Land **2014**, *3*, 574-597; doi:10.3390/land3030574

OPEN ACCESS

land

ISSN 2073-445X
www.mdpi.com/journal/land/

Review

The Fall and Rise Again of Plantations in Tropical Asia: History Repeated?

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Received: 21 January 2014; in revised form: 18 June 2014 / Accepted: 23 June 2014 / Published: 30 June 2014

Abstract: The type of agrarian structure employed to produce tropical commodities affects many dimensions of land use, such as ownership inequality, overlapping land rights and conflicts, and land use changes. I conduct a literature review of historical changes in agrarian structures of commodities grown on the upland frontier of mainland Southeast and South Asia, using a case study approach, of tea, rubber, oil palm and cassava. Although the production of all these commodities was initiated in the colonial period on large plantations, over the course of the 20th century, most transited to smallholder systems. Two groups of factors are posited to explain this evolution. First, economic fundamentals related to processing methods and pioneering costs and risks sometimes favored large-scale plantations. Second, policy biases and development paradigms often strongly favored plantations and discriminated against smallholders in the colonial states, especially provision of cheap land and labor. However, beginning after World War I and accelerating after independence, the factors that propped up plantations changed so that by the end of the 20th century, smallholders overwhelmingly dominated perennial crop exports, except possibly oil palm. Surprisingly, in the 21st century there has been a resurgence of investments in plantation agriculture in the frontier countries of Cambodia, Laos and Myanmar, driven by very similar factors to a century ago, especially access to cheap land combined with high commodity prices. As in the last century, this may be a temporary aberration from the long-run trend toward smallholders, but much depends on local political economy.

Keywords: tropical exports; tea; rubber; oil palm and cassava; plantations; smallholders; commodity history

1. Introduction

In the early 1900s, the production of tropical tree crop commodities for export was concentrated in large-scale plantations. Although plantations had a long and disastrous legacy in the slavery period, their revamped "capitalist" version expanded rapidly in the first period of globalization after 1850, when the movement of capital, labor and trade was liberalized, and European empires rapidly extended into tropical Africa and Asia [1,2].

The dominance of plantations for export commodities was in contrast to the overwhelming role of smallholder family farms in tropical agriculture more generally. However, after World War I there was also a steady and sometimes revolutionary shift away from plantations toward smallholders as the dominant producers of tropical commodities over the course of the 20th century [3,4]. With very few exceptions, this shift was complete by the time of the second major period of globalization from the mid-1980s [5,6].

Against this long historical trend, it is surprising to see a rebirth during this century of large plantations on the frontier regions of Southeast Asia, especially in Cambodia, Laos and Myanmar (CLM) and the large islands of Sumatra, Borneo and New Guinea. A fundamental question raised by this abrupt break in the long-run trend toward smallholder systems is whether there has been a change in the economic fundamentals related to technology and markets, or whether other drivers related to state policies and investor "mindsets" have played a more important role.

An understanding of this phenomenon is critical to addressing three critical land use issues in the tropics today. The first is the agrarian structure as defined by land ownership. All things being equal, a more egalitarian agrarian ownership structure leads to more rapid growth, stronger poverty reduction impacts [7] and higher public investments in education and infrastructure that is critical to long-run inclusive growth [8,9].

Second, the granting of large land concessions even in areas of relatively low population density is likely to infringe on land rights of local communities. This is especially the case in extensive farming systems where much land is left in fallow as secondary forest and where forests provide important sources of livelihoods beyond farming. This issue has come to the fore in recent years with a surge of foreign investment in relatively land-abundant countries and cries of international "land grabs" [10,11].

Third, large-scale mono-cropped plantations and commercial farms have been historically and still are important drivers of deforestation [12–14]. While smallholders are not immune to charges of deforestation, they often produce crops for both subsistence and the market within complex landscape mosaics that preserve at least some of the environmental services provided by natural forests such as biodiversity.

To better understand these land use issues, the objective of this is to review the resurgence of large plantations in mainland tropical Asia from a historical perspective. A key question is whether there are new drivers that have permanently changed the agrarian structure or whether we are experiencing a temporary aberration from the long-term trend toward smallholders. A further objective is to analyze how institutional and historical factors specific to countries in the region explain evolving agrarian structures for tropical commodities.

The paper is developed around a simple framework presented in the next section that considers economic fundamentals as well as policy biases and beliefs as the determinants of the balance between plantations and smallholders in commodity production. We then apply that framework in Section 3 to case studies of changes in agrarian structure for four commodity exports that have historically and continue to be important in the Greater Mekong and Himalayan regions (the focus of this special issue)—rubber, tea, oil palm and cassava. Each case illustrates the transition from plantations to smallholders over the past century, albeit via different pathways. Section 4 then examines the recent rise again of plantations in mainland Southeast Asia for the same group of commodities (except tea) and analyzes the underlying drivers, within the same framework. We conclude with a synthesis of the major findings and what they portend for future agrarian structures for commodity production in the region.

2. A Simple Framework for Analyzing Drivers of Agrarian Structure

The case studies are built around a simplified dichotomy of organizational models for producing tropical exports derived from perennial crops. On the one side, the modern plantation is a near-industrial form of production organization, relatively large in scale, and usually specialized in one commodity. It typically employ hired managers and hired labor organized in a hierarchical manner, with specialization of labor to particular tasks, given the year-round labor needs of perennial crops in the humid tropics [15]. Such plantations generally have access to external sources of capital through formal financial markets, an important asset given high upfront investments and the long gestation period for payoffs from perennial crops. They are also usually vertically integrated into first stage processing and sometimes further down the value chain.

Smallholders on the other hand are family farms defined by family management, family ownership of a significant share of albeit limited assets, and with most labor provided by family members in combination with management [16,17]. They are typically diversified and in particular in the context of this paper, when they produce export crops they usually do so in combination with food crops for home consumption. Incomes of family members combine returns to their labor inputs with returns to family management and their owned assets. Typically, such incomes will be substantially higher than could be earned by labor incomes alone by working on plantations [10]. The exception is where there is a large yield gap between smallholders and plantations lowering overall returns to all production factors received by smallholders.

There are of course many shades of gray in these definitions. Plantations may be family owned but still employ managers and hired labor for day-to-day operations while others are large multinational agribusiness companies. Likewise, smallholders vary substantially in assets, with some countries of the region such as Thailand and Malaysia using a definition based on a farm size as much as 20–25 ha—a definition that we broadly follow in this review. Further, smallholders may be associated with plantations through contractual obligations for processing their products and for receiving technical advice, in what are generally known as nucleus-outgrower schemes.

