RUBBER, RICE, RACE, AND SPACE: A SOCIO-ECOLOGICAL APPROACH TO THE REMAKING OF AGRICULTURAL SPACE IN EAST SUMATRA

A thesis submitted
To Kent State University in partial Fulfillment of the requirements for the Degree of Master of Arts

by

Stian A. Rice

August, 2012
Table of contents

List of figures ........................................................................................................................................ viii
List of tables ......................................................................................................................................... ix
Acknowledgments ................................................................................................................................ x
Chapter 1. Introduction ........................................................................................................................... 1
  The transformation of agricultural space ................................................................................................. 3
  The socio-ecological approach ............................................................................................................... 5
  Insights .................................................................................................................................................. 6
  Organization of the thesis ..................................................................................................................... 8
  Critical histories .................................................................................................................................... 9
  Timeline of key events .......................................................................................................................... 11
Chapter 2. Approaches to colonial environmental history .................................................................... 13
  Traditional approaches to colonial environmental history ................................................................ 14
    Economic determinism ......................................................................................................................... 15
    British-centrism .................................................................................................................................. 17
    Colonialism started environmental degradation .............................................................................. 19
    European discourses of conservation .............................................................................................. 20
  An alternative approach: the tradition of cultural and political ecology ........................................... 22
    Cultural ecology .................................................................................................................................. 23
    Political ecology ................................................................................................................................. 24
| Chapter 3. Agro-ecological communities | 28 |
| Components | 30 |
| Agents | 30 |
| Conditions | 32 |
| Processes | 33 |
| Imperatives | 34 |
| Resources | 35 |
| Model expectations | 37 |
| Other approaches | 38 |
| Chapter 4. The Sumatran east coast | 40 |
| Physical geography | 44 |
| Volcanic history | 44 |
| Topography | 45 |
| Biology | 48 |
| Climate | 54 |
| Social and cultural groups | 55 |
| Malay | 58 |
| Simelungun Batak | 60 |
| Karo Batak | 62 |
| Toba Batak | 64 |
Chapter 5. The ecology of pre-European cultivation

Gardens

Biological considerations

Spatial considerations

Functional considerations

Swidden

Biological considerations

Spatial considerations

Functional considerations

Wet rice

Biological considerations

Spatial considerations

Functional considerations

Cultivation systems by region

Simelungun and Malay lowlands

Chapter 6. The arrival of Europeans

Setting the stage for a land grab

Geopolitics

Religion

Economic liberalism
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanitarianism</td>
<td>117</td>
</tr>
<tr>
<td>The plantation paradigm</td>
<td>118</td>
</tr>
<tr>
<td>The problem of land</td>
<td>119</td>
</tr>
<tr>
<td>The problem of labor</td>
<td>126</td>
</tr>
<tr>
<td>The problem of people</td>
<td>129</td>
</tr>
<tr>
<td>The problem of cultivars</td>
<td>133</td>
</tr>
<tr>
<td>Chapter 7. The ecology of post-European cultivation</td>
<td>138</td>
</tr>
<tr>
<td>The model contract</td>
<td>138</td>
</tr>
<tr>
<td>Implementation and evolution of the contract</td>
<td>141</td>
</tr>
<tr>
<td>Swidden-follows-tobacco</td>
<td>145</td>
</tr>
<tr>
<td>Environmental considerations</td>
<td>145</td>
</tr>
<tr>
<td>Spatial considerations</td>
<td>149</td>
</tr>
<tr>
<td>Functional considerations</td>
<td>153</td>
</tr>
<tr>
<td>Consequences of intervention</td>
<td>163</td>
</tr>
<tr>
<td>Rubber</td>
<td>164</td>
</tr>
<tr>
<td>Environmental considerations</td>
<td>166</td>
</tr>
<tr>
<td>Spatial considerations</td>
<td>167</td>
</tr>
<tr>
<td>Functional considerations</td>
<td>169</td>
</tr>
<tr>
<td>Consequences of intervention</td>
<td>171</td>
</tr>
<tr>
<td>Wet rice</td>
<td>173</td>
</tr>
</tbody>
</table>
List of figures

Figure 1: Dutch visitors in a Malay kampung ................................................................. 13
Figure 2: Simple agro-ecological community for wet rice production ...................... 37
Figure 3: Postkantor and monument to Jacob Nienhuys in Deli, 1910......................... 40
Figure 4: Map of East Sumatra ...................................................................................... 43
Figure 5: Map of East Sumatran bioregions (from Whitten 1997) ............................... 49
Figure 6: Map of East Sumatran social groups ............................................................. 58
Figure 7: Village in the Karo Batak highlands ............................................................... 67
Figure 8: Map of subsistence cultivation methods ......................................................... 69
Figure 9: Agro-ecological swidden community (Simelungun and Malay lowlands) ...... 98
Figure 10: Planters and Chinese laborers in a tobacco field ........................................ 100
Figure 11: Land categorization under the 1870 law ..................................................... 122
Figure 12: Concession boundaries and affected villages ............................................. 152
Figure 13: Decision-making process for head of house under Model Contract .......... 159
List of tables

Table 1: Timeline of key events

Table 2: Cultivation systems by region

Table 3: Agents/imperatives/resources in Simelungun and Malay lowlands

Table 4: Conditions in Simelungun and Malay lowlands

Table 5: Processes in Simelungun and Malay lowlands
Acknowledgments

This work is dedicated to my grandfather, H. Z. L. Tobing, who spent the Japanese occupation and post-war years as a rubber plantation administrator for NV Verenigde Deli-Maatschappijen. Though I never met him, the man I have imagined through stories has been the inspiration for this project from the beginning.

I wish to thank the members of my committee, James Tyner, Mandy Munro-Stasiuk, and Sarah Smiley, who guided my work and endured this longum opus without so much as a caveat lector. Special thanks go to my colleagues at Kent State University, Alex Peimer, Gabriela Brindis Alvarez, and Alex Colucci, who exhibited uncommon patience for conversations about such esoteric historical subjects.

Finally, I extend boundless gratitude to my parents, Josephine and William Rice, who introduced me to vibrant East Sumatra as a child; to my mother specifically, for her help with Dutch translation; and to my sister, Sonja, for her constant support and reflection. The unwavering confidence of these friends and family members ensured that this endeavor – indeed, this academic career – was able to germinate in the first place.
Chapter 1. Introduction

When Jacob Nienhuys arrived on Sumatra’s eastern shore in 1863 looking to start the first European tobacco plantation, the alluvial plains of the east coast were covered in dense, canopied rainforest. Through a myriad of cultivation systems, the diverse assortment of native societies in the lowlands and surrounding hills produced enough food to sustain themselves. Apart from a small coastal trade in coconuts, copra, and pepper, East Sumatra contributed little to the world market. In the vernacular of European explorers, East Sumatra was a vast, empty, and unproductive land.

As the second largest island in the Indonesian archipelago, Sumatra defined the western edge of the vast Dutch East Indies (DEI). While Java, the Sunda Islands, and the Moluccas to the east had been the objects of Dutch attention since 1602, Sumatra remained largely untouched. For over two centuries, colonial administrators in Batavia – the capital of the East Indies and now the city of Jakarta – experimented with ways to turn Sumatra into productive space. These efforts would cost thousands of lives and pay few dividends. This all changed when Nienhuys, a nearly bankrupt Dutch sugar planter from Java, started his tobacco plantation in 1863 and unwittingly solved a geopolitical riddle that had vexed the Dutch Empire for 250 years.

By the outbreak of World War II, these alluvial plains had become the largest and most profitable plantation zone in the DEI. Planters cut down ten thousand square kilometers of rainforest to create “productive” land for tobacco, rubber, tea, coffee, cacao, and palm oil. While experimentation with various cultivars made planters and investors secure, it was tobacco and rubber that made them rich. By 1910, Sumatran
tobacco plantations had become the most profitable tobacco enterprises (per unit) in the world. By 1930, Sumatran rubber accounted for half of the global supply (Geertz 1963). Meanwhile, land and population pressures led to a collapse of local cultivation systems, so that by 1940, East Sumatra was the largest importer of food in the DEI.

Nienhuys’ first tobacco plantation was the beachhead for a cultural, economic, and ecological invasion. European businessmen, some with no knowledge of agriculture whatsoever, flooded into East Sumatra in search of cheap concessions. Chinese laborers followed them, arriving by the tens of thousands each year to work as plantation hands. Javanese workers – indentured and bound by the ruthless Penal Sanction – came later, nearly doubling the population of East Sumatra by 1940 (Pelzer 1978). Even the cultivars were foreign. The variety of tobacco grown by Nienhuys was brought from South America by the Portuguese (Boomgaard 1999). The rubber tree that made millions for white planters was Hevea brasiliensis, stolen from Brazil by the Englishman Henry Wickham in 1876 (Jackson 2008). Tea came from British plantations in India. Palm-oil from West Africa. With people and plants came liberal capitalism, a money-based economy, European social theories, and a state philosophy that justified deploying doctors one day, and cavalry the next.

Had East Sumatra truly been “empty,” the story might have been different. But this invasion took place in a social and ecological space populated with cultures and cultivation systems that could not be easily displaced. Nor were they. Clifford Geertz writes of this transformation:
Nowhere else in Indonesia ... did plantation agriculture develop so extensively, so resourcefully, so profitably, or so destructively. Nowhere else did Western interests and Indonesian ones clash so directly, harden so completely, and grow so unmanageable. Nowhere else did ethnic diversity, ideological contrast, and class difference crystallize into so convoluted a form; ... and nowhere else were the death throes of colonialism more clamorous, more visible, or more drawn out.” (Clifford Geertz, in Pelzer 1982, i)

The story of East Sumatra as described by European historians is a well-known one. It features a familiar cast of colonial characters: peasants, planters, administrators, soldiers, merchants, and missionaries. Its plot lines re-inscribe the contours of European imperialism: the search for raw materials, the creation of captive markets, and – that quintessentially modernist project – the inauguration of the neo-European state. The story has become a moral tale as well: a case study in capitalist exploitation, a lesson about racism, and an admonition on the excesses of greed and arrogance. By all of these measures, the story of East Sumatra finds itself well-placed in the constellation of colonial histories, sharing company with the British Raj in India, the Culture System in Java, and the Spanish encomienda in the Philippines.

**The transformation of agricultural space**

Rather than write another colonial history of race, power, and social upheaval, the story told here is an agricultural one. In this thesis, we will revisit the history of East Sumatra with an eye to the transformation of agricultural space.

I believe that a specifically agricultural approach to colonial history can offer unique insights for four key reasons. First, food production is necessary for human survival: in many colonial contexts (including this one) the bloodiest episodes of native resistance were fought over access to agricultural land (Scott 1976). Thus, threats to food
production quickly become threats to social stability. By extension, to control food production effectively is to control a major source of dissent, a truth not lost on Sumatra’s planters and Dutch overseers. When we add to this the fact that cash crop production was the primary form of colonial income, it becomes clear why agriculture should be understood as a contested site. The fight over agrarian outcomes in the colony was a fight over who got to make a living (even a life), and at whose expense.

Second, agrarian change is situated at the intersection of diverse cultural, economic, political, and environmental processes. As cultural practices evolve, markets expand or collapse, new land laws emerge, and soil or climate conditions change, agricultural production changes as well. Likewise, altering what we grow or how we grow it impacts our social fabric, trade balance, political climate, and ecological conditions. The collision of local and foreign plants and people in East Sumatra created complex linkages between these human and ecological processes. It dissolved traditional society/environment relationships while it forged new ones. At times, agrarian change was the cause; at other times, the effect. But in every case, agriculture was involved. Thus, an agricultural approach does not ignore the cultural, economic, political, or environmental experiences of the colony. Rather, it serves to link these experiences together in unique ways.

