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Unexpected Outcomes of Thai Cassava Trade: A Case of Global Complexity and Local Unsustainability

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Abstract

Tracing the Thai cassava (*Manihot esculenta*) trade network, between 1960 and 2000, offers a compelling example of global complexity at work. The emergence of Thailand's dominance of world export markets caught the world by surprise. The opening up of a European market for cassava was supposed to be met by Brazilian and Indonesian producers. Instead, Thailand took over the market by 1975. Several factors facilitated this emergence including: entrepreneurial diasporic networks of Thai-Chinese traders, local political economy conditions in both Europe and Thailand, and ecological conditions in Thailand. These same factors also shaped the subsequent timing of the closing of the European market, the emergence of a new industry association, the creation of new cassava products, and the expansion to other markets. Furthermore, the dynamic nature of cassava market yielded equivocal outcomes for both Europe and Thai farmers.

Introduction: Complexity and Cassava

In 1967, the multilateral General Agreement on Tariffs and Trade (GATT) established low import tariffs to Europe on cassava (*Manihot esculenta*), and named Brazil and Indonesia, then the largest producers of cassava, as the principal exporters. Instead of Indonesia and Brazil emerging as the top exporters to Europe, by 1975, Thailand emerged as the dominant world exporter of cassava chips, pellets, and starches. In 1985 Thailand garnered 95% of the European cassava imports. The unexpected and dramatic emergence of Thailand as a cassava exporter took the European Economic Community (EEC) by surprise and quickly led to attempts to manage the flood of cassava products to protect competing European grain producers. By the mid-1990s, managed quota access to the European market was dramatically closed to Thai exporters. As the warning signals grew through the late 1980s and early 1990s, leading economic development agencies and pundits heralded dire consequences for Thai cassava growers. Instead, Thai cassava production suffered only a minor setback and Thai exports continue to dominate the world market. How did these two

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outcomes come about? And, why were they not anticipated by leading policymakers and social scientists?

The Thai cassava case offers an opportunity to understand the dynamics of globalization and contributes empirical evidence for the emerging paradigm of global complexities (Urry, 2003). Social science scholars of globalization are currently caught in debates about the importance of global institutions versus the role of the local and localities in shaping globalization. As Urry (2003) points out, globalization has become both cause and effect, but social science has not fully elaborated the internal structure and dynamics of the global and how global systems might interact with other social systems. To do so requires a new paradigmatic perspective to explain how globalization is ‘neither omnipotent nor subject to control by society’ (p. x).

The complexity framework proposes that the global is ‘characterized by emergent and irreversible complexity and by processes that are simultaneously social *and* natural’ (Urry, 2003, p. 13). Emergent properties are the collective or system properties that come from the compounding of individual and iterative actions and that are more than just a scaling up of microprocesses (pp. 24–25). These emergent properties are self-organizing (pp. 28–29) and as they come from iterative actions by individuals, they do not exhibit proportional, or even predictable, cause and effect (p. 23). Positive feedback loops and increasing returns can mean unexpected and irreversible path dependence (p. 28). Complexity theory draws its lessons from empirical studies of networks and mathematical models of chaos.

A complexity approach also widens the frame of reference until there are no externalities (Urry, 2003, p. 37). Moving in this direction, it is not enough to look at the macro governance structures, such as GATT and other trade agreements, to understand how Thailand came to dominate the global trade in cassava. The institutions behind these governance mechanisms often presume control over the entire system. However, in this case they exerted very little control beyond initially setting the market conditions. Both the surprising amount of cassava flooding European markets and the unsuccessful attempts from subsequent trade agreements to curtail the flow hint that other powerful mechanisms were at work. For example, another global institution that became implicated and then took control was a global migrant network of entrepreneurs. Specifically, the Chinese diaspora, with connections across East and Southeast Asia, worked outside of and was accountable to neither national nor international governance regimes. Importantly for the establishment and spread of cassava production and exports, these entrepreneurs had contact with both local farmers and connections to export markets. And, they also created new institutions to develop new forms of processing and management of production, research product diversification, and actively cultivate new markets for cassava products.

