shorter maturity times were being considered. As a 60-year-old Yao woman farmer explained:

> We'd tried so many different crops to make enough money, but nothing worked. Finally we tried growing cinnamon and fir trees, but they required such long growth cycles before we could sell them for anything that they didn't have any economic value for us. We didn't have any real economic benefits until we started planting bananas. That's when we were able to afford to build a house. (Nanxi Township, Hekou County, Honghe Prefecture)

Responses to cinnamon vulnerabilities. Over two-thirds of the cinnamon cultivators whom we interviewed had abandoned their cinnamon production completely. However, in contrast to the other two spices studied here, their livelihood diversification was nearly exclusively on-farm. While bananas were the most common substitute, interviewees had also begun cultivating other crops including mango, grapefruit, *sharen*, taro, pomelo, jackfruit, plums and macadamia nuts. These cash crops tended to be cultivated alongside ongoing rice and maize subsistence production and small livestock rearing, as had occurred during the time of cinnamon cultivation. However, not all households were able to maintain subsistence activities, and some had made the switch entirely to cash cropping, as this 51-year-old Hmong male farmer explained:

> Cinnamon was the first cash crop I ever planted. Back then, we used to grow maize and a small amount of rice. We thought that cinnamon was promising because the government was planting it, but it failed and we had to sell it for a cheap price. Now we grow bananas. They take up all our land so we can't grow maize or rice anymore. (Nanxi Township, Hekou County, Honghe Prefecture)

While switching to bananas had addressed many of the vulnerabilities of cinnamon cultivation, it also produced its own, including price fluctuations, much higher labour input (some households no longer had time to grow rice or maize), and a new environmental vulnerability, fusarium wilt. Other households made additional cash income from renting out their agricultural land. We only interviewed two farmers who were maintaining cinnamon trees as part of their livelihood portfolios with both explaining that they were waiting for cinnamon prices to rise so that they could then sell them. Yet, it was unclear if they were referring to licit or illicit felling of their trees, which brings us to our next observation.

In addition to the widespread forms of diversification seen as a response to cinnamon vulnerabilities, we also observed several cases of everyday resistance. For those who had experienced political vulnerability in the form of changing government regulations and policies surrounding forest protection, cutting down trees was a form of resistance mentioned several times. Some phrased this as 'stop-loss', namely felling cinnamon trees while they were still small (and therefore not illegal to cut down even within protected areas), without the upset of having the trees come to maturity and being unable to harvest them. Some trees that were cut down were immediately replaced with other trees, thereby still 'complying' with the 'Returning Farmland to Forests' mandate. For those with mature trees, some respondents – or people they knew – reported full grown trees as 'stolen', and were able to claim financial compensation.

Star anise

For many farmers in Maguan and Funing Counties, Wenshan Prefecture, star anise was seen as a 'green bank', a metaphor for the high returns the crop could offer with minimal investment. Some had begun cultivating star anise before the 1950s, then experienced their trees being managed collectively during the collectivisation era. Trees were then reallocated during the reform era beginning in the late 1980s, often to new individuals, while others again started planting star anise trees around 1999–2000, linked to the 'Returning Farmland to Forests Programme'.

Star anise vulnerabilities: Catching disease and (initially) stopping viruses. Despite the promise that this booming crop seemed to initially guarantee, star anise generated specific environmental and economic vulnerabilities, quite different from those for cardamom and cinnamon. An important threat to star anise cultivation was an environmental vulnerability previously unseen in the region, namely a disease that infected numerous star anise trees across the borderlands, killing the trees or severely reducing yields. Nobody we interviewed knew what the disease was called, or how they could cure it, but variously referred to it as the 'cancer of star anise, 八角癌症' or the 'falling leaves disease, 落叶病'.[5] A 60-year-old Hmong male farmer explained:

> At the beginning, I had over 2,000 *mu* planted with star anise. This was over eight years ago, so the trees should be producing by now. However, last year the star anise disease came and now more than half are dead or dying. We've lived here for most of my life and nobody has ever seen this before. We don't know how this happened. The trees turn grey, then the leaves fall, and then the trees stop blossoming until they are completely dead. (Muchang Township, Maguan County, Wenshan Prefecture)