Third, agriculture is a spatial and temporal practice. Every form of agriculture involves maintaining control over a given area for some period of time. Whether the form of spatial control is ensuring proper fertilization, renting land to tenants, or defending a field from pests, agriculture is a system of energy production performed within a definable space. As a means of producing energy, agricultural performances must take place over time. The length of time needed to extract energy depends on what
is being harvested and by whom: for forest gatherers, it may take minutes to pull and trim a root of wild manioc; by contrast, a productive rubber tree will need manual attention every day for 25 years (Pelzer 1978). For this reason, any change to what is being cultivated – or how it is cultivated – is fundamentally a change to how space and time are used. Of course, space and time are the currencies of government, and none more so than a colonial state bent on turning “unproductive” land into profit as quickly as possible. Through its ability to drastically organize and constrain the behavior of people with respect to space and time, agriculture was an ideal place for the application of colonial law and policy.

Finally, whether they grow crops for cash or food, planters are participating in a biological act. Agriculture is ecological by nature: even in the most isolated monocultures, cultivator and cultivar still engage in larger energy flows, biological communities, and relationships of competition or commensalism. Agrarian change can lead to the modification of larger ecological systems, while changes to ecosystems likewise impact agricultural productivity. For this reason, a history of agrarian change is also an ecological history, one which stands firmly astride the traditional society/environment boundary.

The socio-ecological approach

Traditional histories of Southeast Asian colonies tend to privilege social and economic contingencies over ecological ones. In this view, the colonial experience is seen as an epiphenomenon of material greed, national pride, and moral duty. As discussed in Chapter 3, this approach can only offer a partial explanation of what happened to agriculture in East Sumatra.
For the purpose of this thesis, the standard narrative of economic imperatives and social upheaval fails in two key ways. First, changing environmental conditions lead to changing agricultural practices. By altering these practices, environmental conditions affect economic and political outcomes. Thus, any history that explains the economic and political landscape of the colony without addressing the role played by the environment is incomplete.

Second, the standard narrative tends to focus its attention at an institutional scale. The history of the colony becomes a story about legislative decisions, population movements, capital movements, and the conflicting interests of broadly defined “peoples.” Establishing an analysis at this scale may seem suitable for answering the classical meta-questions of interest to European writers: how did the colony succeed? Why did the colony fail? And, was the net effect positive or negative? However, to understand the particulars of agricultural change will require analysis at a variety of scales. In this thesis, we will describe processes ranging in scale from the movement of capital around the globe to the movement of nitrogen through a stalk of rice.

To address the role of environmental conditions and maintain fluidity of scale, this thesis adopts a socio-ecological approach to colonial history. Described in Chapter 3 and implemented in Chapter 4, this approach draws from the analytical traditions of cultural and political ecology.

**Insights**

This story of agrarian change in East Sumatra contributes a distinctly socio-ecological view to the abundance of social and institutional histories. This approach leads to several key insights – developed in Chapters 5, 6, and 7 – into the colonial
relationship between the power and the environment. Two are worth mentioning at the outset.

First, regional-scale social, political and economic outcomes were determined by changing relationships between labor inputs and environmental outputs at the household scale. The most important of these changing relationships was the reorganization (and reconceptualization) of agricultural space. As a field changed from fallowing forest to a swidden plot, from a swidden plot to a tobacco plantation, or from annual staple production to perennial cash crop, so too did cultural performances of energy extraction. Changing performances demanded shifts in labor input and the timing of such inputs. With new labor requirements came comprehensive changes in social organization, including the collapse and reformation of community economies, population growth, migration, and violence. Ecologically, changes to how and when energy was extracted from the ecosystem lead to dramatic niche modification. In East Sumatra, the household-level decision by thousands of highland Batak to move from swidden and wet-rice cultivation to wage labor increased forest loss and soil erosion in the piedmont zone, the spread of saw grass (*Imperata cylindrica*), and the frequency of forest fires. Cultural adaptation to these changing environmental conditions led to further niche modification, sometimes with disastrous results. In many cases, planters and administrators struggled to adapt their practices to changing conditions. In others, they used such systems of feedback to their political and economic benefit. While it is the large, regional-scale conflagrations that have drawn the attention of historians, a plot-level or household-level biogeography (and “bio-economy”) is critical to an understanding of how East Sumatra was transformed.
Second, not only did decisions about the use of agricultural space change social outcomes, but the sequence of these decisions helped to select and enable these outcomes in the first place. The choice of tobacco as the primary plantation cultivar in the late 19th century enabled planters to integrate cash crop production into indigenous systems of cultivation. Through several key spatial transformations, the biological, economic, and political imperatives of tobacco production paved the way for the next wave of cash crops. As I will show in Chapter 7, the rubber plantations that dominated the world market in 1930 could never have been introduced to East Sumatra without the social and ecological spadework offered by tobacco. From these insights, I offer a theory of “commodity succession” in which a pioneering cultivar can create the socio-ecological spaces, economies, and systems of governance necessary for the next.

**Organization of the thesis**

This thesis is organized into seven chapters. In Chapter 2, I review some of the traditional approaches to writing environmental histories of former Southeast Asian colonies. I identify four key shortcomings with the literary tradition and propose a socio-ecological framework based on the analytical foundations of cultural and political ecology.

In Chapter 3, I develop the socio-ecological framework around the concept of an *agro-ecological community*. This community – which represents the agents, conditions, processes, and relationships involved in a cultivation system – will become the central analytical tool for modeling colonial agriculture in this thesis.

Chapter 4 provides an overview of Sumatra’s east coast, including its physical geography, ecology, pre-European social and environmental history, and native societies.
Based on both the topology of the island and the traditional territories of its native societies, I divide the research area into four distinct regions. While a complete analysis of the east coast would contrast the different outcomes experienced in each region, this thesis focuses on the agricultural history of one of the regions: the plantation lowlands.

In Chapter 5, I use the framework of agro-ecological communities to describe the three dominant cultivation systems of East Sumatra prior to 1863. This analysis pays particular attention to cultural “land practices,” moral economies, and environmental contingencies affecting the different kinds of crops cultivated by native societies.

Chapter 6 describes the ascent of Dutch authority over East Sumatra, the arrival of planters, and the political economy of Straits trade in the 1860s. This section explores the problems facing planters and the unique legislative measures adopted by colonial administrators that helped paved the way for plantation agriculture.

In the final chapter, I model the new agro-ecological communities implemented under the plantation system and explore the dramatic changes to native cultivation communities as a consequence of European arrival. Using this analytical model, I explore the interaction of social and environmental processes across a wide range of scales, retaining a particular sensitivity to the effect of these processes on the spaces of agricultural production.

**Critical histories**

The story of Nienhuys’ arrival in 1863 and the subsequent transformation of East Sumatra may be of interest to some Southeast Asian historians, while a specifically agricultural approach may appeal to those concerned with agro-industrial history. For
what it is worth, this thesis is motivated less by a desire to reflect on colonialism than by a need to examine contemporary neo-colonialism, and with that in mind, my audience broadens considerably.

Agrarian change of the scale experienced in East Sumatra is still taking place, but today it marches under the banner of development: sometimes “green,” “sustainable,” or “alternative,” at other times unabashedly “growth-centered” (Watts 1983). The changes to food production transforming agricultural space today will produce social and ecological consequences that have not been adequately examined. Part of this examination involves placing the colony back under the microscope: as the grandfather of institutions like the World Bank, International Monetary Fund, and Food and Agriculture Organization, colonial practices inform our understanding of these modern powers that have taken up the planter’s mantle. The microscope in this case is a geographical, ecological, and historical one.

Reflecting on historiography, Nietzsche identified three modes of memory: the exemplary, the monumental, and the critical (Nietzsche 1990). The critical mode examines the past for the purpose of liberation: liberation not only from the record of material suffering, but also the weight of responsibility we inherit as products of history ourselves. It is in this way that the critical mode draws our attention forward to suffering that has yet to happen: suffering made clearer (and more accessible to intervention) by the act of historical examination. Such historiography is, in essence, “a trauma-driven repudiation of the past in the name of a better future” (Moses 2005, 313). This thesis will take a critical approach to agricultural history with the aim of providing a better understanding of the consequences of agrarian change. To undertake this in any comprehensive manner is, of course, beyond the scope of this thesis, and would demand
a level of scholarship to which this author could never pretend. Hopefully, however, it can serve as a small (critical) step forward.

**Timeline of key events**

Table 1 shows key events during – and leading up to – the period of agricultural transformation in East Sumatra. The plantation period is indicated in grey.

**Table 1: Timeline of key events**

<table>
<thead>
<tr>
<th>Year(s)</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1602</td>
<td>Dutch East Indies Company (VOC) established</td>
</tr>
<tr>
<td>1619</td>
<td>Capital established in Batavia (now Jakarta)</td>
</tr>
<tr>
<td>1800</td>
<td>VOC files for bankruptcy. All East Indies territory assumed by the Netherlands government</td>
</tr>
<tr>
<td>1821-1837</td>
<td>Dutch embroiled in the Padri War in central Sumatra</td>
</tr>
<tr>
<td>1824</td>
<td>Treaty of London fixes boundaries between British and Dutch interests in Sumatra</td>
</tr>
<tr>
<td>1830</td>
<td>Consolidation of Java under the Cultivation (or Culture) System</td>
</tr>
<tr>
<td>1863</td>
<td>Nienhuys arrives in Sumatra marking the start of plantation agriculture.</td>
</tr>
<tr>
<td>1870</td>
<td>Land Law of 1870 implemented, paving the way for large-scale concessions</td>
</tr>
<tr>
<td>1870-1907</td>
<td>Rapid expansion of tobacco production</td>
</tr>
<tr>
<td>1873-1904</td>
<td>Dutch wage war against Aceh. Dutch eventually win and annex all remaining areas of Sumatra.</td>
</tr>
<tr>
<td>1907-1938</td>
<td>Expansion of rubber production and decline of tobacco</td>
</tr>
<tr>
<td>1939-1942</td>
<td>Food crisis leads to Compulsory Cultivation Ordinance of 1939</td>
</tr>
<tr>
<td>1940</td>
<td>Germany invades the Netherlands</td>
</tr>
<tr>
<td>1942-1945</td>
<td>Japanese forces occupy Sumatra</td>
</tr>
<tr>
<td>1945</td>
<td>Indonesia declares independence</td>
</tr>
<tr>
<td>1949</td>
<td>The Netherlands recognizes Indonesian independence</td>
</tr>
</tbody>
</table>
Significant work from a feminist perspective has explored colonial experiences at the scale of the body and the household (for example, see Kipp 1998). While such research has illuminated the often overlooked everyday manifestations of imperialism, like the more traditional institutional approach, such research tends to limit itself to a particular scale.
Chapter 2. Approaches to colonial environmental history

The traditional narrative in colonial literature has been a human-centered one: the colonial story is a tale told using vocabularies of power, race, exploitation, and hegemony, alongside humanitarianism, modernism, and nationalism (Loomba 1998). With emerging interest in discourses of conservation and sustainable development, however, a growing body of colonial literature has started to explore the relationship between colonial practices and the environment (Beinart and Hughes 2007).
Recent attempts to understand the complex relationship between Nature, the state, and capital have encouraged researchers to revisit the colonial state: to exhume the colony once more for autopsy, this time searching for the structural and discursive precursors to the environmental crises we face today. Colonial histories of agrarian change – traditionally incorporated into the broader socio-political narrative – are emerging as environmental stories in their own right, speaking directly to the state’s use of ecology (in this case agro-ecology) as a tool for social control and a site for both social resistance and ecological transformation (for example, see Boomgaard, Colombijn, and Henley 1997).

It is in this exploratory spirit that this thesis seeks to unravel the story of agrarian change in East Sumatra. This particular story is complicated not only by the multiplicity of social and ecological actors, but by a Western narrative tradition that sees its own histories as authoritative. Before exhuming the colonial body in East Sumatra, then, we must first challenge the authority of these established narratives: the traditional approaches to colonial environmental history.