Widening the frame to include all externalities also means examining the local conditions and dynamics that influence the organization of production or consumption. Local conditions, such as geopolitical considerations, ecological considerations (especially when considering natural products—agricultural, forestry-related, or fisheries), and history, all of which set the stage for emerging path dependencies or social change. In this case, Thai national government concerns about insurgency and strategies to develop northeastern

Thailand in particular figure in cassava's success. Within this historical framework and important for the complexity framework, was the individual and iterative nature of the spread of cassava cultivation knowledge. Cassava is not grown on huge plantations, rather by smallholders. The decisions of individual farmers were essential, particularly to the growth in production. Later, as agribusiness vertically integrated (and national policy toward agri-business warmed), individual farmers were increasingly tied into contractual arrangements with buyers and processors (Baguma & Kawuki, 2006; CIAT, 2002; Curran (pers. comm. with cassava factory manager, summer 2008; Goss et al., 2000). However, planting cassava yields ecological path dependencies, resulting from the degradation of land quality (deforestation and erosion) that then limit alternative cropping options and only encourage the continued planting of hardy cassava, significant land remediation investments (which few Thai farmers have access to), or abandoning land for lengthy periods of time. The widening of the analytical frame identifies the social and natural processes working in tandem to produce a complex system of local dynamics influencing a global system, which in turn profoundly influences local conditions and dynamics. Identifying the feedback mechanisms that link nodes to a web—specifically how they shape the structure of both nodes and webs—is a fundamental exercise for understanding complexity and its outcomes.

In this work we weave together the different aspects of the complex web mentioned above, taking into account international institutions, international migrant networks, geopolitical dynamics, the actions of individual farmers, and the consequences for the natural environment. We do this in four sections. The following section sets up the boom in cassava production and exports from Thailand. First, we start with a brief description of cassava and its place in Thailand in the first half of the twentieth century. We then sketch out a description of particular conditions in Europe and the United States that set the stage for the cassava-related GATT negotiations and we summarize the resulting trade agreement. Second, we describe the startling emergence of Thai production and exports, particularly in northeastern Thailand. While the geopolitical dynamics at this historical moment were friendly to cassava exports, we subsequently argue that they were not what drove the boom. Instead, we discuss the social capital of the Chinese agricultural middlemen and their connections to export networks and northeastern farmers. In the third section, we detail the reactions in Europe to the flood of cassava and the attempts to stem the flow. Here we also detail the puzzling response of the Thai state to the European demands. Finally, the subsequent section discusses the unexpected continuation of cassava production despite fluctuating trade agreements and the intense social and environmental impacts in Thailand resulting from cassava trade. In the conclusion, we discuss how this case supports an understanding of globalization through a global complexity framework.

Setting the Stage and the Resulting Boom

Cassava is a starchy tuber that can tolerate poor soils and long droughts and is resistant to many pests (Henry & Hershey, 2002, p. 17; Howeler, 2002). Grown throughout much of the tropics, it is a staple food crop in many countries in Latin America, Africa, and Asia. Beyond human sustenance, it can also be processed into a starch or dried and chipped or pressed into pellets for use as a component in animal feeds. It is the latter that figures importantly in Thailand's cassava story.

Around the 1850s, cassava was brought to Thailand (Onwueme, 2002, p. 58). However, production remained fairly localized and only a trickle of exported flour, starch, or tapioca was directed towards Indonesia and Malaysia before the Second World War. The size of this trade was so small as not to be recorded systematically (Siriprachai, 1987). It was not until well after the Second World War and with significant shifts in world market demands that cassava production spread to large parts of Thailand.

One of the most important shifts in market demand for cassava emerged out of Europe. After the Second World War, many European countries were incapable of producing adequate grain to feed their growing livestock herds. By the early 1950s, animal nutrition scientists were searching for alternative feed formulas and devised one that mixed soybean cake with cassava pellets. This nutritional equivalent to traditional feeds, such as oat, barley, wheat, and maize, was considered more efficient since it was significantly lower in fiber and bulk with higher calories per unit and was therefore a practical substitute in livestock feed mixes. With this development, European countries began to import cassava from their current and former colonies; France imported from Madagascar, Belgium imported from the Congo, the Netherlands from Indonesia (Siriprachai, 1987). However, by the late 1950s and early 1960s, with the move to independence of many European colonies, trading partnerships and infrastructures were disrupted by political unrest and instability.

At the same time, across the Atlantic and as a result of heavy investments in agricultural research, US production of soybeans was increasing faster than the demand in the domestic market. The American Soybean Association reports in its history that in the 1960s, 'Soybean stocks became burdensome as production exceeded usage' (2005). American soybean farmers were eager to encourage the development of an international market for their crops.

Coinciding with these developments, by the 1960s increased demand for imported feed for livestock came from rapid economic development in Europe. First, rising consumption of meat in European households pushed meat prices up and encouraged the expansion of livestock herds. Second, rising incomes, particularly within nonagricultural sectors of the economy and the strength of farmer lobbies within the European Commission (EC), created pressure to increase farmers' incomes by increasing price supports. With increased demand for meat and increased support for farmers, policymakers were pushed to provide both (McCalla & Josling, 1985; Nelson, 1985). The EC instituted the common agricultural policy (CAP) in 1962 with the purpose of providing stable and remunerative incomes to the farm sector. To achieve this goal, European markets were insulated from changes in world markets and domestic prices for agricultural products were kept well above world prices. High cereal prices were supported by variable import levies or variable export restitution (Sathirathai & Siamwalla, 1987, p. 596). As a result, grain prices in Europe increased throughout the 1970s. Nominal rates of protection for cereals averaged 90% in the late 1970s (p. 596). With the expanded livestock herds, this increase in grain prices discouraged their use as feeds and instead encouraged the use of many kinds of cereal substitutes (Nelson, 1985).