This environmental vulnerability of star anise perpetuated economic precarity for star anise farmers despite all their efforts, as this 68-year-old Han male farmer detailed:

> My family has more than 2 *mu* of star anise, over 200 trees. Before it got sick, we used to earn about 1,000–2,000 yuan (150–300 USD) every year from star anise. But after the 'cancer of star anise' came, the situation became very bad. I've tried everything I can think of to save the trees, applying pesticides, mowing the area, but nothing I've tried has worked. My sons are also living in debt, so they can't help us. (Muchang Township, Maguan County, Wenshan Prefecture)

Such environmental vulnerability was considered unprecedented in these prefectures and no farmer interviewees had ever experienced something similar with star anise or other crops before. Local civil servants were also concerned, with one Village Secretary noting: 'We're very worried about the star anise disease problem in this village. We feel helpless. We have never seen anything like this before' (Muchang Township, Maguan County, Wenshan Prefecture).

Yearly farm-gate price fluctuations for star anise have added a layer of economic vulnerability to these livelihoods. Cultivators typically sold their harvests to visiting wholesalers, with cultivators having little negotiating power. However, for most farmers, their worst experience of economic vulnerability stemmed from a drastic price drop starting around the year 2000. Most reported being able to sell one kilogram of dried star anise for 25 yuan (3.75 USD), or even up to 50 yuan (7.50 USD), before this price bust. However, producers now receive only 1 to 12 yuan (0.15–1.80 USD) per kilogram, while the cost of living has increased markedly over the same period.

Research on both sides of the Sino-Vietnamese borderline by the third author has proposed that this price drop was in large part due to the Swiss-based pharmaceutical company Roche creating a synthetic alternative to shikimic acid, which is found in star anise and used in the production of the anti-influenza drug oseltamivir phosphate (Tamiflu). Roche was concerned that the supply of star anise was not consistent enough given large-scale demand for Tamiflu after the H5N1 avian flu hit, and hence turned to create this synthetic alternative, centrally contributing to the global price crash for star anise (Turner *et al*., 2019).

For interviewees with non-diseased star anise trees, most noted that the slumped selling prices were too low to meet the labour costs of harvesting, and they therefore just left the star anise fruit to fall from the trees, while hoping a price increase in the future would make harvesting worthwhile again.[6] As a 45-year-old Yao male village leader lamented: 'Ever since the price drop, none of us feel that it is worthwhile anymore, because it takes a lot of time and energy to collect star anise' (Dongbo Township, Funing County, Wenshan Prefecture). As farm-gate prices never recovered since the early 2000s, a combination of vulnerabilities regarding the cultivation of star anise has made it an unpopular cash crop option, leading to its bust in the region. One 50-year-old Han male spice trader summarised the situation: 'In recent years, the market price for star anise has stayed low, and due to the combined impacts of trees aging, disease, and other issues, the growers now don't think it is cost-effective. The enthusiasm is no

longer there' (Dongbo Township, Funing County, Wenshan Prefecture).

Responses to star anise vulnerabilities. As with both other spices, the most common response to the vulnerabilities impacting star anise cultivation was livelihood diversification, but in this case off-farm diversification was the most common approach. Many farmers referred to the period of star anise's boom as 'back then', reflecting on how 'back then' they used to only grow rice, corn and star anise, but that now their livelihood portfolios are far more diverse. While various replacement or complementary livelihood activities were mentioned, migrant and day labour were the most common, closely followed by on-farm crop diversification including cultivating chayote, *sharen*, sugar cane and vegetables. Yet interviewees also mentioned a range of difficulties associated with these activities, demonstrating that moving away from star anise had not necessarily reduced livelihood concerns. For example, migrant labour was often considered harder than on-farm work due to challenging working conditions. *Sharen* cultivation had resulted in economic vulnerabilities as it required a long growing period before harvesting, while sugar cane was considered challenging to cultivate, with honest intermediaries difficult to find.