**Traditional approaches to colonial environmental history**

Colonial environmental histories of Southeast Asia exhibit four common shortcomings: (1) implicit adherence to economic determinism, (2) British-centrism, (3) the myth that colonialism started environmental degradation, and (4) a preoccupation with European discourses of conservation.
Economic determinism

Addressing the roots of colonialism, the economist J. A. Hobson wrote that economics was the “taproot” of imperialism (in Tully 2011). European powers sought colonial territory for four essentially economic reasons: as a source of raw materials, as a source of cheap labor, as a captive market for goods manufactured in Europe, and as a destination for surplus capital. While geopolitical imperatives and visions of a social utopia may have contributed (Cannadine 2002), economic incentives formed the first and last justifications for empire.

This understanding of imperialism as a money making enterprise has been at the foundation of most colonial narratives, whether from a critical or apologetic perspective (for example, see Loomba 1998, pg. 9). Though some authors have sought to emphasize the role of cultural production and social philosophy (Cannadine 2002 and Stoler 1985), national identity (Gouda 2008), or geopolitical posturing (Reid 1969), economics has never lost its place as the essential motivation. Colonial critics, particularly those writing in the Marxist tradition, have found such imperatives of accumulation and exploitation to be particularly appropriate for explaining the social upheaval and environmental destruction we see in the historical record (Beinart and Hughes 2007).

As more recent research turns towards the relationship between Nature and the colonial state, the role of economics has expanded from that of social motivation to direct causation. Economic determinism in this context starts with the aphorism that all environmental change is a consequence of economic imperatives. Thus, greed and the desire to accumulate wealth directly or indirectly cause pollution, exploitation, and all other forms of degradation. Once we establish that the colony came into existence for
economic reasons – and economics is responsible for driving environmental change – the entire environmental history of the colonies can be explained in terms of the movements of money. With most of the money in European hands, it follows that these historical trajectories tend to follow European interests.

I do not dispute the relationship between money and environmental change. However, research that adopts a model of economic determinism tends to have difficulty bridging the economics/environment divide. On the one hand, most environmental histories tend to focus on the extensive and complex “productive” machinery of the colony (for example, the movement of capital, legislative intervention in land and labor, and fluctuations in commodity prices on the world market, to name a few). Such detailed focus is applied “down to” the point of environmental change, at which point, the impact on the environment is broadly stated and left largely unexplored. In this top-down approach, economic concerns receive primary attention as the source of environmental change, but little thought is directed to both the nature and consequences of the change.

By contrast, research interested in ecological outcomes tends to adopt a bottom-up approach, focusing attention on extensive and complex environmental consequences “up to” the point of economic interference (for example, see Whitten et al. 1997). This interference remains unexplored, being cast aside with such general labels as “capitalism,” “globalization,” or “development.” While research of this kind espouses the central role of economics in environmental change, it fails to account for the different kinds of economic processes and their differential impacts on the environment.

In either case, economic determinism privileges the role of capital interests in determining environmental outcomes. In so doing, however, it denies the role of the
environment in shaping economic outcomes. As we will see, changing ecological conditions and systems of feedback played a significant role in shaping the social, political, and financial outcomes for East Sumatra. Variations in soil type due to different periods of volcanism led to both gains and losses for plantation owners. Seasonal differences between lowland and highland regions affected the proliferation of pests as the Dutch attempted to expand rice production to feed the colony (Pelzer 1978). The changing relationship between soil quality and the caloric value of native root crops impacted population growth in the concession lands. A thorough account of agrarian change in East Sumatra will need to avoid privileging economic processes over ecological ones.

British-centrism

Through the use of terms like “peasantry” and “feudalism,” the long tradition of colonial writing has exposed its Eurocentric roots (Bray 1994). There can be little doubt that the writing of colonial history has been a distinctly European endeavor. While European narratives of colonial history have dominated, other perspectives (indigenous, subaltern, postcolonial, nationalist, and post-nationalist) have had to contend with a pervasive discourse that sees European history as the essential one, and sees colonial dominance as a reification of European superiority, even if such dominance was misguided. The precedent established by this discourse has led Chakrabarty (1992) to question whether it’s possible for anyone to write a non-Eurocentric colonial history.

In addition to Eurocentrism, literature on Southeast Asian environmental history suffers from a latent British-centrism. Two tendencies have emerged. The first and most overt follows the assumption that British histories of India, Burma, and Malaya serve to
explain the vast majority of colonial environmental experiences. Thus, we need only look to the rubber plantations in Malaya to understand what happened in Sumatra. Likewise, we can explain the experience of swidden cultivators in the Sumatran lowlands by exploring the plight of the southern Burmese (for example, see Furnivall 1948).

European colonies varied greatly and yet, because relations of superiority and inferiority were often quite similar, colonial writers have tended to treat the European encounter with the other in monolithic terms (Loomba 1998). Following this first tendency, unique environmental histories of the Dutch East Indies (DEI), French Indochina, Spanish Philippines, and Portuguese Malaya may be overlooked.

The sheer volume of literature on the British colonial experience leads to the second tendency: describing the experiences of other colonies using British terms and metaphors. In *Netherlands India* (1939) and *Colonial Policy and Practice* (1948) J.S. Furnivall provides a painstakingly thorough account of the political, economic, and social organization of the DEI. With extensive professional experience in both Burma and Java, Furnivall offers a detailed comparison between the two colonial approaches, identifying key philosophical differences and consequent outcomes. Despite his attempt to show unique characteristics of the DEI, by framing his analysis within the prototypical example of the British Empire, Furnivall cannot escape from British colonial discourse. Dutch administrators are described in terms of their British equivalents, while the characteristics of Javanese subjects are easily compared to their supposed Burmese counterparts. In this way, the distinctly British vocabulary of empire unifies and simplifies the discussion, all the while masking the small, unique, but significant differences.
This thesis is concerned with the small and unique. As difficult as it may be to escape the confines of British colonial discourse – and Eurocentrism more generally – I will try to maintain sensitivity to the legacy of our terminology.

_Colonialism started environmental degradation_

Many critical environmental histories make the assumption that ecological degradation did not begin until the arrival of Europeans. In this myth, the natural environment is portrayed as a pristine and unmolested space, harboring both diverse animal and human life. Native societies are portrayed as existing in a state of harmonious equilibrium, taking and returning energy to the larger ecosystem in sustainable fashion (Moniaga 1993). While some histories reflect explicitly on this conception of a prelapsarian Eden (for example, see Ratzel 1896), most accept it implicitly. Implicit acceptance is frequently found in descriptions of the arrival of capitalism and European culture, in the “opening up” of “virgin” forest to exploitation, the conversion of “empty land” to “productive use,” and in the “civilizing” of wilderness.


Though research of this sort is limited in the DEI, throughout this thesis, I will argue that East Sumatra experienced extensive environmental transformation (whether or not it falls under the more qualitative heading “degradation”) prior to the arrival of
Europeans. By the time Col. John Anderson arrived in Sumatra in 1823, a fast-growing form of saw grass known locally as Alang-alang (*Imperata cylindrica*) was widespread in the highlands (Anderson 1826). We now know that Imperata takes over fields that have been burdened by intensive swidden cultivation. If plots are cropped for too many seasons before fallowing, or are not allowed enough time to fallow before reuse, nutrient levels in the soil may deplete below the point where forest will regrow. Without competition from pioneer tree species, Imperata takes over (Whitten et al. 1997), greatly restricting the amount of available land for future cultivation. From the standpoint of subsistence cultivation, over-cropping to the point of nutrient depletion constitutes degradation.

*European discourses of conservation*

Recent work on imperialism and Nature has traced the development of conservation discourses in late 19th century Europe (for example, see Kumar, Damodaran, and D'Souza 2010). This movement towards a greater awareness of the natural environment emerged as a reaction to the externalities of early industrialization: polluted rivers, polluted air, cleared forests, and overcrowded living conditions in Northern Europe fanned the flames of protectionism. For many authors, environmental legislation in the colonies came about as a result of this European discourse, exported to the colonies as part of the imperial project. The creation of national parks, in particular, is attributed to enlightened European intervention into the destructive and unsustainable behaviors of the native population (Beinart and Hughes 2007).

This preoccupation with the European “invention” of conservation hides two important points. First, implementation of conservation measures in the colonies was
inconsistent at best, particularly when capital interests were involved. The Clearings Ordinance established by the East Indies government in 1874 was intended to restrict the cutting and burning of forest by native swidden cultivators (Furnivall 1939). The ordinance was hailed as a milestone in the protection of the natural environment. However, the Clearings Ordinance placed little restriction on forest cutting taking place under the earlier Forest Regulation of 1865, a measure that opened up large tracts of land to private (mostly foreign) logging enterprises. The combination of the 1865 and 1874 ordinances ensured that companies logging for profit could continue to operate, while natives were forced to abandon swidden for the sake of “environmental protection.”

Second, by focusing on the “European-ness” of conservation discourses, we deny indigenous conservation practices already in place when the colonists arrived. In the 18th century, villages in South Sumatra shared territory with the Sumatran tiger, notorious at the time for stalking and killing unsuspecting travelers. Despite the threat to life and limb, animistic beliefs prohibited the killing of tigers. When the Dutch began to expand pepper operations in South Sumatra, the government offered a bounty for dead tigers. In time, the financial incentive overcame the cultural practice, and tigers came to be hunted extensively (Marsden 1784). Today, with fewer than 400 remaining in the wild, the Sumatran tiger is on international endangered species lists (World Wildlife Fund 2011).

These four approaches – what I have labeled shortcomings – lead to research that denies or diminishes the agency of certain actors in the colonial space. Economic determinism fails to acknowledge how ecological conditions and systems of feedback affect social outcomes. The myth of a pure and primeval nature denies long and potentially tumultuous histories of ecological transformation at the hands of non-
Europeans. A focus on Western discourses of conservation denies those same non-
Europeans the capacity to invent and maintain sustainable practices. Meanwhile, a
tradition of British-centricism in the literature ensures that all imperial administrators are
cast as simple variants of the English, colonial imperatives are compared to British ones,
and all colonial subjects are understood within the familiar characteristics of Indian,
Chinese, or Malay.

The agrarian change that took place in East Sumatra lies at the confluence of
cultural, political, economic, and ecological processes. In this context, any adequate
history of agrarian change will need to account for non-economic imperatives, extensive
environmental transformation prior to colonization, and a long history of mutual
adaptation between nature and cultural practice. In the following sections, I will outline
an alternative approach to address these concerns.

An alternative approach: the tradition of cultural and political ecology

Integrative research of this kind faces two interrelated problems: missing agency,
and linear causation. The problem of agency arises from the tendency to see certain
actors as “driving” environmental transformation, while others are cast as passive or
reactive. While uneven relationships of power between actors can and do exist, the
literature exhibits a strong tendency to exaggerate the agency of the “powerful” (and
diminish the agency of the “weak”) to an unrealistic extent.

The problem of linear causation arises from missing agency: so long as only
powerful actors can initiate change, it is those actors that determine all outcomes. Thus,
causation flows from the powerful to the powerless, from the active to the reactive, from
human to environment, from colonizer to colonized. Effects have difficulty flowing
upstream. It should be no surprise that this “topography” of causation in colonial research mirrors the topography of European colonial discourse.

*Cultural ecology*

In the 1960s and 70s, work in what came to be known as cultural ecology attempted to address these twin problems. In an effort to better represent the role of Nature in determining human outcomes, cultural ecology sought to associate the varieties of cultural expression with the differences we see in the physical environment (Netting 1986). Two primary assumptions guided this approach:

1. The survival of any society is dependent on its ability to extract energy from the environment
2. The cultural forms of that society are largely determined by the mechanisms needed to extract this energy

Thus, cultural behavior is driven by the need to survive. Each behavioral form is understood as an adaptation to unique environmental conditions: for example, the time and effort needed to “extract” a resource, the temporal and spatial distribution of that resource, and the long term environmental consequence of extraction. While early interest in cultural ecology focused on the forms of human adaptation to the environment, later research took greater account of ecological adaptation to human actions.

Critiques of cultural ecology center around its tendency to slip into environmental determinism: in an effort to give agency to Nature, many felt that cultural ecology’s focus on adaptation diminished the role of human agency (Robbins 2004). This
determinism meant that cultural ecology became a useful tool for explaining “how things are,” but was poorly equipped to predict the consequences of human actions. With the growth of the environmental movement in Europe and North America in the 1970s, researchers sought analytical tools that could be used to evaluate the consequences of environmental policy. Cultural ecology’s contribution – reinstating Nature as a missing agent – was a necessary, but insufficient step.