Many authors have discussed the unique attributes of agriculture that favor the inherent efficiency of family farms [18,19]. Diversified family farms have advantages in managing production risks and the seasonality of labor demand. Dependence on family labor reduces their transactions costs of labor supervision. Further, the local soil, climatic and seasonal specificity of agriculture puts a premium on

managers' local knowledge and experience often accumulated over generations, again favoring family owner-managers [18]. The integration of management with family labor inputs also reduces management overheads.

Why then did plantations emerge at all for export commodities? I address this question through a framework that considers three sets of factors—economic fundamentals, biased policies, and beliefs and perceptions of modernity.

2.1. Economic Fundamentals

The most widely accepted economic argument for large plantations derives from a combination of significant economies of size in processing, and the need to closely coordinate harvesting with processing for bulky products that deteriorate rapidly after harvest [17,20]. Sugarcane, oil palm, tea, and sisal require processing within about 24 h after harvest, and fresh cassava also deteriorates rapidly. Further, large economies of scale in milling and high transactions costs of organizing smallholders to a tight delivery schedule to fit mill capacity may favor vertical integration of large-scale production units with processing of these commodities.

Another economic fundamental relates to the pioneering cost and risks of introducing new commodities into new areas [21]. This can favor large companies with relevant experience, their own R&D capacity, and ready access to capital. Pioneering costs and risks are highest when a crop is being domesticated for cultivation for the first time (as was rubber and oil palm in the early 20th century and Jatropha in the early 21st century) and in frontier areas, where infrastructure and services are poorly developed and new crops are being tried.

A possible third economic driver, at least in the short run, is when investors speculate on periods of high commodity prices to invest in the sector. The larger scale of the plantation mode of production facilitates raising external capital and investing it. However, like pioneering costs and risks that will likely fall after the industry develops, 'excessive' returns in an industry due to high prices will sooner or later be negated by increasing supply induced by the investments.

None of these economic fundamentals guarantees the superiority of plantations and the final outcome depends on relative transactions costs [19]. Plantation production incurs significant transactions costs of its own in hiring and managing labor and accessing land. These costs are expected to be higher for relatively labor-intensive products and in areas with poorly functioning land markets. Processing firms could choose to reduce these costs by entering into contracts with smallholders, although this incurs other types of transactions costs of identifying contract farmers, enforcing contracts, and controlling product quality and standards. An alternative is for smallholders themselves to vertically integrate downstream through collective action, such as cooperative processing, although this has well-known transactions costs of developing strong farmer organizations. Note that relative transactions costs among these organizational modes depend on country-specific economic and institutional contexts and are likely to change over time.

2.2. Biased Economic Policies

Beyond economic fundamentals, the rise of plantations may reflect policies that distort the underlying costs in their favor [22]. Policies that reduce prices for the key production factors (land,

labor and capital) to large operations relative to the prices faced by smallholders obvious favor plantations. Policy distortions may also arise from neglect of basic public goods and services that would favor smallholder development, such as research and land tenure security [23]. In addition, financial markets for smallholders are often very imperfect reflecting the higher transactions costs of providing loans to smallholders [24].

These policy regimes, of course, respond to political economy factors, and biases are especially likely where there are close relations between investors and the state, as in colonial times or in many nascent democracies today. These state-investor relationships are likely to be most apparent in periods of high commodity prices when rent-seeking activities by the key players are most lucrative.

2.3. "High Modernism"

Prevailing ideologies and beliefs also shape the nature and extent of investments in plantation models and the design of policies to support them. Colonial officials widely believed that plantations linked to global capital and product markets and under European management were the most efficient production system [25,26]. Such beliefs prevail more generally in what Scott [27] has termed a "high-modernist faith" in technology and machines, standardization of tasks and processes, and scientific management. This thinking is especially applicable to tropical mono-crop plantation commodities that are amenable to specialization of tasks, hierarchical organization of management, and spatial orderliness more generally. Diversified smallholder systems by contrast may look disorganized or messy through the eyes of "modern managers".

3. Case Studies of Four Commodities, 1850–*circa* 2000

I apply the above framework to review long-term changes in agrarian structure for production of four export commodities in tropical mainland Asia. The selection of commodities was based on their importance in the region historically, their importance today in the resurgence of plantations on the frontier, and their requirements for processing scale and timeliness. Three of the crops, tea, oil palm, and cassava, require rapid processing after harvest to avoid spoilage, and there are significant economies of scale in processing, at least for tea and oil palm. Tea was one of the first major plantation crops cultivated on wide scale, from the time it was pioneered in Northeast India in the mid-19th century. The cultivation of rubber was also pioneered in Southeast Asia and rubber has also been by far the most important and dynamic export in the Greater Mekong Region since 2000 especially in the CLM countries. In Southeast Asia more generally, oil palm, has been the most important export commodity since 1990. Cassava is less well known, but was an important Southeast Asian export before rubber in the late 1800s based on plantation production. It has revived again as a fast growing export since the 1990s.

Two other important export commodities in the region could also be included, but that would not change the major findings of a long-term trend toward smallholders. Sugarcane plantations in the region for exports largely disappeared by the end of the 20th century (outside of state-own farms), and Thailand became the world's second largest sugar exporter based on smallholder production [28]. Coffee was an important plantation crop in the early colonial era, but smallholders quickly adopted

the crop. After 1990, smallholders in Vietnam's uplands staged a remarkably rapid adoption of the crop to take second place in world coffee exports [29].

3.1. Rubber—A Quintessential Smallholder Crop

The consumption of rubber expanded in the last part of the 19th century for industrial uses and consumer goods, based entirely on harvesting of several wild rubber species in the tropics that was associated with widespread abuse of human rights of rubber collectors [30,31]. In the early 20th century, the nascent automobile industry stimulated a major new market for rubber. A three-fold increase in the price of rubber during 1905–1910 led to the conversion of rubber supply to cultivated rubber, starting in Malaysia (for convenience I use modern country names) where active support by the colonial government and entrepreneurial planters were successful in cultivating *Hevea brasiliensis,* based on seeds from Brazil.

The initial high price of rubber stimulated large inflows of foreign investment and rapid expansion of planted rubber through foreign-owned plantations in Southeast Asia (largely British, Dutch, and French but also American-owned). Cultivated plantation rubber increased rapidly from 0.3% of world supply in 1903 to 60% of supply in 1914, driving prices down by 75% from their peak in 1910 [32,33]. However, with highly volatile prices many small companies and individual planters did not survive and large vertically integrated companies emerged, including the major tire manufacturers, Goodyear in Indonesia, Dunlop in Malaysia, and Michelin in Vietnam [33,34].