With the common agricultural policy in place, larger European livestock herds, and former European colonies unable to meet demand for cassava as alternative feed source, the EC had

to act. In 1967 during the Kennedy round of the General Agreement on Tariffs and Trade (GATT), the Europeans, with encouragement from the US, thought they could provide some assistance to the developing world, with great benefit to themselves. They agreed to a bound import tariff for cassava at 6% *ad valorem* and a tariff on soybeans set to zero (Sathirathai & Siamwalla, 1987, p. 596). At that time, Indonesia and Brazil were among the largest producers of cassava and the expectation was that they would be the major source of cassava for Europe (Sathirathai & Siamwalla, 1987). At the same time, the export market for US soybeans greatly increased. The protection of grain prices in the EC effectively raised the price of soy cake and cassava pellets to well above world market levels. The result was the creation of a large world market for cassava where only a small market had existed previously (McCalla & Josling, 1985; Nelson, 1985).

Instead of Brazil and Indonesia meeting European demand for cassava, as was the intention of the GATT negotiations, Thailand very quickly emerged as the dominant world cassava chip and pellet exporter (see Figure 1). To meet market demand, phenomenal rates of growth were achieved, with root production doubling every three to four years from 1967 to 1980 (Sathirathai & Siamwalla, 1987, p. 597). The vast majority of this raw cassava was processed and exported (Onwueme, 2002, p. 60) (see Figure 2). The incredible growth of the cassava export market meant that by 1980 cassava accounted for 16% of all Thai agricultural export earnings. By the early 1970s and throughout the 1980s, Thailand was supplying over 80% of the world's cassava exports (Table 1) and the quantity and value of exports grew dramatically (TDRI, 1992). Much of this production for export was in northeastern Thailand, also called *Isaan*, which, by 1982, accounted for 60% of the total area planted.

What accounts for this terrific and surprising boom in cassava exports from Thailand? In part, the larger geopolitical situation of the Cold War created friendly conditions for the phenomenon. American fears about the spread of communism across Southeast Asia spurred investments in Thailand both directly related to the war in Vietnam in the form of huge military bases and highways, particularly in *Isaan* which borders Lao PDR and Cambodia, and less directly in the form of aid to the Thai government. These investments, as well as private capital investments, amounted to an enormous sum (Goss & Burch, 2001, p. 974).

The investments and infrastructure, particularly highways, provided connections between *Isaan* and Central Thailand in an unprecedented way. For example, one major highway, still called 'The Friendship Highway' in honor of its Thai and US government collaborative construction, connected Bangkok to the Laotian and Cambodian borders through southern *Isaan*. *Isaan* has historically challenged the central Thai kingdom. When it first became an official part of Thailand, for many years it was considered a frontier area not fully under the control of the central Thai government (for more on *Isaan's* representation see Winichakul, 1994). It has also consistently been the poorest region in the kingdom. Growing unrest among students and rural Thais in the mid-1960s led to the emergence of insurgency movements in both northern Thailand and *Isaan* (Bowie, 1997). The highways and other investments facilitated and supported modernization schemes and were attempts to assert control over *Isaan* by Field Marshall Sarit Thanarat, who took control of the Thai government in a 1958 coup (Goss & Burch, 2001, p. 973). These schemes favored private

investment with accompanying protections against state takeover, openness to international aid and influence, and a focus on urban industrialization (p. 975). To support the urban industrialization and quell the unrest in rural Thailand, including *Isaan*, Sarit instituted five-year National Economic Plans (NEP), starting in the early 1960s, to systematically develop the Thai economy. Diversification of agriculture was also facilitated by the formation of the Bank of Agriculture and Agricultural Cooperatives (BAAC) in 1966, which provided some access to credit for smallholders. It is important to note that while the Sarit government did promote agricultural diversification, its focus on encouraging private enterprise meant the direct investments in and guiding of agricultural sector development were largely left to private interests. As Goss and Burch put it, 'the conditions for investment in the rural sector became increasingly attractive by the 1970s, but there was nothing inevitable about this process' (p. 975). The new American-funded roads through *Isaan* made transport of upland crops with potential for industrial processing and export, like cassava, a potentially viable system. Indeed, Sathirathai and Siamwalla (1987, p. 597) identify Thailand's comparative advantage in transport over other cassava producers as the key to its emergence as the largest world supplier.