Political ecology

Political ecology emerged in the 1970s largely as a response to this need (Robbins 2004). For political ecologists, the interaction of society and environment can be understood in terms of nested inter-relationships of power. In this view, the behavior of human actors still involves environmental adaptation, but is also contingent on the interests of other human actors with varying capacities to impose their will.

Consider the relationship between a farmer and her choice of crop. From the standpoint of cultural ecology, her choices are constrained by soil and climate, labor inputs, and caloric outputs. Her behavior is driven by survival and shaped by flows of energy between her and the environment. For the political ecologist, we must add significantly to this list of contingencies. Not only are we interested in environmental conditions and energy flows, but also the interests of her extended family, her landlord, the proscriptions of colonial law, and the price of various commodities on the world market, to name a few.

Two landmark publications in the tradition of political ecology offer a starting point to the approach taken in this study. In “Silent Violence,” Michael Watts explored the bidirectional relationship between environmental change and pastoralism in
northern Nigeria (1983). While his study focuses on the pastoral practices in response to drought conditions in the 1970s, Watts identifies a chain of causation responsible for the drought that started with colonial land policies under British rule.

In “The political economy of soil erosion in developing countries,” Piers Blaikie (1985) proposes a socio-environmental view of land degradation that incorporates material and biological processes with social and political practice. Blaikie adopts an model that accounts for both spatial and non-spatial actors, attempting to understand practices and processes in place, yet still account for the relationship with general conditions (like government policies and market forces) that are not spatially situated.

While the explosion of research in political ecology has found abundant fuel at the intersection of environment and power, one emerging critique of political ecology argues that research has focused on the social relations of power to the point of ignoring ecological contingencies (Vayda and Walters 2004). By this argument, the study of political ecology today focuses too much on the political, too little on the ecological, and only superficially on the vast network of linkages between the two. While cultural ecology’s lack of human agency was motivation for the emergence of political ecology, political ecology has subsequently discredited the agency of nature. The privileging of human processes has given rise to the same linear causation described earlier, reasserting the social/environmental dichotomy, rather than blurring it.

Overall, this thesis takes an approach to colonial agriculture in the tradition of political ecology. However, it adopts an analytical system inspired by early work in cultural ecology; namely, a perspective that subsumes society and environment into a single, interrelated system. Markets, governments, and tenure systems may all be
hierarchies of power, but they are also flows of energy, productive niches, and networks exhibiting both competition and commensalism. The lowland rainforests of Northeast Sumatra may have been transformed by political and economic processes, but they also constrained and directed this transformation through a wide range of feedback systems. In an effort to break with traditional forms of determinism and distribute agency more evenly, this thesis attempts to reconstruct East Sumatran agriculture within a socio-ecological model.

Finally, an analysis of this kind will need to integrate agents and processes acting across a variety of scales, from global commodity markets to the labor decisions of individual villagers. Recent work in political ecology has been responsive to the need for scale-transparent approaches, with increased calls for attention to household-level economies in exploring changes to agrarian and agro-forestry practice (Zimmerer 2004). However, for many colonial histories, the mode of analysis tends to be stuck at the scale of states, institutions, and broad social movements. Thus, the familiar shape inscribed by European imperialism has at its vertices acts of war, land legislation, trade agreements, capital liberalization, inter-ethnic violence, and nationalist rebellion. The social and environmental changes we are interested here cannot be discerned at this scale, even though these changes affect – and are affected by – state actions, institutions, and social movements. My goal in adopting a socio-ecological approach is not to ignore the standard narrative, but to incorporate its actors and processes into a more expansive and inclusive universe of participants.

The next chapter describes how we operationalize the socio-ecological approach through the concept of an agro-ecological community.
For example, Furnivall uses common agricultural practices, settlement patterns, and methods of labor organization as reason to assume widespread similarity between southern Burmese and Javanese rice farmers (1948). However, political and social structures differed considerably: while Javanese villages were hierarchically distributed within a matrix of competing kingdoms (Ricklefs 1993), Burmese communities operated in general statelessness (Harris 1972). It is reasonable to assume that these political differences would have contributed to different social outcomes in the colonial context. While Furnivall’s assumption of similarity between Burmese and Javanese allows him to isolate the differences in colonial policy as a key variable responsible for the different outcomes, it is not at all clear that the different outcomes weren’t more closely related to the different forms of political organization.

One could argue that these approaches ensure that the only actors with agency in the colonial environment are Europeans.
Chapter 3. Agro-ecological communities

“Any form of agriculture represents an effort to alter a given ecosystem in such a way as to increase the flow of energy to man [sic].”

— Clifford Geertz in Agricultural Involution, 1963

In this thesis, I start from the premise that all agriculture takes place within the context of an ecosystem. Among its many definitions, ecosystems have been understood as arrangements of biological and non-biological entities participating in the accumulation, transformation, and distribution of energy (Matson, Vitousek, and Chapin 2011). In any ecosystem, energy takes various chemical and physical forms. Biological organisms acquire energy through photosynthesis, predation, and metabolism, transforming this energy into growth, movement, and reproduction. In an effort to facilitate survival and reproduction, organisms adaptive to both other organisms and the non-biological environment. When such behavior is exhibited in the relationship between two species, it has traditionally been classified as one of competition, commensalism, mutualism, or parasitism (Matson, Vitousek, and Chapin 2011). This adaptive behavior takes place in response to the environmental conditions within a given geographical space. For any given species, these spatially defined conditions are referred to as its “niche.”

Ecologists use the term “community” to describe groups of plants and animals that are behaviorally related to each other for the purpose of survival and reproduction. In Sumatran secondary forests, the branches of the Macaranga tree are often home to
colonies of the *Cremastogaster borneensis* ant. While the tree provides shelter for the ants, it is thought that the ants benefit the tree by cutting through the young stalks of climbing vines. The ants, meanwhile, maintain colonies of scale insects in the branches and leaves of the Macaranga. The scale insects suck sap from the tree and excrete honey-dew, on which the ants feed (Whitten et al. 1997). In this example, tree, ant, scale insect, and climbing vine occupy the same community. Each species may belong to other communities, while other species may play a part in this one, demonstrating the difficulty in establishing strict boundaries to any community. Nevertheless, ecologists usually define communities so that the relationship between species within the community is of greater significance than between species of different communities.

From the assumption that agriculture takes place within the context of an ecosystem, it follows that the cultivation of any particular crop establishes certain ecological communities and competitive relationships. Meanwhile, the intervention of the farmer – an effort to alter the flow of energy – can be understood as niche modification. While this ecological understanding of agriculture is useful for describing the relationships of survival between biological entities, our study seeks to describe significantly more than shifting flows of energy. Though much of agricultural practice involves directly altering the energy balance of a biological system in favor of the farmer (for example, tilling the soil to distribute nutrients, or cutting trees that shade a plot), those practices are inspired, maintained, and constrained by *flows of knowledge* and *relations of power*. An ecological description of the rice field may be sufficient to explain how a rice seed turns into a rice plant, but it can’t be expected to explain how market forces, political unrest, land laws, and religious beliefs led to that seed being planted in the first place.
I need an analytical framework to conceptualize entities, processes, and relationships across a variety of traditional categories (economic, cultural, and ecological) and a variety of scales (from household to globe). In this chapter, I will develop the idea of an “agro-ecological community”: a conceptual framework for describing those entities, processes, and relationships involved in the production of a particular agricultural product.

Components

An agro-ecological community comprises the following components:

- Agents
- Conditions
- Processes
- Imperatives
- Resources

Agents

Agents comprise all plants, animals (including humans), and institutions that have a direct capacity to modify conditions with respect to cultivation. Consider wet rice production. While certain agents, like pests, usually have a single role (that of consuming the plant), others may have different roles depending on context. For example, a human may be an indentured servant, a tenant, or a landlord depending on time and place. While I use the term “agent” to denote the organism, “role” is used to identify the organism’s behavior with respect to cultivation. As with ecological communities, each agent may participate simultaneously in multiple agro-ecological communities: a farmer
who intercrops wet rice with onions is not only participating in both communities, but is encouraging the interaction of agents between communities through spatial juxtaposition.

In the case of wet rice cultivation, the agro-ecological community would include the following agents and roles:

- Rice (*Oryza sativa*)
- Herbivores that eat the rice, including rats, birds, and the brown planthopper (*Nilaparvata lugens*)
- Animals that predate on the herbivores, including birds, spiders, and humans, among others
- Detrivores like *Diptera*, *Coleoptera*, and *Collembola* that consume dead animal and plant matter, supplying nutrients for rice growth
- Tenants and laborers who make decisions about cultivation, prepare fields, plant rice, supply water, deter herbivores, harvest, supply rice to markets and landlords, and consume rice
- Landlords who supply rice to markets and distribute land to tenants

Depending on where this community is located and the historical context in which we’re interested, other agents may play a part, including:

- Village chiefs who adjudicate in disputes over access to land and represent village interests to colonial officials
- Agricultural collectives that provide loans to farmers and organize labor for large-scale irrigation works
Government institutions that established land laws and agricultural policies, collects taxes and tariffs, and assemble corveé labor

- Banks and lenders
- Regional and global markets for rice

Figure 2 shows a simplified representation of wet rice production. Agents are represented by thick-bordered boxes.

**Conditions**

In an ecological niche, agent behavior is shaped by both biotic and abiotic conditions. For example, the conditions suitable for plant growth on the forest floor include chemical properties of the soil, access to water, availability of sunlight, and the distribution and behavior of other species in the community, like herbivores and pollinators. While the concept of an agro-ecological community similarly acknowledges both biotic and abiotic conditions, other (traditionally non-ecological) circumstances must also be included in our analysis.

The farmer’s decision to plant rice depends on access to land, availability of labor, agricultural policies, cultural traditions, and know-how. Each of these factors can be understood as a “condition” impacting the outcome of rice production. Conditions can be (1) necessary for particular behaviors, (2) sufficient, (3) beneficial, or (4) detrimental. While know-how and a cultural tradition of rice farming may be beneficial conditions for planting rice, access to land and availability of labor are both necessary.

The relationship between agents and conditions is bidirectional. While agents behave in response to conditions, agents also affect conditions, a process in ecology
known as niche modification. At times, this modification is performed directly and with specific intent; for example, fertilizing a field to increase yield. At other times, such modification is indirect and/or unintentional; for example, destroying fish stocks downstream through nitrate runoff. The reflexive relationship between agents and conditions can lead to systems of positive and negative feedback.

Conditions adhere within defined spaces. However, the spatial boundaries of these conditions in our analysis need not be congruous: for example, the availability of labor necessary for tobacco cultivation may be far less extensive than the land concession that grants such cultivation, or the climatic conditions that enable tobacco growth. Thus, the set of conditions relevant to a field of rice includes all conditions within the space of the field and all macro conditions to which that field is subject. A similar understanding is employed in traditional ecology. Species are understood to respond not only to environmental conditions peculiar to their niche, but also to geological and atmospheric conditions that span ecosystems.

In Figure 2, the conditions involved in wet rice production are represented by rounded rectangles.

**Processes**

Processes are the interactions that relate agents to conditions, and agents to other agents. In our wet rice example, the list of processes might include, among others:

- Cultivating and harvesting – actions taken by a laborer with respect to rice
- Land and paddy allocation – actions taken by landlords and village chiefs to make land available for cultivation
• Rainfall and plant growth – relates the rice plant to water and nutrient levels
• Consumption and predation – relates various carnivores to rice-eating herbivores

In this agro-ecological model, processes are the mechanisms by which conditions change. Processes can also affect the resources of an agent (see below). Any given agent or condition may be involved in multiple processes: for example, a tenant may be involved in planting, harvesting, tilling, fertilizing, paying rent, and paying tax. Likewise, soil conditions may be affected by human-initiated processes (like fertilization) or natural ones (like erosion). Processes may change over time, and in some cases, reverse the direction of influence: during good years, tenants pay rent to landlords, but during bad years, landlords subsidize tenants (Scott 1976).