Colonial governments in the region actively supported the development of rubber plantations through loans, such as Malaysia's Loan to Planters Scheme of 1904 [35]. Colonial states also provided access to cheap land grants. In peninsular Malaysia, the extensive and sparsely settled forest areas were considered as elsewhere "wastelands" and appropriated by the crown to encourage commercial agriculture [36,37]. When French Indochina entered the plantation rubber industry in the 1920s virtually free land concessions encouraged land acquisitions well beyond needs that often conflicted with use by local communities, mostly ethnic minorities—the so-called *Montagnards* [38–40].

Land concessions were usually granted in heavily forested areas of low population density to minimize conflicts with existing users, but with relative labor scarcity. Colonial governments eased this constraint by facilitating immigration of indentured labor. Issues of labor rights and conditions became widespread throughout the region [31,41,42], resulting in labor inspections by the newly created International Labor Organization as early as the 1920s that gradually improved conditions [43].

One of the unexpected developments at the time was the rapid emergence of smallholder rubber producers that broke the enclave nature of plantation agriculture [33]. Rubber could be processed on farm through relatively simple methods and as a labor-intensive crop that required daily harvesting it was quickly taken up by smallholders, once the basic technology (varieties, tapping techniques) and infrastructure were in place [44]. This was despite a hostile policy environment from colonial governments especially in the discriminatory allocation of market quotas after the price collapse following World War I and in the lack of research and extension services for smallholder systems [33]. By 1930 about half of rubber in Asia was already produced by smallholders and by the first decade of this century, this share was about 90% in the world's major rubber producers—all in tropical Asia (Table 1). Rubber emerged as a commodity that provides livelihoods to millions of smallholders and wage earners.

In land extensive systems, smallholders quickly adapted rubber to their long fallow agroforestry systems that produce diversified outputs, reduce risks, spread labor demand, and conserve biodiversity [44–46]. Another motivation for planting rubber in these systems was to establish land rights in order to protect customary lands from outside encroachment by plantation companies or from extension of government forest reserves [44,47].

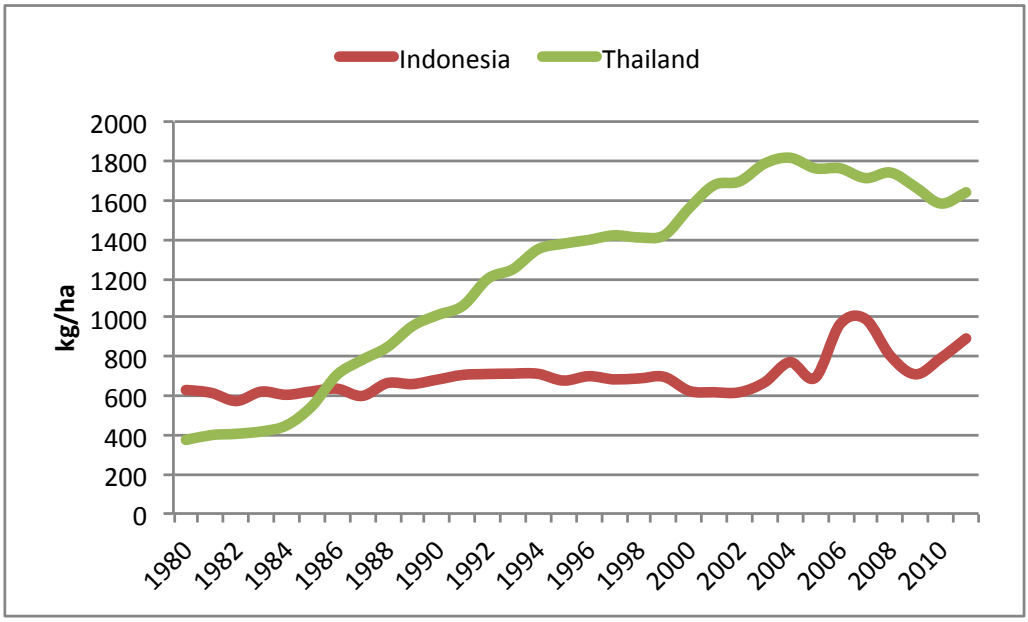
Smallholders have also successfully intensified rubber production in Thailand, China, and India, under pressure of growing land scarcity and conservation efforts to preserve remaining forests. Thailand, where rubber is virtually all produced by smallholders has become the world's number one rubber exporter through a four-fold increase in yields since 1980 (Figure 1). One million smallholders with an average of 2–2.5 ha make up 95% of area, and rubber provides the livelihood of 10% of the Thai population [48]. Intensification of rubber in Thailand was based on the adoption of high yielding clonal planting materials on over 80% of the area, orchestrated by the Office of Rubber Replanting Aid Fund (ORRAF) a parastatal established in 1960. ORRAF provided grants for replanting up to 2.5 ha and advisory services, funded by a cess on rubber sales [49]. A land-titling program has provided tenure security to invest in tree crops and facilitated access to credit through the state agricultural bank.

Table 1. Percent of world rubber production and share area under smallholdings, in *circa* 2005. Source: [45,50].

Country	% of World Production, 2005	% Rubber Area in Smallholdings
Thailand	32	91
Indonesia	25	85
Malaysia	12	93
India	9	88
Total	78	83

Note: Smallholding defined according to country but usually <20–25 ha.

Figure 1. Yields of rubber in intensified systems of Thailand and more extensive systems of Indonesia. Source: [50].



In short, Southeast Asia pioneered the cultivation of rubber and has led world exports for over a century. However, the structure of production shifted decisively from large externally financed plantations to almost all smallholder-based production, both in extensive and intensive systems. The large plantations remaining at the end of the 20th century, mostly in Vietnam, Indonesia and India, were mostly state run and a legacy of colonial times; after independence European owned and operated plantations were nationalized.

3.2. Tea: A long Struggle to Keep Plantations Alive

In the Himalayan Hills of Northeast India, tea has been the major plantation crop in the area since the 1840s. Because of its high upfront establishment costs and requirement for rapid processing in a relatively large factory within a few hours from harvest, black tea was historically produced on plantations [51]. In fact, in a generally sympathetic review of the role of smallholders in tree crop exports in 1960, Wickizer [52] singled out black tea as a crop where he saw little potential for smallholders (although green tea that has simple processing requirements is generally produced by smallholders).

Tea consumption took off with the industrial revolution in Britain, initially sourced from China through an East India Company monopoly [53]. When this monopoly expired amid growing unrest in China, the British imperial government in India took a strategic interest in fostering tea production in northeastern India where a semi-wild tea variety was already growing. Initially the Assam Tea Company was the largest operation, but many other companies and individual planters entered the industry to meet rising demand. The industry experienced high start-up costs, major infrastructural hurdles, and many failures, in part due to inexperience with tea production on this scale [53]. Over time, with a desire for quality differentiation and branding, many of the major retail tea merchants, such as Tetley and Lipton, integrated upstream into tea production.