The next question is which private interests took advantage of the conditions created by international markets and geopolitics and national policy shifts to coax so much cassava out of a country that had never relied on or widely cultivated the tuber. For this we must focus on another international system, which, unlike GATT, is not a formalized institution: the vast network of Chinese diaspora merchants and middlemen.

Chinese immigrants and ethnic Chinese have a long history of involvement in trade in Southeast Asia. Indeed, their reputation for success in business is considered common knowledge in Thailand and is frequently remarked upon. Many business professions in Thailand have been dominated by ethnic Chinese (Coughlin, 1960, p. 122) and even today many of the top, business tycoons are from this same group (Suryadinata, 2001, p. 66). Their minority status in the Kingdom of Siam both excluded the Chinese from important posts of social status such as ownership of rice land and government posts and provided motivation to fully utilize social networks for survival and success (Suryadinata, 2001). These social ties aided both international and local trading, which in concert with industry such as rice milling, built substantial wealth for several Chinese families in Thailand. Their business strength and wealth was consolidated by the disruption of European business during the Japanese occupation of Thailand during the Second World War and disruption of Chinese diaspora remittances by the Chinese revolution (Goss & Burch, 2001, p. 971). General wealth and business connections, as well as specific dominance in trading (within Thailand and internationally with extensive ties in Southeast Asia and Europe) and milling (both timber and rice) (Sirisambhad, 1988), positioned Chinese business interests throughout Thailand as the key potential investors in both agriculture and industry once Sarit's policies made the business climate friendly to private interests.

But two further connections allowed the Chinese to encourage the production of cassava specifically. First, the trickle of cassava produced in southern Thailand before the Second World War was processed and marketed by Chinese middlemen and factories. These middlemen initially sold cassava products to Indonesia and Malaysia to help fulfill those

countries' exports to European cassava markets, which had grown from former colonial ties. These connections were established first through ethnic ties inherent throughout the Chinese diaspora at the time. These same Chinese entrepreneurs took advantage of the opening of land opportunities along the eastern seaboard of Thailand, particularly in Chonburi province, to establish cassava plantations (Siriprachai, 1987). Later they began exporting directly to European countries, particularly the Netherlands and Germany, especially as the demand from the EC grew dramatically and the suppliers in other producing countries were incapable of providing enough source material. With the increasing demand but trade paths in place, the Chinese middlemen only needed more of the raw materials.

The second important connection was to another migrant network: that of laborers from *Isaan*. *Isaan* has long been a source of migrant labor, particularly seasonal migrant labor, within Thailand. One reason for high migration is the region's high poverty rates relative to much of the rest of the country, which are tied partly to poor soil fertility and regional susceptibility to sustained droughts. In particular, this region was a source of labor for the Chinese eastern seaboard cassava plantations (Shigetomi, 2004). When these migrants returned home to *Isaan*, they brought with them knowledge of and experience of growing and harvesting cassava. Cassava had been called a 'miracle' crop for poor and drought-stricken nations and was in many ways perceived as a miracle crop for *Isaan*. Cassava can tolerate the poor quality of soil and unreliable rains characteristic of *Isaan*, something few other crops can do as successfully. *Isaan* farmers with knowledge of cassava, and connections to the Chinese middlemen in the eastern seaboard, primed them to be the dominant producers of exported feed for Europe's livestock.

With Sarit's friendly laws, private investments in infrastructure and loading facilities were safe, and the latter was primarily funded by Chinese business interests in Thailand. These investments kept transaction costs for farmers low, allowing them to keep a higher rate of the port price and kept the overall price of cassava from Thailand comparatively low on the world market (Sathirathai & Siamwalla, 1987). Innovation in the processing of cassava also occurred in Thailand in the early 1970s and also as a result of private sector research. Pelletizing cassava by breaking the tubers in smaller pieces and pressing them into pellets with very low moisture content allowed for increased scale of trade and economized transport costs. Again, Chinese entrepreneurial networks and increasing vertical integration of firms facilitated these innovations and applications (Phipatseritham & Yoshihara, 1983).

The butterfly that flapped its wings in Europe less than 20 years earlier had yielded a rainfall in Thailand and then a blizzard of cassava back in Europe. The impact of the CAP and the 1967 Kennedy Round of GATT had completely unintended effects that traveled around the world. Instead of Brazil and Indonesia benefiting from the European market opening, Thailand was the primary beneficiary. This demonstration of an unintended outcome with disproportional cause and effect, as a result of iterative decisions at the margins of the trading system, is one indication of how global cassava commodity trade is best characterized as a complex system (Urry, 2003). To further unpack this complex system we return to an examination of the local impacts in both Europe and Thailand.