In Figure 2, arrows represent the processes that link agents and conditions.

**Imperatives**

In ethology, species behavior is generally attributed to a small set of basic motivations; for example, sex, nourishment, threat avoidance, and social contact (Wilson and Keil 2001). To represent the social causes and consequences of agrarian change, I will need to account for a more expansive set of motivators. In this agro-ecological model, imperatives drive agent behavior. An imperative can be thought of as a need (like food) to which end the agent expends resources (like labor) and initiates certain processes (like cultivation). While each agent may have more than one imperative, the set of imperatives will also vary between agents. For the most part, imperatives will be modeled for human agents only: while it is possible to conceive of imperatives for a
plant, such detail will introduce complexity that may not be beneficial for the task at hand.

I have included imperatives in our understanding of agents because changes in environmental, social, and political conditions can alter the imperatives of agents, and such alterations can significantly change the outcome of agents and conditions. For example, under traditional circumstances, a village chief may seek social credibility as a strong and just leader. Under colonial circumstances, the same chief may present himself to Dutch administrators as an amenable subordinate willing to accept territorial and political compromise in exchange for financial gain. In this case, the nature of the imperative has changed, and with it, the processes engaged in have changed as well.

In other cases, the same imperative may lead to divergent processes. Different farmers may select different cultivars or different cultivation strategies for reasons that cannot be distinguished solely by environmental conditions. Thus, the same imperative, shared between agents, does not guarantee that each will act the same way.

**Resources**

A resource is a property of an agent that allows the agent to act with respect to imperatives. Resources can be expended and acquired through processes. In the case of a rice farmer, labor is one such expendable resource. To start the process of cultivation, a certain quantity of labor must be used. In economic terms, this labor, once dedicated to cultivation, cannot be utilized for other purposes. Thus, decisions about where and when to commit labor are frequently tied to calculations of the potential benefit from such sacrifices.
Agents can also acquire resources through certain processes. The act of harvesting supplies the farmer with rice which can be eaten, stored, exchanged in the marketplace for other goods, or used as payment for labor. While some resources are limited and expendable (like rice), others are replenished regularly (like labor), and others do not deplete (like knowledge).

My objective in representing resources is not to model the cost/benefit calculus made by agents, but to show the relationships between changing circumstances and the kinds of “capital” available to agents. For example, in a non-currency economy, monetary resources lack value. When the government institutes a cash-based head tax, it becomes important to have monetary resources. With the rising importance of cash, agents must seek new processes in which to engage (like wage labor). Such processes will demand additional expenditures of labor that cannot be used for other tasks. It is this multi-agent and multi-condition interdependency that I seek to represent.

Figure 2 shows a simple agro-ecological community for wet rice production. Within each agent box, imperatives are shown in the top row. Resources are shown in the bottom row.
Model expectations

While the framework for this model borrows from ecology and systems theory, it is intended to provide qualitative – not quantitative – insights. One should not expect that a model of an agricultural system using this framework will be able to assess, for example, the impact of a 5% increase in the price of rice on the population of rats.

However, such a model should be able to evaluate (1) whether some impact is expected,
(2) the direction of that impact in positive/negative terms, and (3) the agents, processes, and conditions involved in the chain of causation.

Clearly, the number of possible agents, conditions, and processes that can be included in such a model quickly becomes unwieldy. For the purpose of this thesis, the models will be organized around the cultivar and the farmer/laborer. This relationship forms the core of our analysis: while peripheral actors and conditions will greatly shape this relationship (even to the point of destroying it) our focus is less on the behavior of these actors *per se* than the effect of their actions on agriculture. For example, government agents like the Resident (colonial governor) may have numerous imperatives that do not significantly impact farmers. As such, I will commit a higher level of analytical detail to the imperatives, resources, and processes, affecting the farmer and the cultivar, than to other actors in the system. To avoid untenable complexity, the models developed here will be somewhat selective in the choice of agents, resources, and processes described.

**Other approaches**

Two other “ecological” approaches to agricultural systems are worth mentioning here. In *Rice and man* (1972), Lucien Hanks develops the concept of a “holding.” Similar to an ecological niche, a holding is “the totality of relationships of a given species ... to an environment partly or wholly altered by that species for the purpose of survival” (Hanks 1972, 45). While the concept of a holding shares many of the ecological assumptions inherent in the agro-ecological community developed here, Hanks did not extend holdings to account for political or economic agents and processes.
In *Swidden systems and settlement*, David Harris distinguishes between natural ecosystems and “ecotypes,” or “man-modified ecosystems” (1972, 245). Agriculture, Harris argues, can be understood as an ecotype: a kind of ecosystem in which humans are the dominant agent responsible for niche modification. While Harris acknowledges that human agency makes ecotypes analytically distinct systems, like Hanks, he does not extend any systematic understanding of ecosystem into the realm of the political or economic.

Both holdings and ecotypes are insufficient frameworks for the task at hand. In order to better understand the variety of influences shaping agricultural change in the colonial context, this thesis will necessarily scrutinize the social spheres of politics and economy, drawing connections between those traditionally social realms and ecological ones. The agro-ecological model developed in this chapter is an attempt to provide a framework for such an analysis.

---

4 While it may be possible to argue that all human motivations can be dissolved into the same rudimentary urges attributed to animals, the agro-ecological model described here makes no attempt at such reductionism.
Chapter 4. The Sumatran east coast

Figure 3: Postkantor and monument to Jacob Nienhuys in Deli, 1910 (Courtesy of KITLV/Royal Netherlands Institute of Southeast Asian and Caribbean Studies)

The town of Deli, seat to the Residency and a vibrant market to the plantations during the colonial era, is now the bustling city of Medan. This modern city of 2.1 million stretches north and south along the Deli River, and east and west into the former plantations of the Deli Company. Under the homes, shops, and mosques of southwest Medan lies the soil that nurtured Jacob Nienhuys’ first crop of experimental tobacco. And in the center of town, the old headquarters of European banks and plantation
companies still overlook the same busy intersections. Their functions may have changed but their white-painted and colonnaded facades have stayed much the same.

The main road east from Medan follows the old Dutch railway through the plantations of the East Coast, traversing first tobacco, then rubber and oil palm. At regular distances, dusty tracks turn off to the north and south; access into the plantation for workers and equipment. As the road arrows east, there is no trace of the dense and diverse jungle that once covered these lowlands. The horizon is distant and level, formed by the uninterrupted crowns of a million cloned rubber trees. The road itself is flat and straight, rising up only briefly to cross the wide Sungei Ular (Snake River), its meandering days now gone thanks to high, Dutch-era levees. Roadside villages dot the journey with names that speak to history and place: Tanah Merah (“red earth”), Sungainipah (“river of nipa palms”), Tanah Jawa (“Java land”), and further into the plantations, Chinakasih (“Chinese gift”).

Before reaching the coast, the road and railway turn south, arriving at Tebing Tinggi. There is perhaps some irony in its name: Tebing Tinggi, or “high hill,” sits a scant 11 m above sea level. A city of 135,000 with a long history of nationalist and inter-ethnic tensions, Tebing Tinggi retains a sizeable population of Chinese and Javanese descendants to this day. From here, the road narrows as it begins its slow climb towards the southern plantations. Along the way, it encounters other expatriates: coffee from Africa (by way of Java), cacao from South America, and tea shrubs from India dot the landscape in estates clustered throughout the foothills, taking advantage of cooler temperatures. Giant mahogany trees line the road up to Siantar, the gateway town to the highlands around Lake Toba. Planted by the Dutch to shade the asphalt road from the
tropical sun, some of these majestic trees still stand, despite the ballooning price of their timber.

Here in the plantations around Siantar, the railway ends, and with it much of Europe’s historical influence. As the road winds up the hill, we leave the predominantly Malay lowlands and enter the traditional homeland of the Simelungun and Toba Batak people. Place names change. Customary dress changes. Churches emerge as mosques ebb. Though Indonesian is now widely spoken, in the markets and coffee houses on the road ahead people still engage each other in the Batak language. At the top of the hill the road finally crests the caldera edge and reveals the sudden panoramic splendor of the lake. It is here along this ridge that the land of the highland Toba Batak begins, and the formal Dutch residency ends. Although thousands of Dutch soldiers crested this ridge in the 80 years of colonial rule, no plantations ever took root beyond this point. Though agricultural practices transformed the ecology and culture of the lowlands, beyond this ridge Toba Batak still cultivate wet rice in the same way they have for hundreds of years. While much of the indigenous ethnic identity among lowland societies has been lost to history, highland Batak have retained a strong sense of place and community, despite participating in the second largest ethnic diaspora in Indonesian history. These differences in topography, society, and history between lowlands and highlands have created what Reid describes as two distinct Sumatras (Reid 2005, 5).

In this chapter we will begin with a survey of the physical geography of the region: its history of volcanism, topography, biology, and climate. From the physical landscape we will turn to the social one, exploring briefly the four native societies that inhabited the area prior to 1863. Figure 4 shows a physical map of the region.
Before embarking on this exploration, let me make a brief note about boundaries. Our area of study – what would become the plantation lands of the Deli Residency – is not the easiest region to define. Indonesians refer to this as North Sumatra (Sumatera Utara) and today this area is part of a state by that name. We are only interested in the eastern half of this state, however. Dutch and other European writers referred to this region as the Sumatran East Coast, even though the use of this term in a geographic sense selects much more than we want. If we stick to cardinal terms, we are not helped by the alignment of the island along a northwest-southeast axis. “North Sumatra” or
“northern Sumatra” implies the inclusion of Aceh. “East Sumatra” suggests we’re interested in Palembang and other areas to the south. “Northeast Sumatra” doesn’t make much sense. Meanwhile, if any of the native societies had a term for the whole region, they likely disagreed. Referring to the area as the “plantation lands” smacks of Eurocentrism. Going forward, I will refer to it using various terms, either to select specific meanings or simply to reflect the geographical preference of the historical source. In all general cases, the use of “East Sumatra” will refer to the area under the Dutch Residency by that name.

Physical geography

Volcanic history

Situated along the boundary between the Eurasian plate and the Australian plate, Sumatra owes its existence to a long history of volcanism. Approximately 120 miles off the west coast, the Australian plate, moving northeast, subducts under the Eurasian plate on which Sumatra is located. This plate boundary continues to be the source of considerable seismic activity: on December 26, 2004, it produced a magnitude 9.1 earthquake that resulted in the Indian Ocean Tsunami. The island of Sumatra is the result of over a million years of volcanic activity along this boundary. Sumatra began as a string of islands in a volcanic island arc, typical of subduction zones. Continued magmatic activity resulted in the merging of these islands into a single land mass. Sumatra is now the sixth largest island in the world at 473,481 square kilometers.

While volcanic eruptions have played a role throughout Sumatra’s history, one event stands above the rest in its effect on the island’s physical geography. The third and largest eruption of the Toba volcano, approximately 70,000 years ago, released an
estimated 2800 cubic kilometers of ejecta, making it the largest eruption in the last 25 million years (Gathorne-Hardy and Harcourt-Smith 2003). Approximately 2000 cubic kilometers of ignimbrite spread over the ground as pyroclastic flows and 800 cubic kilometers fell as ash. While the ash fall over Southeast Asia averaged 15 centimeters deep, 6 meter deposits of “Toba tuff” in India have been found. In and around the Toba caldera on Sumatra, the ash layer reached 600 meters in depth (Whitten et al. 1997).

While the consequences of the Toba eruption and the ensuing volcanic winter on Southeast Asian plant and animal life are significant, the transformation of Sumatran topography is of primary interest here. The broad alluvial plain that inspired European dreams of plantation lands was formed from the erosion and subsequent deposition of vast quantities of material ejected by Toba.