As for rubber, the provision of cheap land concessions and access to cheap labor were major inducements for external investment in the tea industry. Siddique [54] has meticulously analyzed the acquisition of land for tea in northeast India over a century. From 1840 to 1940, some 4.7 M ha was allocated—although only 0.45 M ha of tea was planted. With the expansion of plantations and population growth, land competition increased and conflicts became more common in the 20th century [54]. Tea is a highly labor intensive crop requiring about 2 workers per hectare and indentured labor was employed from other parts of India. Rights of contracted workers were subjected to many abuses (death rates were high in the early years) and labor rights and conditions have continued to be an issue until today [54].

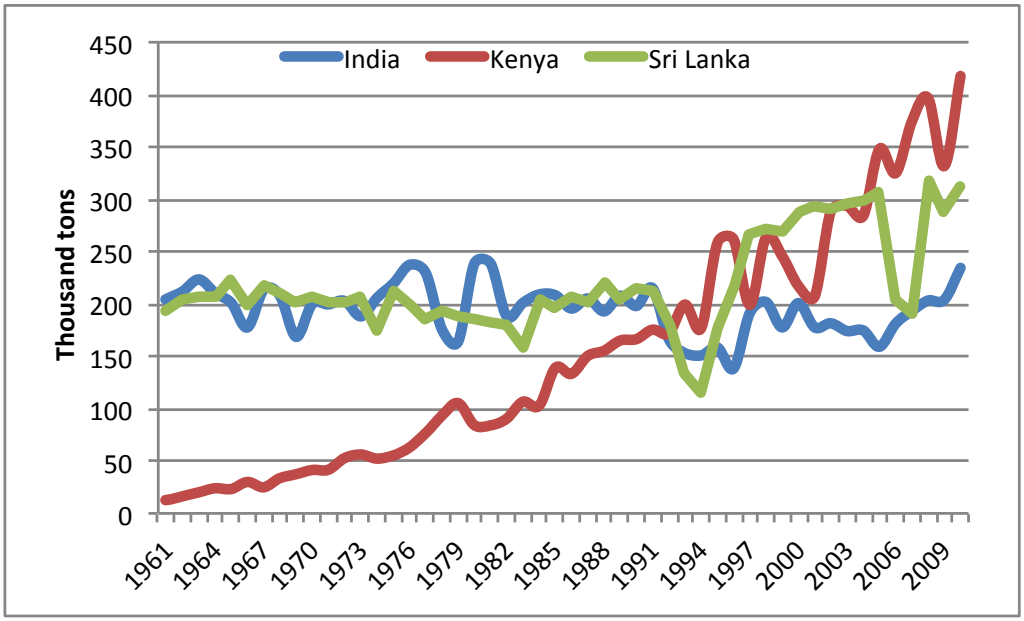
Meanwhile, Sri Lanka entered the tea industry from around 1870 and Kenya from around 1920. These colonies followed a similar large plantation model, based on land concessions, external capital and in the case of Sri Lanka, imported labor. Sri Lanka quickly emerged as a rival to India in export markets, and more recently Kenya has become the world's largest tea exporter. However, during most of the colonial period smallholders in Kenya were prohibited from growing cash crops [55] and in Sri Lanka policies actively discriminated against smallholders [56].

Since independence the tea industries in India, Sri Lanka, and Kenya have all undergone major structural changes to reduce foreign domination and to address ongoing labor and land conflicts. However, the trajectory of these changes in each country has been different, indicating how

country-specific policy contexts affect agrarian structures. They also demonstrate again the underlying competitiveness of smallholders in global markets.

Today, India remains the largest black tea producer in the world, and 75% of this is produced in Northeastern India. As elsewhere, after independence India's government required majority ownership of plantation companies by Indian nationals. However, government policy toward the tea industry was internally inconsistent. On the one side, the Tea Board of India, the main statutory body for tea, continued to favor large plantations. Indeed, it put in place rigid requirements for registration of tea growers that essentially precluded the rise of smallholder growers [57]. On the other side, the Plantation and Labor Act of 1951 and subsequent amendments instituted rigid standards on hiring and housing of plantation labor. As a result, rising costs combined with low prices and stagnant productivity put a long-term cost-price squeeze on Indian tea companies. With continuing losses and labor unrest, many companies closed down their plantations in spite of periodic government bailouts [58]. Since the 1960s, Indian exports have stagnated and slipped to third place behind Sri Lanka and Kenya (Figure 2).

Figure 2. Trends in tea exports (thousand tons) by the three largest black tea exporters. Source: [50].



An important factor in the success of the tea industries of Kenya and Sri Lanka was their move toward smallholder growers. Responding to growing land conflicts in Kenya, the Swynnerton Plan was drawn up in the 1950s to develop the African smallholder sector. The Kenya Tea Development Agency founded in 1964 was fully privatized in 2000 under the ownership of smallholder tea producers [59]. With majority farmer equity, it now works with 550,000 smallholders (holding an average of 0.4 ha) and 63 smallholder-owned factories. Today, smallholders account for 62% of national tea production, and the big yield gap between smallholders and estates in 1980 has largely disappeared [59].

In Sri Lanka, after much debate, all plantations above a minimum size were nationalized starting in 1971. However, performance of the state-owned sector was poor, and Sri Lanka steadily lost

competitiveness in world markets. Inefficiencies and the high costs of state-owned plantations and the high wage costs of unionized and increasingly militant labor eventually favored the emergence of independent private processors who contracted with smallholder producers [51,56]. An important institutional innovation favoring this model was a government-brokered formula for establishing a price for raw tea delivered to factories based on the world price and quality norms. Also very similar to rubber in Thailand, a parastatal (the Tea Small Holding Development Authority) was established to provide extension and loans for replanting, based on an export cess [56]. The transformation has been truly remarkable, with the production share of smallholders rising from 7% in 1960 to 72% in 2012 [51,60].

Meanwhile back in Assam where it all began, Indian policies belatedly shifted in the 1980s to ease entry of smallholders into the industry from the 1980s when all other efforts to reform the estate sector had failed [57]. By 2010, 70,000 smallholders with an average of nearly 2 ha accounted for 30% of Assam's tea area [57]. They sell on contract to intermediaries, estate mills and newly established independent mills. By planting high yielding clones and more intensive management, they have achieved much higher yields than the plantation estates [57]. However, the transition to smallholders has been slowed by lack of the type of institutional support enjoyed by smallholders in Sri Lanka and Kenya, especially access to finance, secure land titles and a formula pricing mechanism [56].