Due to the economic vulnerabilities that star anise had caused, some farmers had adopted specific resistance strategies. The most common among these was 'improving' the appearance of their star anise for traders. As many cultivators mentioned, buyers 'give better prices for better appearances' based on the size, colour and shape of the star anise. Farmers shared stories of their micro-resistance strategies when prices dropped too low, including boiling and then drying star anise in the sun to increase its weight and improve its appearance before sales, as well as using a range of chemical dyes.

A more extreme resistance measure had occurred due to the significant fall in star anise prices during the 1980s. As the majority of the crop was purchased directly by the government during that period, producers burned their star anise in front of government cooperatives in protest of the low purchase price. However, once low prices and price fluctuations became associated with the market rather than the government, this form of protest was no longer relevant and leaving star anise crops unharvested was the only response they had found to insufficient purchase prices.

Disaggregating boom-bust cycles

By disaggregating the boom-bust cycles of three spice crops in Yunnan, we found that each crop had specific and interrelated forms of environmental, economic and political vulnerabilities that caused farmers to exit production (Table 1). Environmental vulnerabilities were reported for all three spices. Cardamom and star anise were crisis-prone, leading to the death or lost productivity of the crop. For cardamom, this was associated with extreme weather events, with increased frequency and severity of snow, hail and cold fronts, whereas for star anise, a widespread but previously unknown crop disease had destroyed most trees in our study area. In contrast, cinnamon appeared the most resilient environmentally speaking; however, poor

Table 1. Disaggregated forms of vulnerability for spice crop cultivation in Yunnan

	Spice		
Form of vulnerability	Cardamom	Cinnamon	Star Anise
Environmental	Extreme weather events (snow, hail, and cold fronts)	Failed growth due to poor spacing and soils Long maturation cycle	'Star anise disease' Reduced productivity of aging trees
Economic	Traders and wholesalers stockpiling	Price drops	Price crash in early 2000s
	Price fluctuations	Inability to meet cash requirements due to long maturation cycle	Ongoing price fluctuations
Political	(none identified)	Changing policies regarding forest protection and rights to fell trees ('Returning Farmland to Forests Programme')	(none identified)

guidelines from the government regarding proper planting methods had resulted in low yields.

Economic vulnerability was the most consistent form of vulnerability, occurring for each of the focus crops. This was largely market-related, caused by price drops and fluctuations and low farm-gate prices. While there was variation across the three spices in terms of the extent and specific years of price changes, overall economic vulnerability was reported across field sites and interviewees. However, cardamom price fluctuations were specifically attributed to urban traders and wholesalers stockpiling, highlighting the micro-politics and power imbalances in the commodity chain. Moreover, while the price of cinnamon did not experience as devastating drops or fluctuations as cardamom or star anise, cinnamon's long growth cycle led to cash shortages while farmers waited for it to reach maturity, perpetuating economic vulnerabilities. In contrast to environmental and economic vulnerabilities, political vulnerability in this case study was only identified by cinnamon cultivators. Changing and unclear government policies regarding forest protection and particularly the 'Returning Farmland to Forests Programme' put cinnamon cultivation in a very vulnerable position, with farmers' lands and mature cinnamon trees retroactively designated as being within protected areas.

Taking a step back from each individual crop and their forms of vulnerability, we also see broader vulnerabilities across the case study region, with power imbalances observed between farmers and local governments, and between farmers and trade intermediaries. The impacts of larger scale political-economic vulnerabilities – such as living in a socialist state where there is often limited farmer input into rural policy decisions – are woven throughout farmers' livelihoods within and beyond cash crop cultivation decisions.