Later volcanism would shape colonial outcomes as well. Two volcanoes, Sibayak (2212 m) and Sinabung (2460 m) overlook the alluvial plain of the Deli River in the northern plantation zone. Until the eruption of Sinabung in September 2010, both volcanoes had been inactive for at least 400 years (Global Volcanism Program, Smithsonian Institute 1). But prior to historical records, eruptions from these mountains released dacitic and andesitic lahars into the lowlands, reshaping the landscape and soil chemistry of the alluvial plain (Pelzer 1978). The sharp line between the acidic (liparitic-rhyolitic) soils of the Toba ash fall and the basic soils of later eruptions would have far reaching consequences for European planters and indigenous cultivators alike.

Topography

Though it is the physical geography of the East Coast that seems most relevant to colonial plantation agriculture, the topography of North Sumatra as a whole greatly
shaped the imagination and decisions of Europeans. It was as much the surrounding landscape of mountains, deep ravines, and lush jungle as it was the lowland swamps that determined material outcomes in the plantation belt. Prior to 1863, the landscape of Sumatra shaped (and was shaped by) a variety of native societies.

The topography of the East Coast and surrounding areas shown in Figure 4 can be divided into three distinct regions by elevation: alluvial plains, piedmont, and highlands.

Extending 30 km in width, the alluvial plain has been expanding ever since the eruption of Toba through the fluvial transportation and deposition of Toba tuff from the highlands. George Windsor Earl, an English explorer and author, wrote in 1853 that the alluvium was too deep to allow accurate determination of the age of underlying strata (1853, 18). Indeed, it was not until the late 19th century when planters struggled with soil chemistry and erosion issues, that the significant funds needed for a thorough geological survey were finally garnered. Mangrove swamps occupy much of the coastline, while nipa (palm) swamps follow meandering rivers inland from their mouths on the Strait of Malacca. Heavy silting prevents ships from navigating most of these broad rivers. Beyond five to 10 kilometers inland, lowland forests would have been widespread in 1863, providing near complete coverage of the plains accept in those areas cleared for villages and agriculture. The land here is exceptionally flat, broken occasionally by old beach ridges (pematang): the remains of former shorelines (Pelzer 1978). While dense forest and poorly drained soils were common in the alluvial plain prior to European arrival, planters and their laborers worked for decades clearing land, diking rivers, and building drainage canals. In the end, the alluvial plains of the East Coast would become one of the most transformed natural spaces in the DEI.
From an elevation of 50 m up to 500 m, the plains transition into rolling hills with deep ravines cut through by fast-flowing rivers. Here, the effect of water is still rapidly transforming the landscape, eroding the light tuff material from Sumatra’s history of volcanism. In the northern part of the region, the transition from alluvial plains to mountains is sudden, with the Karo highlands overlooking the lowlands from atop a plateau made from the ejecta of Sinabung and Sibayak. These later eruptions sent lahars down into the plains, filling the deeply-cut valleys in the process (Pelzer 1978). Rivers have since begun to cut through this later material, depositing dacitic and andesitic alluvium along the way, in a process that is very much ongoing. To the south, the transition between plains and highlands is more gradual, with rolling hills giving way to broken terrain and deep valleys, some descending 200 m below their ridgelines. The light parent material has produced well-drained soils and low water tables (Lekkerkerker 1916). Towards the southwest, the land rises along the flank of the Toba volcano, eventually reaching the edge of the caldera wall and the Lake Toba watershed.

Above 500 m, a high plateau interspersed with mountainous ranges runs the length of the island. In the northern part of our study area, the eastern edge of the Karo plateau sits at 1500 m, a boundary between the Lake Toba watershed and that of the Strait. From here the plateau slopes gradually down to the South towards Lake Toba, while rising to the north into mountainous terrain where it reaches its highest point at Gunung Bandahara (3012 m). In the south, the caldera created by the third eruption of Toba is now Lake Toba, a ring-shaped lake approximately 100 km along its northwest-southeast axis, and 30 km wide. In the middle lies the island of Samosir, once part of the volcano’s cone that collapsed into the magma chamber during the eruption. Since then, Samosir has continued to rise on a resurgent dome of magma. Around the rim of
the caldera, steep slopes descend towards the lake, particularly to the north and west where the rim rises over 800 m above lake-level. Rivers that flow into Lake Toba cut deep ravines through this escarpment, revealing much of the Tertiary and pre-Tertiary basement rocks (Pelzer 1978). These steep valleys and the narrow strips of shore at their outlets, would play a key role in shaping agriculture practices among the Toba Batak, the native society occupying the area around the lake (see below).

_Biology_

World Wildlife Fund (after Whitten et al. 1997) has classified the Sumatran east coast and interior into six different bioregions:

- Sumatran freshwater swamp forests
- Sumatran lowland rainforests
- Sumatran montane rainforests
- Sumatran tropical pine forests
- Sumatran mangrove forests
- Sumatran peat swamp forests

While this classification fails to account for the numerous local variations in habitat or those environments currently in transition, it serves as a starting point for our discussion of native ecology. Figure 5 shows the distribution of these bioregions. Boundaries are meant to indicate the maximum historical extent of each region: in most cases, due to human transformation, these bioregions no longer fill the area indicated.
For the purpose of this study, we will look at four bioregions involved in both traditional cultivation and plantations: freshwater swamp forests, lowland rainforests, montane forests, and tropical pine forests.

*Freshwater swamp forests* – Bounding the coast from Deli southward, freshwater swamp forests take advantage of abundant rainfall and heavy stream flow. High water tables and occasional inundation lead to eutrophic muck and mineral soils. Despite their coastal situation, these swamps are freshwater, fed by streams and rainfall,
unlike the saline mangrove forests along the coast to the north. The costs involved in transforming swamp forest into plantation land were high enough to prevent much loss of habitat in this region. However, the canal system built to drain areas of lowland rainforest produced some local transformation. Canals were constructed to drain water from swampy areas of cleared forest into the numerous lowland rivers. The effect was an increase in coastal silting and seasonal inundation, solved only through the construction of riparian levees (Lekkerkerker 1916). Such levees served to increase inundation in some parts of the swamp forest, and decrease it in others, leading to differential consequences along the shore (for example, coastal erosion).

A second form of vicarious transformation resulted from the construction of tobacco plantations. Along river banks in the swamp forests grew sizeable stands of nipa palm (*Nypa fruticans*) known locally as *nipa-atap*. The long leaves of the nipa palm were prized as roofing and siding material for the tobacco drying sheds used on the plantations (Pelzer 1978). To prevent the spread of diseases between each crop of tobacco, the drying sheds were burned down and rebuilt after each season, creating a sizeable market for the continuous harvesting of nipa leaves. The demand for nipa created a niche market for many Malay villagers well-situated to exploit these riverine palm groves (Pelzer 1978). While there is evidence that villagers cleared areas to plant nipa, clearing was never widespread, and large-scale nipa plantations never took hold.

*Lowland rainforests* – Speaking to what remains of this once expansive ecosystem, Whitten writes “the lowland forests of Sumatra are among the most diverse, awe inspiring, complex and exciting ecosystems on Earth” (1997, 189). These dense, wildlife-rich environments could be found from the coastal lowlands up to an elevation of 1,200 m. Like many tropical rainforests, the Sumatran lowland forests exhibit the
classic three-tiered canopy structure, with prominent *Dipterocarpaceae* emerging above less obvious secondary and tertiary layers. Though some lowland rainforest still exists in scattered areas throughout Sumatra, the original forest that occupied the plantation belt has been entirely removed, most of it by 1932 (Whitten et al. 1997).

As with other tropical forests, soil quality is poor despite litter production levels as high as 14.2 tons/hectare/year (van Noordwijk and van Schaik 1983, in Whitten et al. 1997). While high ambient temperatures lead to rapid decomposition of fallen biomass, nutrient demand from the living vegetation ensures equally rapid reabsorption of chemical compounds. Meanwhile, heavy precipitation tends to leach nutrients away from the upper soil horizons and into the water table. Where tree cover and litter is compromised, soil quality is quickly lost to leaching and runoff, leaving abundant aluminum and iron in hard laterite layers. The majority of north Sumatra’s soils are oxisols, though yellow-red podzols (and associated complexes) are found at higher elevations (Whitten et al. 1997, 478; Gardiner and Miller 2008).

Wherever the forest is cleared, land that is not quickly converted to agricultural use either returns to secondary forest or transitions to a grassland monoculture (Whitten et al. 1997). The emergence of secondary forest is usually due to the success of fast-growing trees (like *Macaranga*) that shade emerging grasses. If these pioneer tree species can establish a foothold – and if areas of undisturbed forest with pollinators and seed stock are nearby – slower growing hardwoods will eventually take root. In many cases, the process of reforestation may take upwards of 150 years (Kartawinata, Riswan, and Soedjito 1980).
Under less favorable conditions, a type of pernicious saw grass (*Imperata cylindrical*) known locally as *alang-alang*, may emerge. This fast-growing rhizomatous grass, commonplace on disturbed forest land, can grow to 3 meters in height and has “turned ... much of Southeast Asia into a green desert” (Geertz 1963, 10). Indeed, once the grass has established itself and crowded out all other plant species, it can be exceedingly difficult to remove. For the most part, Sumatran cultivators have made no attempt to remove the grass once it has taken hold due to the time and labor involved. The fact that *Imperata* removes land permanently from agricultural use has significant consequences for swidden cultivators: there is evidence to suggest that Sumatran societies evolved specific cultural practices to discourage the spread of *Imperata* (see Sherman 1980). Whether cleared forests return, or transition to grassland, depends on both environmental conditions and the nature of human intervention (see “Swidden cultivation” in Chapter 5).

*Montane rainforests* – Above 1,200 m, vegetation begins to change dramatically with elevation. On the lower mountain slopes, the forests resemble the lowland rainforests with dense vegetation and high biodiversity. Progressing towards the higher reaches, the forest structure simplifies, trees become shorter, and overall biodiversity tends to decrease. Indeed, the ascent from lowland to mountaintop in many ways resembles the journey from tropical to temperate climates. As Whitten explains, with respect to both appearance and plant genus, “the tops of some Sumatran mountains are very similar to ... Scottish moors (1997, 282). Though montane forests show adaptation to specific environmental conditions, highland plant communities overall exhibit greater tolerance for variation in both temperature and rainfall.
While all Sumatran forest soils are nutrient-poor, here in the mountains, the forest’s grip on fertility is even more tenuous. Topsoil erosion swiftly exposes red and yellow oxide layers wherever vegetation is removed. Heavy rainfall carves deep rills in barren soil. During the rainy months, landslides are common in the deforested valleys around Lake Toba and along the rim of the Karo plateau. Lowland rivers turn brown with the sediment during those months when rainclouds shroud the mountains.

To complicate matters further, the likelihood that disturbed land will return to forest is considerably lower in the highlands than the lowlands. Greater variability in rainfall in the highlands (see below), combined with an increase in nutrient loss to erosion tends to encourage the proliferation of *Imperata*. Though conversion to grassland can take place in all forest ecosystems, highland forests have shown a distinct vulnerability (Lekkerkerker 1916). Today, the montane forests that once covered the mountains surrounding Lake Toba have been replaced entirely with grass. We know that *Imperata* covered these hills as early as the mid 1800’s (see Anderson 1826) suggesting that the transformation from forest to grass was a consequence of native land use, possibly under a swidden regime that could not be sustained in this environment. In such a scenario, increasing pressure on rotating cultivators (through loss of land to grass) may have encouraged the development of intensive wet rice cultivation, a form of production well suited to highland topography. Though no record of this change is available, such a transition is suggested by the fact that wet rice is found only among the Toba Batak people, whose traditional area was dominated early on by *Imperata*.

*Tropical pine forests* – In the southern highlands along the caldera rim, small stands of tropical pine forest can still be found. The limited extent of this bioregion today conceals a history of widespread pine forest during the last glaciation (Whitten et al.
With little economic value in its wood and few demands on the land, these small islands of pine have survived centuries of environmental transformation, while both lowland and montane forests have disappeared. Though tropical pine forest occupies part of our study area, it does not have a direct impact on the direction of agricultural change, and as such will not be covered in detail.