Tea then is a story of a long-term transition from foreign-owned plantations to a robust smallholder sector, at least in the two most competitive exporters. The transition reflects the power of entrepreneurial smallholders when provided supportive government policies. In India, where plantations were supported long after independence, this transition is still very incomplete but the momentum to smallholder systems is clear.

3.3. Oil Palm—Transiting to Smallholders?

In 1900, West African smallholders, based on harvesting of wild and semi-domesticated palm groves, dominated palm oil exports to European markets to supply edible vegetable oils, and industrial uses, especially for soap. Oil palm was first cultivated in large plantations from around 1920 by Lever Brothers (a predecessor of Unilever) in the Congo and by a predecessor to today's Belgian plantation company, SOCFIN, in Sumatra, Indonesia [61]. Sumatran palm oil exports based entirely on plantations went from 9% share of the world market in 1929 to 26% in 1939, although West African smallholders continued to occupy over half the market until the early 1960s [61].

With declining rubber prices in the 1960s and rapidly growing markets for edible oils in Europe, Malaysia took a strategic decision to diversify away from rubber and provided policy incentives to investors that greatly increased productivity of oil palm, building on varieties from the Congo [62,63]. From 1973 most foreign-owned companies in Malaysia were devolved to national ownership in what was one of the few post-independence cases of an orderly transition to local ownership [64]. The next phase of rapid expansion from 1990 took place in Indonesia in response to rising wages and land scarcity in Malaysia [65], again initially led by large plantation companies. Indonesia is now the world's largest palm oil producer and exporter and together with Malaysia, accounts for 90% of world exports of palm oil.

The increasing size of oil palm plantations has been partly dictated by economies of size in milling. In 1934 a modern mill at the time required about 2000 ha to supply raw materials [63] and by 2000 this

had increased to over 10,000 ha. Further economies were realized through integration with downstream oil refining and bulk shipping of palm oil. To achieve economies of scale along the whole value chain, oil palm firms have consolidated and expanded into giant vertically and horizontally integrated companies, such as Sime Darby with about 600,000 ha of plantations. UNCTAD [66] lists eight of the 25 largest agricultural production companies in the world as being identified with oil palm.

Government policies greatly facilitated large-scale oil palm expansion through cheap land concessions, state bank loans to companies, and especially in Indonesia, state-organized transmigration programs to provide labor. This expansion was at considerable costs to forests and also often in conflict with local community forest and land users [65]. However, the rapid expansion of oil palm in Indonesia coincided with the rise of global awareness of biodiversity conservation and climate change after the 1992 Rio Earth Summit that has put tropical deforestation firmly on the global agenda and increased the transactions costs of large land concessions in forested areas [5].

Despite the dominance of huge plantation companies in the industry, there has been a discernible trend toward smallholders. From 1956 Malaysia introduced the Federal Land Development Authority to involve smallholders, particularly ethnic Malays, although the organization of production was often highly centralized and not too different to the plantation mode [67]. Indonesian regulations on plantation establishment originally required up to 80% of area to be provided to smallholder associated as outgrowers. The increasing density of processing mills has also led to a rapid increase in independent smallholders who have a choice among several mills within an acceptable distance [68]. As a result, over 40% of the oil palm area in Indonesia is now in smallholder hands.

Even more dramatic is the case of Thailand, which has quietly emerged as the world's third largest palm oil producer based on an industry in which 70%–80% of oil palm is produced by more than 120,000 smallholders with an average land holding of 3.9 ha [69]. Most farmers operate independently but some have contractual arrangements with mills and a few operate cooperative mills. Two factors explain the dominance of smallholders in the Thai oil palm industry. First an oil palm development policy has provided significant incentives for investing in processing mills that generates significant competition in purchasing of fresh fruit and allows independent producers to "shop around" to sell their fruit. Second, Thailand does not provide land concessions and forbids foreign control of farmland [70]. At the same time, it has consistently supported smallholders and is one of the few countries to have a well-run state agricultural bank that provides long-term loans for tree crops to smallholders most of whom have secure land titles.

On the surface, oil palm appears to be dominated by large plantations. However, its period of rapid expansion is recent relative to rubber and tea, and although much less labor intensive, it faces the same pressures as the tea industry in maintaining a competitive cost structure and accessing new land and labor. The facts that smallholders' now account for over 40% of the oil palm area in Indonesia, the largest producer, and 80% in Thailand the third largest producer indicate that the structure of the industry is already shifting. Long-term analysts of the industry such as Cramb and Sujang [71] support this position.

3.4. Cassava—The Forgotten Plantation Crop

Our final commodity is not usually listed among the plantation crops. However, in the late 19th Century, cassava (locally known as tapioca) became an important export from Southeast Asia to

meet growing demand for starch and for processed foods, especially in Britain. This was produced on relatively large plantations in Malaysia and Indonesia [72,73]. In Malaysia, cassava plantations were initiated through land concessions originally granted by the then independent Malay states to Chinese entrepreneurs. Concessions of up to 2000 ha were considered optimal to supply a steam-powered processing factory although actual plantation sizes were smaller given that a shifting cultivation system was practiced [72]. At its peak in the early 1990s, about 100,000 ha of cassava were produced for export, concentrated in the states of Malacca and Negri Sembilan. Similar to other commodities, these plantations depended on external capital and labor, almost exclusively Chinese.

After the Malay States were incorporated into the British colonial system in the late 19th Century, colonial officials regarded the extensive shifting cultivation system used for cassava plantations as environmentally destructive and began to restrict further land concessions [72]. The final death knell was the advent of rubber in the early part of the 20th century, which put a premium on accessible and already cleared land for the rapidly expanding rubber industry, this time reserved by European planters [72].

Cassava remained an important secondary crop in the region but largely for subsistence. It revived as an export commodity in the 1970s when Thailand exploited a loophole in the EU agricultural protection policies to export dried cassava pellets to the EU for animal feed [28]. This grew rapidly to about 1 million tons by 1985 led by smallholders from upland areas of Northeast Thailand. The industry contracted with the reform of EU policies [28] but the opening of markets for feed, starch and biofuel feedstock in China in the 1990s provide a new life in what Howeler [74] described as Southeast Asia's new green revolution. By 2011, exports of cassava products from Thailand and Vietnam, exceeded $US3 billion [75].

In addition, Thailand and Vietnam have committed to ambitious biofuel programs based on cassava, inserting a new dynamics into the domestic markets for cassava. As in the 1970s, smallholders supplied these new markets, some under contract to cassava processing factories but once the industry was established, most are selling independently through intermediaries [76]. Cassava for industrial and feed uses is then another example of a successful transition from a plantation mode of production to smallholders.