Reactions in Europe and Thailand

The explosive boom in Thai cassava drew various and mixed reactions from around the world. German and Dutch pork and beef producers happily absorbed nearly all the Thai imports, along with a smaller stream from Brazil and Indonesia. However, the imports were large and cheap enough that by 1980 the common agriculture policy was no longer effective in protecting cereal producers. In particular, French and Italian cereal farmers were negatively affected and the French pushed the EEC to renegotiate their import policies on cassava trade (Sathirathai & Siamwalla, 1987, p. 597). Brazil and Indonesia, GATT members since 1948 and 1950 respectively (WTO, n.d.), were deemed the initial and principal suppliers under the 1967 Round agreement and were entitled to compensation if Europe renegotiated the terms. Thailand was not a GATT contracting party until November 1982 and was not included in the 1982 negotiations, and so was excluded from compensation (Sathirathai & Siamwalla, 1987, p. 599). The new 1982 agreement with Brazil and Indonesia set up a tariff quota system, with generous and rising quotas for both countries to be imported at a 6% *ad valorem* tariff rate, but with extremely high tariffs on any imports exceeding the quota (p. 599).

Perhaps counterintuitively, the reaction in Thailand to the cassava boom was not complete elation. Cassava exports were extremely profitable. However, there was worry that the market was exceptionally risky due to its concentrated destination and its dependence on specific grain protection policies in Europe (Sathirathai & Siamwalla, 1987, p. 598). Furthermore, with commodity prices declining worldwide starting in the late 1970s, government sympathies throughout the 1980s (backed by international development opinion) steadily shifted toward more intensive and vertically integrated agribusiness. This shift was reflected in the five-year National Economic Plans, which increasingly advocated export-oriented agribusiness that made use of primary commodities such as cassava instead of focusing solely on exporting those commodities (Goss & Burch, 2001, p. 979).

These mixed reactions played themselves out through the 1980s in a series of trade agreements that attempted to manage trade levels. Thailand's overwhelming share in the European cassava market meant that the tariff quota system set up under GATT rules with Brazil and Indonesia had a limited effect on the European grain farmers. The continued pressure from French cereal producers pushed the European Commission to request that Thailand cooperate and 'voluntarily' limit exports of cassava.

In Thailand there were mixed views on whether to sign onto this agreement or not. Proponents were swayed by certain aspects of the offered agreement. They liked that Thailand would issue the export licenses (rather than Europe issuing import licenses) and the Ministry of Agriculture would receive and distribute financial aid from Europe. Some proponents saw the agreement as offering some stability to an otherwise risky market. Furthermore, European negotiating tactics pressured the Thais to make a decision without regard to their pending GATT membership. Opponents to signing the offered agreement thought the quota amounts were too small and other clauses in the agreement were too vague to protect Thai interests (Sathirathai & Siamwalla, 1987). In the end, the Thai government agreed to the voluntary export restraint agreement (VERA) whereby Thailand limited its

exports to the EC to approximately five million tons per year between 1982 and 1986 (p. 599). While these quotas were several times higher than Brazil and Indonesia's, they were a couple of million tons below unrestricted Thai exports previous to the agreement.

In 1985, debate arose again in Thailand about whether to extend the voluntary export restraint agreement past the 1986 expiration. Proponents liked the certainty of the bilateral agreement and were skeptical about the efficacy of the GATT. Opponents believed that since Thailand was by now a GATT contracting party their negotiating stance was stronger in relation to the voluntary export restraint agreement and favored using the older 1967 GATT quota-free tariff agreement. Regardless of the actual legal standing of these claims, the European negotiators discouraged Thai appeals to GATT status and agreements in negotiations (Sathirathai & Siamwalla, 1987, pp. 601, 602). With slight revisions, the voluntary export restraint agreement was extended from 1987 to 1990.

In 1990, the EEC renegotiated its agreements with Brazil and Indonesia under which it was no longer obliged to maintain their quotas. Nevertheless, the EEC was still obliged to recognize Thai access to a declining portion of its market under the voluntary export restraint agreement that was extended again until 1996 (EC, 1994). At that point, Thai cassava exports were completely vulnerable to the vagaries of world market prices. Even so, Thailand still had considerable comparative advantages over many other potential cassava producers, given the significant infrastructure in place to handle processing and transportation. Thus, the export market for Thai cassava went from a protected price condition in the 1970s, a restricted quota system in the 1980s, and, with the shift from GATT to the WTO, to an essentially free trade and unprotected market by the mid-1990s.

Unexpected Continuity

When the initial boom conditions were severely reduced to managed-trade conditions and then world market prices, we might have expected to see a significant and sustained drop in Thai cassava production. We do not (see Figure 2). Certainly there was a drop in the production, but the industry was not decimated and production rose again quickly. The trade pattern we see does not correspond completely to the trade agreements. However, we know from the first section and from a global complexity perspective that trade agreements, whether multilateral or bilateral, are not sufficient to fully explain outcomes. Again, we must look to other actors and institutions to grasp the trade patterns.