**Climate**

“No country in the world is perhaps better watered than this,” wrote William Marsden about his visit to Sumatra in 1784 (Marsden 1784, 9). Indeed, the island is situated in a monsoonal system that brings precipitation in from warm seas year-round. However, a traveler to the island will experience significant differences in temperature and precipitation throughout the year depending on location.

The East Coast of Sumatra experiences southeasterly monsoon winds from May to September, alternating with a northwesterly monsoon from November to March (Pelzer 1957). During the winter months, the northwesterly winds blowing in from the Andaman Sea have the potential to bring significant rains to both coastal lowlands and highlands. The southeasterly winds during the summer months tend to bring dry conditions. Between July and September, lowland areas to the north of the region occasionally experience Bohorok winds descending from the southwestern highlands (Pelzer 1957). These adiabatically warmed, föhn-type winds can bring high temperatures and low humidity to the area around Deli, causing serious losses to tobacco crops.

Within this seasonal variation, total rainfall also varies with elevation. Generally speaking, rainfall gradually increases with elevation, up to the plateau, where rainfall decreases. Deli (19 m), located in the lowlands, receives 2000 mm of rain a year spread
across 142 rain days. Siantar (400 m), in the southern piedmont zone, receives 3000 mm of rain over 127 rain days. In the northern piedmont and at the foot of the Karo plateau, favorable topography helps bring the town of Bandar Baru (500 m) a remarkable 6800 mm of rain per year. At higher elevations rainfall decreases: Berastagi (1391 m) in the Karo highlands sees only 1900 mm. The plateau also experiences increased seasonality. While the humid lowlands will experience rain every month of the year, cultivators in the highlands around Lake Toba may have to endure 1-2 months without any rain, and up to 3 months with less than 100 mm (Pelzer 1978).

Average daytime temperature in the coastal areas is 25° C, with a yearly maximum of 32° C. Land breezes and nightly sea breezes benefit the coast, while interior lowlands experience less diurnal temperature variation. The average temperature in the highland plateau is distinctly cooler, at 12° C, with a yearly range from 5.5° C to 18° C. Areas in East Sumatra between sea level and 100 m elevation have been classified as Af (tropical rainforest). Areas above 1000 m have a Cf (humid mesothermal) classification. With variations in maximum temperature less than 5° C and a summer dry season, the full Köppen classification for the lowlands is Afsi, with Cfsi for areas above 1000 m (Pelzer 1978).

**Social and cultural groups**

With distinct differences between lowland and highland societies, the cultural landscape of Sumatra in many ways follows the topography. Unlike most of Southeast Asia during this period, the interior of Sumatra was more densely populated than the coastal areas. While a history of trade dating back as far as the 7th century (Andaya 2002) led to concentrations of people in port cities, the immediate interior lands remained
largely uninhabited, despite better connections to the outside world. In comparison, the highlands of Sumatra supported sizeable cities and a vast network of interconnected villages with only limited outside trade. This inversion of the classic settlement pattern has led Anthony Reid to call Sumatra an “inside out” island (Reid 1969, 41).

Reid offers five reasons for this unusual distribution of people: agricultural practice, health, statelessness, security, and religion.

_Agricultural practice_ – Swidden and wet rice cultivation differ in terms of the amount of land used and the caloric output per hectare. (See Chapter 5 for an analysis of swidden cultivation.) Wet rice can support large populations on limited land while swidden cannot (Netting 1986). However, wet rice requires flowing water and changes in elevation to support terracing. These environmental requirements prevented wet rice cultivation in the lowlands, effectively limiting intensive rice production to the highlands.

_Health_ – With cooler temperatures and less inundation, highland areas were less suitable for mosquitoes and, consequently, experienced a lower incidence of malaria than the plains.

_Statelessness_ – While coastal areas repeatedly became subject to state control, the highlands “have been miracles of statelessness” (Reid 2005, 63). These Batak societies (described below) established and maintained governance through systems of ritual and kinship, rather than institutional hierarchy. In an effort to avoid the impositions of state control, communities may have sought the relative shelter of the highlands over the oppression of the lowland states.
Security – With exposure to the sea came other threats. Coastal communities had long been a source of slaves for the Kingdoms of Jambi and Palembang, as well as for the Iranun, whose two centuries of raiding claimed 200,000 to 300,000 captives from coastal areas of the archipelago (Warren 2002). The topology of the interior may have offered significant defensive opportunities for people seeking refuge.

Religion – As Islam spread, first through coastal trade and then by way of established port sultanates, the distinction between the Muslim lowlands and animistic highlands grew. Such differences were reinforced with the arrival of Christian Europeans who came to see highlanders as “heathen,” “savage” and “backward.” These ethnic characterizations may have discouraged many highlanders from migrating to the lowlands for fear of discrimination.

Whether or not these factors led to such an unusual population distribution, the idea of distinct interior and exterior lands and people has been popular in European travelers’ tales going back to Marco Polo (for example, see Marsden 1784, Anderson 1826, and Favre 1865). This discourse of a dark, mysterious, and inhospitable interior beyond the civilizing influence of coastal trade played a key role in the imagination of the sea-faring, lowland Dutch. Such cultural and environmental dualism would find manifestation in law, social policy, and the drawing of political boundaries. It would also greatly affect agriculture.

In the following sections, we will look briefly at each of the societies inhabiting the area at the time of Nienhuys’ arrival: Malay in the lowlands, Simelungun Batak in the lowlands and southern piedmont, Karo Batak in the northern highlands, and Toba Batak
in the southern highlands\textsuperscript{8}. Figure 6 shows the historical extent of these four social
groups.

Figure 6: Map of East Sumatran social groups

Malay

Of the four social groups in the region, the Malay (orang Melayu) are perhaps the most difficult to define. Originally a mix of indigenous “proto Malays” and Indian traders, a long history of commerce between kingdoms in the region has added further complexity to Malay ethnicity through intermarriages with foreign merchants and other
indigenous groups (Warren 2002). Today, Malays are spread throughout coastal areas of
archipelagic Southeast Asia, having settled in large numbers along the Malay peninsula
and throughout the lowlands of Sumatra and Borneo. Though dialects did emerge, most
Malay speak a common language, undoubtedly formalized through the necessities of
trade. Derived mostly from Sanskrit, spoken Malay today incorporates words from
aboriginal languages, Arabic, Portuguese, Dutch, and English, a testament to the history
of global influence.

By the mid-19th century, Malays on Sumatra’s east coast occupied all levels of the
social hierarchy. Sultans occupied the top, each claiming a piece of the coast and
disputed territory inland. Within this territory, the wealthiest sultans controlled small
but active port cities, plying a trade with Acehnese sultanates to the north and British
ports across the Strait (Reid 1969). Upper class Malays occupied positions of influence
around each Sultan, while the merchant class operated trading companies in competition
with Chinese and Arab exporters. Poor Malays tended to live in small coastal villages,
relying on fishing or rotating cultivation. Most agricultural production among poor
Malays was for subsistence, though a small number cultivated cash crops in and around
the city of Deli (Lekkerkerker 1916).

Irrespective of social class, Malays were – and still are – predominantly Muslim.
Unlike the Batak (see below), Malay villages exhibited little codified social organization,
with traditions of inheritance and tenure varying from place to place. Located within the
hegemonic influence of the port sultanates, these villages were always subject to the
political whims of the throne: which throne, however, was not always clear. Villagers
were required to pay a tax on agricultural production and could be conscripted for
military service, though any given sultan rarely had the ability to enforce such demands.
While all the land on which the Malay subsisted belonged to the sultan, rarely could the
 crown make any explicit claims. It is in this superficially feudalistic society, in the
 shadow of kings impoverished by large payments of tribute and distracted by domestic
 power struggles, that the coastal Malay survived. This vacuum would collapse quickly,
 and with devastating effect.

Simelungun Batak

The Simelungun are one of several Batak social groups that occupy the interior of
Sumatra. Archeological evidence suggests that the Batak descended from Austronesian
settlers who arrived in the south of Sumatra around 2,500 years ago. Historians believe
that the northern areas of the island were settled by a mix of southern Sumatrans and
Indic agriculturalists several centuries later (Loeb 1972). The Batak can be subdivided
into numerous social groups, including the Simelungun, Karo, and Toba. While some
authors still refer to the Batak as a single collective society, ethnologists argue for
distinguishing between groups, as many (including both Karo and Simelungun) do not
wish to be associated with the Toba (Andaya 2002). Though similarities exist in language
and culture, the differences – in particular, territory and agriculture – are worth noting.

Like all Batak, Simelungun social organization (adat) follows lines of kinship.
Land and home ownership was generally passed down from one generation to the next
through male heirs, with the patrilineal family (marga) as the basic social unit. Land
could also be given from one family to another as a gift, often as part of a marriage
dowry. Agricultural plots were occasionally leased, usually to kin, and usually in
exchange for a portion of the harvest (sharecropping). Agricultural production consisted
almost entirely of swidden cultivation and forest gardens. Without access to the coast,
fishing was limited to rivers and lakes. However, the Simelungun supplemented traditional lowland livestock with pigs, forbidden among the Muslim Malay.

The Simelungun cut and burned forest for swidden plots (ladang) in the area surrounding each village. The density pressures on swidden cultivation tended to keep village size small, usually 8-16 households. Though land was typically acquired through descent, enough land was exchanged between families that any given village might consist of a mix of several marga (cite). Issues of law, land access, and security were handled by the village chief (penghulu). In turn, chiefs were organized along family lines into a hierarchical system of authority. At its apex, Simelungun political structure was capped by a council of elders consisting of members of the four “foundling” marga: Saragih, Purba, Damanik, and Sinaga. These marga were seen as the original families that gave rise to the Simelungun people, and in political matters, all four were considered equal. Marriages between these four marga led to all subsequent (and politically subordinate) marga (Andaya 2002). The distinct hierarchy of the Simelungun stood in contrast to the Malay’s loose subordination to the sultans. Though Simelungun could trace a line of political authority all the way to the council of elders, the vast majority of daily grievances were addressed at the village level by the penghulu.

Interaction between the Simelungun and outsiders was limited. Some authors report that Malay headmen occasionally sought to marry the daughters of Simelungun penghulu as a way to guarantee safe passage through Batak lands (Tideman 1922). One can assume that the extent of interaction fluctuated with trade: over the course of Sumatra’s history of resource exploitation, many valuable forest commodities have come and gone. Historians now believe that the trade in camphor and benzoin starting in the 7th century may have been the impetus for Batak moving out of the Toba highlands in the
first place. It is these pioneer groups that we now refer to as the Karo and Simelungun (Andaya 2002).

**Karo Batak**

Situated in the northern part of the study area, the geographic extent of the Karo Batak straddles the boundary between lowlands and highlands (Kipp 1990). While the highlands have always been considered the cultural homeland of the Karo, centuries of trade with Arab and Chinese merchants brought Karo down from the plateau and into the lowlands to sell forest products (Andaya 2002). Eventually, some Karo settled in the lowlands south of Deli to grow a variety of crops for export, most notably, pepper and tobacco. Indeed, Nienhuys was first introduced to Sumatran tobacco by Karo cultivators. Eventually, European planters would turn to the Karo for help with cultivation methods on the plantation. And later still, the Karo would burn down those plantations in protest.

In among the volcanoes of the highlands, cultivators enjoyed nutrient-rich soils. The settlement pattern in this region serves as a sign of soil quality. Swidden cultivators in North Sumatra were sedentary, living in established – and often sizeable – towns and villages. This pattern suggests that the rate of soil regeneration was high enough to support multiple growing seasons on the same plot, with short periods of fallow in between. In other locales in the archipelago with similar crops and cultivation methods, nomadism is commonplace (Peluso 2009). Using a swidden system more intensive than that of the Malay and Simelungun, Karo would grow a season of upland rice or cassava before switching to onions or other root crops in the following season. Rotation of cultivars in addition to fields offered the Karo a certain degree of food security. Taking advantage of cooler temperatures in the highlands, some Karo villages began to plant
orchards beginning in the early 19th century (Lekkerkerker 1916). With the arrival of Europeans, the Karo were suddenly presented with a sizeable market for mid-latitude fruits like oranges, grapefruit, and Japanese persimmon (Pelzer 1957).