3.5. Common Elements in the Rise and Fall of Plantations in the 20th Century

The four case studies have several common elements. First, initially there was sometimes a good economic rationale for establishing plantations. With the exception of rubber, all required quick processing after harvest in a relatively large-scale processing unit that favored a large plantation vertically integrated with its own processing unit. Notably rubber could be processed in small-scale artisan factories and smallholder production took off spontaneously and rapidly. In the other cases, growth of smallholder production had to await a dense concentration of mills competing for supplies, as in oil palm, or state-led institutional support for smallholder access to processing as in tea.

Second, pioneering risks and costs were real, except for cassava that was already cultivated in the region on a small scale as a food crop. Rubber and oil palm supplies previously depended on harvesting of wild and semi-wild trees and techniques of cultivation had to be developed. Cultivation and processing of black tea for export was also a new venture in South Asia. However, after an

industry was established and the basic processing and export logistics and infrastructure were in place, pioneering costs and risks fell, opening space for smallholders.

Nonetheless, speculation and distorted policies were probably even more important in favoring plantations. In all cases, external investment in plantations took off during periods of high prices in world markets resulting in a considerable amount of speculation from global investors, who often failed in the subsequent and inevitable commodity busts. Investors in large plantations were aided and abetted by an almost universal policy under the colonial empires of providing cheap land through concessions carved out of "wastelands", generally in forested areas with low population density. Land policies were complemented by labor policies that facilitated cheap immigrant labor from poorer and densely populated regions with high levels of landless laborers, often across the colonial borders of the time. Finally, colonial governments often provided considerable support in the form technology and cheap loans, as well as outright grants in times of depressed prices.

Distorted policies worked the other way in failing to provide basic support to smallholders such as research, extension, and access to and secure title to land. Indeed colonial governments often openly discouraged smallholder participation in the production of tropical exports, such as rubber and tea [33]. Notably Thailand which was never colonized resisted requests to grant large land concessions, and instead has favored consistent long-run support to smallholder development, emerging as the world's leading rubber and cassava exporter, the second exporter of sugar, and the third largest oil palm producer. The Thai success with these "plantation crops" amply demonstrated the global competitiveness of smallholders.

Finally, there was undoubtedly an element of "high modernism" in the belief that plantations were inherently more efficient. Plantation managers prided themselves in an orderly layout and a regimented labor schedule for specialized tasks, in contrast to smallholder plots that were disparaged as in the use of the term "jungle rubber" in Indonesia, for example. However, high modernism overlooked the high overhead in the hierarchical management structure of plantations and the high transactions costs of recruiting, maintaining and supervising a large labor force. These beliefs persisted even though colonial texts on tropical agriculture had recognized by the early 1930s the inherent competitiveness of smallholders (e.g., [4,77]).

In short, plantations were propped up by high prices and biased policies and beliefs and once the props were removed, their fallibility emerged. Transactions costs of accessing cheap labor and land steadily rose over time. Even before independence, labor costs had been rising with increasing pressure from colonial governments and international civil society to restrict immigration and raises abysmal standards. At the same time, with growing population pressure, access to "vacant land" became more difficult without creating conflicts with local communities that threatened colonial rule [78].

Independence brought in new policy regimes. The high visibility of foreign-owned and managed plantations together with a strong dose of nationalism and socialism in the post-independence era resulted in the nationalization of plantations in most countries. Where they were taken over by the state, this only hastened their demise. At the same time, independent governments gave more support to smallholders, through research, extension, land reform, and formula pricing, depending on the country and commodity. Global Cold War politics and rural insurgencies in several countries of the region added a sense of urgency to policies to engage smallholders and provide land to the landless [79]. Combined these trends raised the transactions costs of plantations in accessing land and

labor and pushed private companies to look for other institutional arrangements, including contracting by mills or procurement of raw materials in the open market.

4. A Rebirth of Plantations on the Frontier in the 21st Century

4.1. A New Land Rush on the Frontier

Against the almost universal historical trend toward smallholder production systems, there has been a rebirth of large plantations in Southeast Asia on the agricultural frontier since the 1990s. This is most apparent in Cambodia, Laos, Myanmar (CLM) and the large and relatively low population density islands of Sumatra, Borneo (both Indonesian and Malaysian) and New Guinea (both Indonesia and Papua New Guinea). Following the focus of this paper on mainland Southeast Asia, I examine this phenomenon for CLM. These are land-abundant countries relative to their neighbors with considerable areas suited for increased cultivation although some of this land is forestland with high conservation value while other uncultivated land is used by local communities for long fallow cropping systems, livestock grazing and for extraction of forest products [10,80].

Since around 2000, all three countries have allocated large land concessions to private agribusiness. Given the lack of transparency of the allocation process, estimates of the size of these concessions vary widely. In Cambodia, for example, official estimates in 2012 were 1.1 M ha of concessions, while nongovernmental organizations estimate the size at 2.7 M ha [81]. Accepting the latter estimates, over half the agricultural land in Cambodia is in concessions. In Laos, the government has released a detailed database on concessions that amounts to 270,000 ha for agriculture (including rubber) [82]. In Myanmar, it is estimated that 1.4–2.0 M ha of land has been granted in concessions since 1990 in a country where nearly half of rural households are landless or near landless [80,83].

The median size of concessions is large, from 8000 to 14,000 ha in Cambodia and Laos as shown for three of the case study commodities in Table 2 (Source: [84]). Some companies control land concessions that are very large even by historical standards. For example, in Cambodia, Pheapimex (a Chinese company) is reported to hold over 300,000 ha for cassava, rubber and tree plantations, the LYP Group (a Cambodian company) has 60,000 ha for sugar and the Vietnam Rubber Group has 200,000 ha for rubber [81,85]. In Myanmar, locally-owned Yuzana Company controls over 200,000 ha for oil palm, cassava and sugarcane [80]. These companies manage very large plantations in the classic sense, recruiting and housing their own labor force from poor regions or from abroad, and rely on outside capital and professional managers, often tied to the origin country.

Table 2. Summary of land concessions for oil palm, rubber and cassava, 2001–2013. Source: [84].

	Global Area of Concessions (M ha)	Area in SE Asia (M ha)	Median Size of Concession (M ha)	Two Top Countries Globally [a] (M ha)
Oil palm	7.76	4.93	14,000	Indonesia, PNG
Rubber	2.95	1.74	8000	Cambodia (61), Laos (23)
Cassava	0.55	0.32	7850	Cambodia (7), Laos (5)

Note: Does not include Myanmar. Some concessions are for multiple commodities so not all area is necessarily allocated to the specified commodity; [a] Numbers in parentheses are number of concessions recorded since 2001 in Laos and Cambodia.