The continued production was visible in the landscape as well. In 1997, the first year after the voluntary export restraint agreement with its associated low tariffs was no longer in place, Curran and her colleagues went back to Thailand to do fieldwork and expected to see dramatic changes in land use, but fields of cassava still lined the roads. Farmers were reluctant to share how much they were earning from cassava, but they were continuing to grow fields of it. There were still many processing plants along the highways in *Isaan* (near the city of Nakhon Ratchasima). The processing plants were buying cassava roots from the farmers, processing them, and selling the dried cassava pellets to the large exporting conglomerates. Curran and her colleagues noticed that all the companies from the processing plants to the conglomerate exporters were Thai-Chinese companies. Again, the network of

Chinese entrepreneurs and middlemen was actively shaping the cassava trade. However, the network was no longer just informal. In Bangkok, Curran visited the Thai Tapioca Trade Association (TTTA), an organization with significant Thai-Chinese membership. Based on an analysis of TTTA publications, it was apparent that the industrial association was busy developing new markets for Thai cassava. In addition, several international research efforts had started to identify cassava as a high value source for starch (Baguma & Kawuki, 2006; Balagopalan, 2002).

These particular entrepreneurs at the TTTA are largely responsible for the lack of a cassava bust through domestic vertical integration and through the diversification of export destinations and products. Hints of the TTTA work can be seen in one of the features of Figure 2. For much of its history in Thailand, nearly all Thai cassava grown was exported. However, when the voluntary export restraint agreements were no longer in place in the 1990s, we see that there is a break from the historic trend; a substantial amount of cassava is no longer exported.

By the early 1990s, there was already research going on in Thailand, as well as in other countries, on the use of cassava for poultry feed (Khajarn & Khajarn, 1992). When increasing demand from Japan for food imports spurred Chinese-Thai conglomerates to develop new products for export, cassava was a ready and cheap input for higher-value schemes (Goss & Burch, 2001, p. 979; Ratanawaraha et al., 2000). One of the new domestic markets for cassava was a relatively new vertically integrated poultry production industry in Thailand. Charoen Pokphand (CP) Group was one of these companies, started by two Chinese immigrant brothers as a seed shop and that then grew to be Thailand's largest and richest corporation. From its beginnings in seeds, CP Group moved into producing animal feed, including cassava pellets, and has now diversified into poultry breeding, production, processing, and retail, as well as into sectors outside agribusiness (Burch, 2005). Pellets that were once exported to the EEC to feed European pigs and chickens are now used in Thai animal production facilities. This has also led to the development of another major export product in Thailand: frozen poultry. In 2003, CP Group was the fourth largest poultry exporter in the world (Burch, 2005, p. 168).

Another business move by CP Group, and another destination for Thai cassava (at least until Chinese cassava processing plants were established), was agri-industrial market expansion into China. CP Group, notable for the strong ethnic Chinese identity of its CEO and many managers, was the first major investor in China in the 1980s and has since helped develop a major poultry import-export complex there (Burch, 2005, p. 169). This, along with more diversified processing in Thailand, notably into industrial starches for paper, allowed for exports outside Europe.

This vortex of activity at TTTA and by Chinese-Thai companies like CP Group reveal the tenuous relationship between these groups and the other systems at work in this story. When the bilateral or multilateral treaties were favorable, the Chinese middlemen were quite happy to take advantage of them. However, this diaspora group was not limited by these national and international institutions and when the voluntary export restraint agreements and later the closing of special European market access came along, these Chinese-Thai entrepreneurs

focused their energies not on grasping onto the last shreds of these agreements, but on diversifying, upgrading, and redirecting their product. This nimble entrepreneurial spirit was highly effective for this group, and can be seen as a success story for a slice of the Thai population in a globalized world. However, their lack of ties to the Thai government and these international institutions is paralleled by a lack of strong ties or 'loyalty' to the other major players in the cassava story: the *Isaan* farmers. Their independence from these other groups contributed both to their dynamic entrepreneurial success and the intense local effects of this activity.

Impacts on Localities

The cassava market that connected Dutch and German pigs with *Isaan* upland crop farmers had intense effects at both ends of the linkage. While the initial EEC policies that sparked the connection had a huge ripple effect in Thailand, the continued entrepreneurial activity of the Chinese-Thai middlemen meant that effects were also felt in Europe. Across different parts of Europe, the surprisingly quick and plentiful arrival of Thai cassava was felt in different ways. As mentioned before, while the Dutch and German livestock output grew rapidly on these imports, French and Italian cereal farmers protested. Later, after special access to low-tariff quotas was ended for Thai cassava, certain parts of the European agriculture sector still felt the impact of activities in Thailand. The rapid rise of the Thai poultry industry, with dried cassava as an input and frozen poultry as a major new export, the European poultry industry also felt the effects. By the mid-1990s Thai exports were eating into European Union poultry producers' domestic markets (Athukorala, 2000; Burch, 2005). The European Union members began to implement a number of tools to limit developing and to manage food safety concerns (Henson & Loader, 2000).