While the livelihoods literature recognises the presence of vulnerability contexts and that they shape livelihood assets and activities (DfID, 1999; Ellis, 2000), the nuances of these contexts are less commonly considered. In disaggregating the boom-bust cycles of three spice commodity crops in Yunnan, distinct forms of vulnerability emerged in our findings, with differentiated impacts on livelihood activities, decisions and outcomes. In relation to the cash crops literature in particular, we find that despite increasingly in-depth understandings of what drives a commodity's 'boom', the subsequent busts tend to be associated predominantly with economic vulnerabilities (Ha and Shively, 2008; Belton *et al.*, 2017; Filipski *et al.*, 2017). While these vulnerabilities are certainly relevant, and indeed were observed for all three spices here, what is often missing is an analysis of how *other* livelihood vulnerabilities, such as environmental and political vulnerabilities, interrelate with economic vulnerabilities such as price drops or fluctuations. These interlinkages add to the complexities that farmers attempting to grow these spices face, and impact the adaptation strategies and livelihood diversification approaches that cultivators undertake.

Moreover, in addition to on- and off-farm diversification strategies to cope with crop vulnerabilities, forms of everyday resistance were also seen among cinnamon and star anise cultivators (Scott, 1985). Cinnamon farmers were illicitly felling trees, while star anise farmers had found ways to ensure higher incomes by drying and dying their harvest before selling it. Resistance does not factor into many core conceptual frameworks for livelihoods but is a response strategy that clearly demonstrates actor agency and that can help with the maintenance or improvement of farmer livelihoods (Turner *et al.*, 2015).

Concluding thoughts

For a minority of the farmers whom we interviewed, coping and adaptation strategies undertaken in response to diverse and interlinked vulnerabilities involved adding complementary activities to cardamom, cinnamon, or star anise cultivation. Yet, in most cases, we found longer term adjustments to livelihood portfolios amidst the bust of each of these spices had resulted in farmers exiting spice cultivation to a large or full degree, pointing to the extremely tenuous nature of these three cash crops as key livelihood strategies. This begs the question as to how local government officials and research institutions could best support local smallholder livelihoods and help lessen the vulnerabilities these households face? Clearly, officials working in local research

institutes such as the Funing County Star Anise Research Institute have a reputation to uphold and a vested interest in maintaining this specific crop in the region, and little interest in supporting farmers to diversify away from it. Meanwhile, officials linked to cinnamon research institutes have largely lost the trust of local farmers due to the misinformation farmers were provided regarding tree spacing and other growth requirements, as well as changing land use policies. Support for borderland farmers might be better received from non-government organisations; however, these organisations face important challenges to operate in China in general, to which would be added the hurdles of working in a frontier region. Instead, 'entrenched top-down models of implementation' remain the norm (Yeh, 2013: 1182). From the central state's point of view, 'taming' the borderlands requires 'civilising projects' (Harrell, 1995) and cash cropping is considered to be just that. Yet, as we have seen, the realities for frontier farmers are far more messy, with diverse livelihood approaches being necessary for many to adapt to a range of interlocking cash-cropping vulnerabilities, directly challenging state ideals regarding how to tame these frontiers. Whether farmers will be able to maintain their diverse approaches, at least enabling them to gain some cash income for a rising number of financial needs, or whether they will be directly targeted for new cash crop schemes is yet to be seen.

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Notes

[1] *Cinnamumum cassia* is the species most likely being grown in this region; however, interviewees at the Honghe Research Institute of Tropical Agricultural Science of Yunnan Province in 2018 noted that this has never been verified (see Derks *et al*., 2020 regarding similar confusion in northern Vietnam).

[2] While cultivators in China and across the border in Vietnam are known to also harvest the leaves and twigs for essential oil production (Fang, 2005; Derks *et al*., 2020), this was not found in our study sites.

[3] 1 *mu* is 666.5 m^2.

[4] National policy determines that each village maintains up to 5% of all village land as forest reserve land. However, the amount of land set aside is often greater and villages commonly lease this land to villagers using an auction process (Ma, 2013).

[5] Officials interviewed at the Star Anise Research Institute, Funing County, suspect that this is *Colletotrichum gloeosporioides Penz*, a fungus that is caused by harsh weather changes and poor management (see also Su *et al*., 2019). However, we could not gain confirmation of the exact disease in our study sites.

[6] This is exactly the same response that Vietnam-based star anise cultivators implemented when faced with the same price crash (see Turner *et al*., 2019).

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