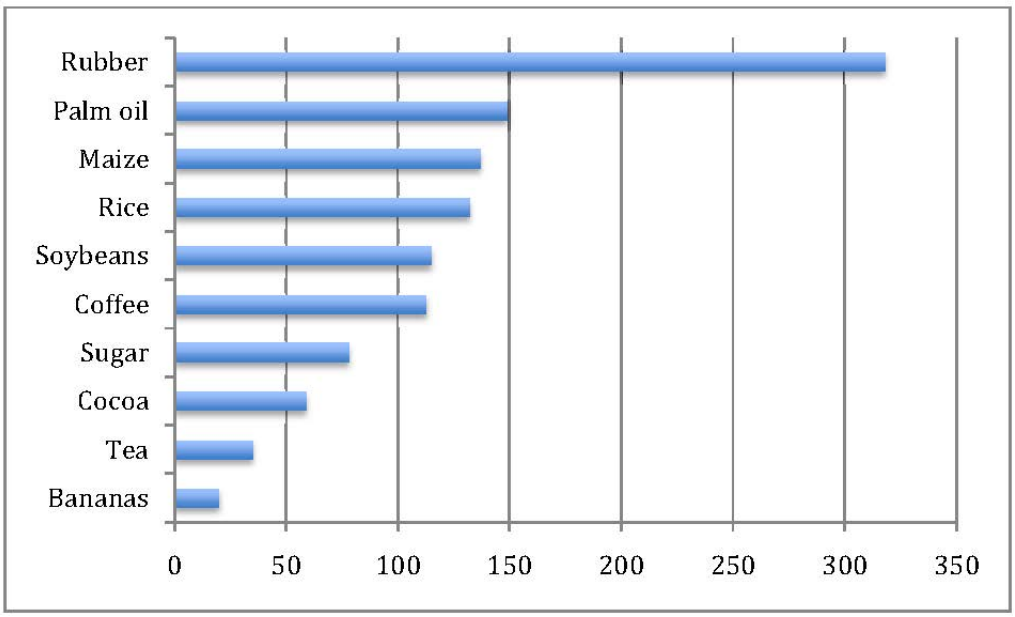
Investors in these large concessions are mostly nationals or from bordering countries, especially China, Thailand, and Vietnam. Just as in colonial times, these investments are often linked to the manufacturing sector in the origin country. For example, China is now the largest rubber consumer and manufacturer in the world and has a strategic interest in securing rubber supplies. However, many companies are home grown such as Yuzana in Myanmar and the LYP Group in Cambodia, with strong ties to ruling elites.

The surge of concessions in the region has led to an outcry about their negative social and environmental impacts. With poorly defined land rights, there are many claims of overlapping land rights and displacement of existing users in long fallow systems [86–88]. Likewise, the concessions have been associated with serious deforestation in what has been called the "rubber juggernaut" [89]. Given these risks, it is important to better understand the reasons for the shift in agrarian structure back to plantations after a century of transition to smallholders within the region. In fact, the drivers are surprisingly similar to the first surge in plantations in the region, but today political economy factors that provide favors to large-scale operations may be even more important.

4.2. A Commodity Boom Driven by Emerging Asian Economies

The first and most obvious factor has been the surge in commodity prices since around 2000. This is apparent for rubber prices that increased in real terms by over 300% from 2001 to 2012, but real prices of most other commodities have also risen significantly (Figure 3, Source [90]). The commodity boom was stimulated by many factors, one of which was growing demand from China and other rapidly industrializing countries on the border of the frontier countries. A high share of the major commodity investments for rubber and cassava are concentrated in CLM (Table 2), and Myanmar is important in oil palm [80]. Rubber has been the number one focus of investors in the region. Fox [45] estimates that some 1,000,000 ha of rubber have been planted in non-traditional rubber areas in the northern parts of Myanmar, Thailand, Laos, Cambodia and Southern China, much of it in large plantations.

Figure 3. Percent increase in real export prices, 2001–2012. Source: [90].



High commodity prices alone do not explain a shift back to plantation mode of production. As we have seen, smallholders responded strongly to high prices for rubber, oil palm and cassava in Thailand and elsewhere. Smallholders have also participated in the rubber boom in CLM but in Cambodia, they make up less than half of the area growth [45], and this is probably the case in Laos and Myanmar as well. Nor do other economic fundamentals explain the shift back to plantations. There have been no significant changes in processing scale for any of the crops in recent decades and in any event, institutional innovations in Thailand and other countries, have enabled smallholders to overcome problems of access to large mills. Pioneering costs and risks may have played a minor role. For example, oil palm in Myanmar and Cambodia is a new crop that requires major upfront investments in mills and infrastructure although the production technology was readily available just across the border in Thailand.

4.3. A New Political Economy

A major driver would appear to be a universal policy of providing cheap land as an incentive to investors without strict requirements to develop the concessions or involve smallholders. For example, in Myanmar investors pay only $2.5/ha annual rent and although they agree to develop the land according to time-sensitive targets, the state rarely cancels undeveloped concessions. Observers find a high rate of underutilization of many concessions. Of the 20 oil palm concessions in southern Tanintharyi Region of Myanmar, less than 10% had been developed in 18 of them by 2013 suggesting other investor interests such as timber extraction or speculation on the future value of the land [80]. With cheap land, high commodity prices and lack of accountability for following the proposed investment plan, companies have little to lose by requesting large land areas beyond their needs.

Other types of support have also been given as well. So-called "crony companies" with close ties with the military in Myanmar, had until recently first call on loans from state-owned banks. In addition, the Chinese government has offered significant subsidies for its companies that invest along its border as part of its Opium Crop Substitution Policy [91]. Conveniently these companies invest in rubber, a commodity that is vital to its fast growing industrial sector. These trends parallel the situation in the region a century ago when rubber plantations were favorite targets for European investors for their fast developing automobile industries, abetted by European states' support to a "strategic industry".

Not surprisingly, policy favors arise from close ties between some of the leading companies and state officials. In Cambodia, for example, one Senator is associated with 10 sugar and rubber concessions totaling 86,000 ha in land deals [92]. In Myanmar the owner of the largest agribusiness company is reported to have close ties with the previous military ruler. Many Chinese companies in Myanmar also have close ties with local-level governments and warlords in areas outside of the control of the national government [83].

Finally, there is an element of "high modernism" in the decision to invest in large plantations. All CLM governments have placed great faith in large agribusiness farms and plantations as the way to "modernize" agriculture. The Myanmar government has an explicit policy that "establishment of modern mechanized farms throughout the country will create opportunities for farmers to increase their productivity" [93]. State-owned companies, such as Vietnam Rubber Group, a major investor in CLM, have a tradition of managing large areas and little experience in working with smallholders.