At the same time there were fairly intense consequences for localities in Thailand, particularly *Isaan* (northeastern Thailand). Cassava export growth mirrored the dramatic declines in poverty during the 1960s and 1970s (Warr, 1998; see Figure 3). Not all of these declines can be attributed to cassava exports, but agricultural exports were viewed by the Thai state as a significant source of foreign exchange earnings (Bello et al., 1998; Warr, 1998). In fact, cassava did contribute significantly toward upland crop income for farmers in northeastern Thailand. During the 1980s, cassava income represented between 40 and 50% of crop income (Ministry of Agriculture, 1951–2001). However, by the mid-1990s the importance of cassava for farmers' earned income had dropped to 10% and farm gate prices had fallen as well (Ministry of Agriculture, 1951–2001). This partially reflected the reorganization of the cassava industry, with processors garnering more of the earnings through higher-end production of starch for other markets and the overall drop in world market prices of cassava pellets. Consequently, although cassava provided an initial income boon for farmers during the 1970s, by the mid-1990s it was hardly contributing to farmers' income.

The Thai State used cassava exports among other strategies to combat poverty and to increase village linkages to the central economy. However, they also used these exports to generate foreign currency reserves for other forms of export manufacturing and economic growth (Bello et al., 1998; Warr, 1998). While cassava production was concentrated in the

northeast, growth in manufacturing mostly occurred in other regions, namely the central region (Bello et al., 1998). The consequences of export driven agricultural production was to subsidize urban manufacturing growth, resulting in remarkable economic growth rates for the country, but growing income inequality between rural northeastern Thailand and urban Bangkok, and a growing concentration of poverty among rural residents (see Figure 4).

Despite income trends, cassava production continued apace in Thailand (see Figure 2) from the mid-1990s onward. The continued trend reflects something of an ecological path dependency resulting from the planting of cassava. The initial planting of cassava came at the expense of forested areas in the upland portions of *Isaan* (Cropper et al., 1997). Cropper et al. estimate that forested areas dropped from 75% of the region in the early 1960s to 25% by the mid-1980s. The increases in cassava production came mainly from upland areas in the northeast, which, in 1982, accounted for 60% of the total planted cassava area and production in Thailand (Ministry of Agriculture, 1951–2001; see Figure 5). Other contributors to rapid deforestation include urbanization (generating both land use change in urban areas and demand for forest products from forested, rural areas), road building, and other export crops (maize and sugar cane) (Cropper et al., 1997).

Cassava is a particularly demanding crop on soil fertility. Because it can grow hardily with few inputs, it is very efficient at drawing nutrients out of the soil. As a result it is valued for its ability to grow in otherwise poor soils or places difficult to cultivate. Associated with cassava fields are high levels of soil erosion. Cassava is grown from cuttings of older plants. These cuttings have a slow initial period in their growth cycle, and even when fully grown provide little groundcover. In Thailand, unlike most of the other cassava producing countries in the world, cassava is monocropped. This leaves tilled fields highly susceptible to erosion, particularly when facing strong monsoon rains. Furthermore, much of the cassava in *Isaan* is grown in upland and marginal areas compounding the negative impacts of cassava on soil quality and erosion (Howeler, 2002). Erosion is responsible for degraded and nutrient-poor soils in much of the area where cassava has been grown. According to some estimates, 20% of upland areas where cassava has been grown have become unsustainable for agriculture (Welsh, 2001). However, Thai farmers have continued to grow cassava, because no other crop can continue to be grown on their upland fields. The imperative to continuous cropping on most upland areas in Thailand is also driven by land tenure policies. For most upland areas, farmers rarely have full title and can only claim usufruct rights (Feder et al., 1988), thus they tend to continue planting these areas, despite declines in soil quality and productivity.

Taken altogether, the cassava story offers mixed blessings for Thailand. It continues to generate important export earnings. In addition, the initial boom helped grow farm incomes, as well fund manufacturing development in Central Thailand. But, the environmental consequences resulting from deforestation and soil erosion limit future land use without allowing for substantial fallow periods. Furthermore, cassava, although still being produced in the region, is no longer a significant contributor to farm income.

Conclusions: Local Challenges and Global Complexity

This land of Sukhothai is thriving. There is fish in the water and rice in the fields. Whoever wants to trade elephants does so. Whoever wants to trade horses does so. (King Ramkhamhaeng, cited in Handley, 1993)

No other sector in the Thai economy is as oriented to international markets as agriculture. Although it has been contributing less than a fifth of the GNP throughout the 1980s, its share in Thailand's export trade remains close to half. (Siamwalla et al., 1994)

The sentiments in the thirteenth-century quote are mirrored in the twentieth-century quote and both seem just as applicable in the twenty-first century. Currently, Thailand is Asia's only net food exporter. Thai rice exports are the largest in the world. Thai farmers also produce other crops for world markets. During the 1960s and 1970s land extensification driven by the development of export crops of cassava, kenaf, sugar cane, and maize resulted in a diversified agricultural economy that met world demand for these products (Siamwalla et al., 1994). This entrepreneurial effort has since led to the development of soybean, oil palm, and coffee production in the 1980s, and in the 1990s Thailand pioneered the production and export of prawns, frozen fowl, fruits, and flowers (Bello et al., 1998).

These two quotes imply a development policy dilemma for Thailand also faced by many other rapidly developing economies seeking to take advantage of opportunities in the global economy through the exploitation of natural endowments and substantial, rural human capital. The often-asked, rhetorical question is: At what point do benefit cost calculations point to diminishing returns on the relative contributions to economic growth and deteriorating natural endowments and social well being (especially when global market prices are unstable)? And, more generally, how does a national economy and society join a global marketplace and maintain the possibility for sustained and sustainable economic development for its people?

To date, definitive answers to these questions have proven illusory due to variable conditions across localities and the dynamic nature of the global economy, specifically the varied ways in which global trade is managed and localities interact with the global marketplace. Complex forces are at work from national or regional policies governing production and consumption in particular locales to bilateral and global trade treaties governing transactions to multinational corporate efforts to either divest holdings for greater flexibility in sourcing production inputs or vertically integrate to command greater market control.

The story of the connection between European consumers and Thai cassava farmers offers an opportunity to observe the global complexities of food production and consumption. Quite unexpectedly, Thai cassava emerges out of the blue for many European pig and poultry growers and EEC cereal producers. Because its emergence was not governed by global trade rules it became particularly difficult to manage the overwhelming influx of cassava pellets. Not only was the Thai state not a GATT member, but cassava traders represented an altogether different global system of relations. This diasporic network could

take advantage of opportunities created by a new market, but they nimbly resisted global governance rules, while at the same developing new institutions for research and development and new markets for cassava products. Besides these two networks, the nodes—Europe and Thailand—provided particular conditions that led to a flurry of cassava production that was maintained throughout. Furthermore, the market network that facilitated cassava production subsequently influenced the worldwide poultry trade network. Finally, the environmental path dependencies resulting from cassava production have had profound social and environmental effects for Thai farmers in *Isaan*.

Although a global complexity framework helps to anticipate the multiplicity of outcomes, it has yet to develop tools for anticipating inequality. In part, this limitation arises from the dynamic nature of the framework. The case demonstrates aspects of global complexity, such as unpredictability and irreversibility but, more importantly, points to the uneven and intense impact on localities of these processes. There are not smooth or evenly distributed positive or negative externalities. The consequences for the two localities yielded not only cheaper meat for European consumers, but also challenges to traditional cereal producers. In Thailand, new institutions emerged; the Thai Tapioca Industry Association was able to develop new markets and continued foreign exchange earnings for the Thai state. As mentioned earlier, these positive externalities came along with negative externalities, including deforestation, soil quality deterioration, and declining farm gate prices. Future work within a global complexity framework might use cases like cassava to illuminate under what conditions inequality is amplified or mitigated.

A global complexity framework helps to anticipate the multiplicity of outcomes and the interconnections among policies and actions that used to be considered independent of each other. Drawing this unevenness into conceptual frameworks, rather than excluding it as residual or exceptional, will help us understand development processes in the current era.

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Figure 1. Dried Cassava: world market and major exporters 1961–2005. Thailand's exports dominate the world market. *Source:* FAOSTAT, 2003.

Figure 2. Cassava production and exports in Thailand, 1961–2000. Cassava production in Thailand is largely export driven. *Source:* FAOSTAT, 2003.

Figure 3.
Percentage of the population in poverty in Thailand, 1962–1999. Poverty in Thailand drops.
Source: Warr, 1998.

Figure 4.

Regional shares of poverty in Thailand, 1988–2002. *Isaan* continues to have the largest share of Thailand's poverty. *Source:* NESDB & The World Bank, 2005.

Figure 5.

Area of land planted for major crops other than rice, 1951–2000. *Source:* Ministry of Agriculture, 1951–2001.

Table 1

Thailand dominates the world export market for cassava

Thailand's share of world cassava exports						
1973-75	1983-85	1993-95	1995	1996	1997	1998
82%	93%	81%	75%	79%	83%	80%

Source: FAOSTAT, 2003; FAO, 2004.