4.4. Weak State Institutions

All countries in CLM have had a difficult transition from a previous socialist economy to one driven by markets, and Cambodia was decimated by the Pol Pot genocide as well. As a result, all have a state apparatus that still works on a "command and control" mentality, with very weak capacity to provide the core public goods such as research, extension, secure land titles and financial institutions to serve smallholders. A good example of this is the very different structure of oil palm on the Thai/Myanmar border. On the Thai side with strong state institutions oil palm is largely produced by smallholders, while just across the border in Myanmar there are virtually no smallholders in oil palm. Part of the reason relates to land policy but weak institutions in Myanmar also constrain investment by smallholders and independent millers alike in the sector.

4.5. Are the 21st Century Plantations Here to Stay?

It is still too early to assess the economic sustainability of the new generation of plantations in the region. However, they will face two big tests in the future. First, there is little doubt that high commodity prices have been a major incentive for investors in CLM. However, commodity prices for tree crops are notoriously volatile and already prices have fallen since 2012 due in part to the slowdown in the Chinese economy. This is especially the case for rubber prices that are closely linked to the industrial cycle and where prices have fallen from over $6/kg in 2012 to under $2.5/kg in late 2013. Second, little thought seems to have been given to labor supply. This is more of a problem for rubber, a relatively labor-intensive crop, than for cassava, which can be fully mechanized. Assuming that at least 0.5 M ha of new large-scale rubber plantations are coming into production, some one million additional workers may be required at full maturity to tap and process the rubber. Creating this many jobs will surely be positive, but presents big challenges to companies to recruit, house and supervise a large labor force. It is also likely that labor conditions and wages will resurface as an important issue in the region, putting pressure on plantation costs, as we have seen for tea in India.

While there are important differences between the rise in plantations in the early 20th century and their rise again a century later, we do not see any major changes in the underlying economic fundamentals that would eventually favor the emergence of smallholders as the most competitive sector. Transactions costs for plantation companies to access large land concessions are rising. Conversion of forestland to plantation agriculture is under greater global scrutiny today, in part as a result of international agreements to conserve biodiversity and mitigate climate change. Land rights of communities on the forest frontier have recently been recognized in the UN's 2007 Declaration of the Rights of Indigenous Peoples. The social and environmental issues generated by the surge in large land concessions for plantations in CLM have also generated increasingly active protests by global and local civil society.

Responding to these pressures; Laos imposed a moratorium on further land concessions in 2007 and Cambodia followed in 2012. Myanmar is still granting land concessions but the pace has slowed [80]. As a result; some companies and local-level governments are looking for ways to partner with smallholders. In both Laos and Cambodia contract rubber schemes are being implemented such as the 2 + 3 contracts in which smallholders provide land and labor (the "2") and the companies provide the technology; capital and access to markets (the "3"). It is too early to evaluate these schemes but

contract farming has generally not worked for rubber due to the long time of 15–20 years to repay establishment costs and the option to process and sell rubber on the open market [80]. Such nucleus-outgrower schemes work best for oil palm given the need to coordinate planting with the installation of large mills.

On the other hand, pressure by international civil society and western consumers to adopt private social and environmental standards for certification of tropical products may favor larger-scale operations. This is because the cost of certification per unit of output is higher for smallholders as seen in recent efforts to certify Thai smallholders' compliance with standards of the Roundtable for Sustainable Palm Oil [94]. Certification also requires considerable management skill to meet and comply with standards. The greater capital intensity of export commodities today, such as the cost of high yielding planting materials for rubber, may also disadvantage smallholders unless they are backed by well-governed state programs or collective action as seen for tea in Sri Lanka and Kenya, and rubber in Thailand. If smallholders achieve very low yields relative to plantations, their returns to all factors of production are penalized and the income advantage of smallholders *versus* working as wage labor on plantations may disappear. Partnerships with responsible plantation companies may help smallholders overcome such disadvantages through improved access to technology and technical advice.

5. Conclusions

The type of agrarian structure employed to produce tropical commodity exports affects many dimensions of land use, such as ownership inequality, overlapping land rights and conflicts, and conversion of forestlands. During the 20th century, commodity exports from most perennial crops in tropical Asian underwent a remarkable transition from a structure based on large plantations to one based on smallholders. In the early 20th century, there were some basic economic fundamentals that favored a plantation structure, especially the need to quickly process the raw product in large mills as well as major pioneering costs and risks and sometimes periods of high commodity prices. However, these economic fundamentals were re-enforced by a number of policy biases of colonial states that favored plantations and in many cases openly discriminated against smallholders due to unequal power relations enjoyed by the plantation companies. These biases were further re-enforced by beliefs and racial prejudices at the time by both colonial officials and investors from the metropolitan European countries in the superiority of large "modern" plantations under European management for supplying exports to their home markets. However, over time, the inherent economic efficiency of smallholders became apparent, sometimes spontaneously (e.g., rubber) and sometimes with targeted support from the state, especially after independence altered the political economy of state support to foreign-owned plantations.

The revival of plantations in the frontier in the early 21st century is based on remarkably similar drivers early in the previous century—high commodity prices, biased policies reflecting a new political economy of converging investor-state interests, and prevailing beliefs about the modernity of large agribusiness operations. Only the context has changed, with external investors now originating from the rapidly industrializing countries of the region.

With little underlying change in the economic fundamentals, the current plantation phase may pass just as it did in the last century, accompanied by a reversion to family-owned farms to supply most commodity exports (although farm size and productivity will need to increase to provide competitive

farm incomes in the rapidly growing economies of the region). However, much depends on a local political economy that levels the playing field for smallholders through development of basic services of research, extension, land tenure security, and financial institutions. The CLM countries reviewed here are still in the very early stages of democratic transition that may eventually give more political voice to smallholders.

While we have deliberated framed the debate in terms of smallholders *versus* large plantations, both can and often do co-exist with mutual advantages. Smallholders associated with a nucleus plantation can gain from technology transfer and advice as well as access to needed processing and marketing infrastructure, especially for oil palm and tea. At the same time, vertically integrated plantation companies can benefit from lower transaction costs of accessing land and labor by purchasing from smallholders to fill milling capacity. Increasing standards on social and environmental sustainability in global markets for tropical commodities will further re-enforce the value of partnerships of smallholders and responsible agribusiness companies.

Acknowledgments

I wish to acknowledge valuable comments on an earlier draft by three referees.

Conflicts of Interest

The authors declare no conflict of interest.

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