The Karo system of land tenure resembled the Simelungun, with household land divided equally among sons upon the parents’ deaths (pembagin tanah). Unlike the Simelungun or Toba, land was rarely bequeathed to daughters upon marriage. The net result was that Karo villages tended to organize around a small number of marga, with daughters moving into the villages of their husbands (Kushnick 2010). Some anthropologists have theorized that the tradition of landholding through descent served to moderate the birthrate: families with too many sons might experience infighting, or be forced to send a child away as indentured labor until conditions of inheritance improved, for instance, through the death of a sibling (Kushnick 2010). Though quantitative information on highland populations is essentially non-existent, the writings of early European travelers suggest that the Karo population remained stable until the early 20th century (Reid 2005).

Like the Simelungun, the Karo political hierarchy culminated in a council of five margas (merga silima): the Karo-Karo, Peranginangin, Ginting, Tarigan, and Simbiring (Neumann 1926). While individual penghulu retained considerable power at the village level, the council oversaw matters affecting Karo society as a whole, and in particular, the relationship with outsiders. A history of conflict with Aceh to the north led to long periods of militarization among the Karo. Between 1540 and 1630, Aceh waged war with the Batak in an effort to spread Islam and take control of the pepper trade (Reid 2005). This bloody conflict would initiate a dichotomy – widely embraced by Dutch administrators – of the “evil” Arab/ Muslim/lowland Acehnese and the “good”
Indic/animist/highland Batak. Such a discourse would have bittersweet consequences for the Karo.

*Toba Batak*

Located on the island of Samosir and to the east and south of Lake Toba, the traditional extent of the Toba Batak homeland was (and still is) a densely populated network of rice farming communities. In contrast to the hierarchal structure of both Simelungun and Karo society, the loose organization of independent Toba villages has been described as one of the great “stateless” societies of Southeast Asia (Reid 1969). A history of high population density was supported by intensive wet-rice cultivation in the deep, bowl-shaped basins of these highland valleys. Even without population pressure, swidden would have been impossible here as all of the original forest had been replaced by impenetrable grassland by the time of John Anderson’s arrival in the 1820s (and potentially much earlier). Whether the conversion of forest to grass forced the Toba into wet-rice cultivation, or wet-rice cultivators migrated to the area in search of favorable topography, is open to debate.

A sophisticated kinship structure formed the core of Toba law and cultural practice. Land and home were passed down to male children. Traditionally, land could not be bought or sold, though it was occasionally bequeathed to daughters in marriage. While real property was acquired through descent, obligations of assistance (financial and social) were secured through marriage. A Toba man acquired the fields of his father, but was obligated to provide various forms of assistance to his wife’s family when required. This “affinal” relationship bound not only the husband in each marriage, but all members of the husband’s *marga* (Vergouwen 1964). Such relationships extended
beyond the life of the married couple, passing from one generation to another. Two Toba, strangers to each other, may have obligatory duties based on a marriage that took place generations past. Thus, identification of common ancestry was critical to determining appropriate social behavior: it is still commonplace for individuals who meet for the first time to sit together and trace their lines of descent, a process known as *martutus* (Vergouwen 1964).

Because land was passed through descent and always associated with males of a given family, Toba villages tended to be associated with specific families as well: a “founding” marga made up of the descendants of the chief, and a “indwelling” marga comprising the relatives of the chief’s wife, brought into affinal relationship through marriage to the chief’s male heirs (Vergouwen 1964). As the population grew beyond the capacity of the surrounding rice fields, male members of the founding marga would leave to start another village, though the new village would always retain a close relationship to the “mother” village. This two-dimensional social practice created a distinctly spatio-geneological organization of land.

With little to no supra-village hierarchy, no ruling council, and no concept of large-scale territorial division, the village chief was effectively the highest political authority (Vergouwen 1964). While it made sense to speak of a village’s land, and thus the land belonging to a marga, there was no concept of a larger “marga territory” spanning multiple villages. Villages might collaborate when large inputs of labor were required, for example, irrigation projects. But these collaborations were temporary and did not constitute permanent accords. The only institution with significant influence above the level of the village was the *Bîus*, an organization made up of marga heads and religious leaders that set some economic and social policy. Its authority was loosely
religious, and Bius festivals were held seasonally to prevent drought, epidemics, and encourage good harvests (Andaya 2002, Vergouwen 1964). Concerned that the animistic rituals taking place during these ceremonies would interfere with missionary efforts, the Dutch banned the Bius. This interference in traditional cultural activities helped incite Toba resistance in the latter half of the 19th century. In response, the Dutch would launch military expeditions against the Toba in 1877, 1878, 1883, 1887, and 1889 (Lekkerkerker 1916). These bloody campaigns did little to dismantle Toba resistance. But in time, missionaries, a money-based economy, and expanding plantations next door succeeded where Dutch rifles had failed.

In the next chapter, we will use our agro-ecological framework to integrate these physical, biological, and social agents and conditions. The end result will be an analytical model that describes native agricultural production in the lowlands prior to the arrival of European planters in 1863.11

---

5 A residency was the largest administrative unit in the Dutch East Indies below the level of the colony. Its chief administrator was the Resident, responsible to the colonial Governor General in Batavia.
6 Geographically speaking, Samosir is not an island. A small isthmus less than 1 km wide connected Samosir to the western edge of Lake Toba near the town of Pangururan. In 1906, the Dutch commissioned the construction of a canal through the isthmus to increase boat traffic (Lekkerkerker 1916).
7 Sherman (1980) has observed some recent instances of *Imperata* removal among Toba Batak villages.
8 Some authors have referred to these groups as “native” societies. While the denotation of native is generally understood to select these four groups, the implication that the people belonging to these groups had a long history of inhabitation may not be supported. The Malay in particular were a more recent addition to the cultural landscape and some Batak may have still considered them foreigners by the mid-19th century.
9 Also known as gum benjamin, benzoin was being extracted from highland forests and shipped to China for use in medicine and perfume as early as 600 A.D.
10 While I refer to these practices in the past tense, there are still communities that adhere to these traditions today.
11 Though plantation agriculture led to serious consequences for Karo and Toba Batak societies in the highlands, a full analysis of the changes to agriculture in these regions is beyond the scope of this paper.
Chapter 5. The ecology of pre-European cultivation

Prior to 1863 and the arrival of plantation agriculture, native societies in Sumatra utilized a wide variety of cultivation methods and an even wider range of cultivars. Though some commodities were grown specifically for export, the majority of agricultural production supported subsistence (Anderson 1826).
Throughout the region’s long history, pepper dominated foreign trade, with native tobacco, gum benjamin (benzoin), camphor, coconut, and copra, contributing at different times and places (Andaya 2002). These exports served to entrench foreign interest in Sumatra, with waves of traders from Aceh, India, the Middle East, China, Europe, and North America seeking a piece of the export pie. Nevertheless, until the arrival of plantations, the scale of export production never threatened the cultivation of basic staples: the demands of the global market benefited some and hurt others, but native Sumatrans continued growing traditional grains and root crops largely undisturbed (Pelzer 1957). We are interested here in the transformation of these vast, subsistence-oriented spaces by European plantations, a revolution that greatly overshadows the transformations taking place under earlier export production. As such, we will concentrate on subsistence and staple crop systems.

Figure 8 shows a map of subsistence cultivation methods by region.
Cultivation systems can be organized into three broad categories: gardens, swidden, and wet rice. In the following sections, we will provide a brief overview of the biological, spatial, and functional considerations for production.

**Gardens**

Sumatran communities practiced two kinds of garden production: forest gardens and kitchen gardens. In forest garden systems, villagers walked into forested areas looking for various fruits, vegetables, and other non-edible materials for use or sale.
Depending on what was sought after, these trips might last several days. Some plants, like cassava, were harvested wherever found. In other cases, particularly with fruit trees, villagers made note of the location and stage of each tree, returning to it at scheduled times to collect fruit (Favre 1865). For their ability to extract not just food but medicinal remedies from the forest, villagers with significant geographical and ecological knowledge are held in high esteem.

Closer to home, villagers often spread seeds in barren soil within village limits. In the case of Batak communities, these kitchen gardens were located immediately behind each house where vegetables could be conveniently harvested during meal preparation (Vergouwen 1964). After meals, food scraps were scattered on the garden as a simple compost. Despite their proximity to the house, there is little historical evidence that kitchen gardens were ever “tended to” or organized in the same way that swidden or wet rice plots were managed. The ground was never tilled or weeded, distribution of seeds was haphazard, and crops were harvested as required: whatever wasn’t used was allowed to rot and die.

As such, it might stretch our definition of “cultivation” to refer to either forest or kitchen gardens as cultivation systems. However, as a significant source of food for several lowland societies and a form of production vulnerable to changing land use, it plays an important role in Sumatran agricultural history.

**Biological considerations**

Villagers take advantage of forest gardens only where dense – and usually virgin – forest is nearby. With the removal or degradation of forests, the practice of forest gardening disappears. Degraded forests may still provide opportunities to collect certain
products (like wood or honey\(^{13}\)), but with the accompanying loss of biodiversity villagers need to travel further afield to find the fruits and vegetables upon which they depend.

When dense and pristine forest is available, however, villagers find use in a wide range of forest products. William Marsden (Marsden 1784) observed native gardeners extracting coconut, betelnut, chili, two kinds of turmeric (one solely for export), coriander, cardamom, ginger, wild tobacco, jarak (castor oil), sugar cane, ancu palm, mulberry (for silkworms), calooee (for twine), hemp (for smoking), bananas, plantains, pulses, yams, sweet potatoes, eggplants, maize, and indigo. These species were well-integrated into the larger forest ecosystem and so long as extraction did not deplete an entire area of seeds, most species could be harvested from the forest on a continuous, rotating basis.

Kitchen gardens were equally diverse, and some of the older gardens exhibited a three-tiered morphology much like the forest. Karl Pelzer (Pelzer 1978) identified a small selection of varieties in native kitchen gardens. The lowest tier contained mostly tuberous plants: elephant yam, white arrowroot, purple arrowroot, sweet potato, taro, Goa bean, bitter cucumber, snake gourd, Lima bean, Goa potato, wild yam, and sweet yam. In the middle story, one could find cassava, citrus varieties like *Citrus nobilis* and *Citrus aurantifolia*, papaya, banana, rose apple, and soursop. The top story was made up of tall fruit trees such as coconut, jackfruit, sapodilla or chico, pomelo, belinju, mango, durian, candlenut tree, tamarind, pete, stinkbean tree, and santol.

While management of kitchen gardens was generally informal, early records suggest that in some small villages (*kampungs*), kitchen gardens evolved into extensive fruit orchards. Anderson (Anderson 1826) identified *kampungs* surrounded by groves of
fruit trees, palms, and clusters of bamboo. In addition to those varieties identified by Pelzer, such orchards grew bread fruit, mangosteen, guava, pomegranate, rambutan, and cashew nut. In each case, these village gardens were characterized by multicropping and layering of cultivars. Such diversity of cultivation makes sense in a context where survival is the primary imperative for production: while export-oriented economies tend to encourage large-scale monocropping, subsistence economies reduce the risk of hunger by encouraging a wide variety of cultivars. This contrast will be explored further in Chapter 7.

Spatial considerations

Kitchen gardens are situated within easy reach of village households making them a convenient source of food during meal preparation. These gardens appear to have been used as dietary supplements rather than a source of staples. Because these gardens are within the immediate boundaries of the village, as the number of households increases, gardens may be forced to decline in size. In a typical highland Batak village, rice fields begin at the edge of the village. Should new houses be built within the village, marginal space once used for gardens would be forced to shrink.

Forest gardening is similarly affected by population pressure. As demand for food increases, over-extraction from nearby forest areas will eventually force gardeners to travel further afield. Clearing of forest for fields also extends the distance to foraging grounds. In villages where nearby land is available, one may see a shift from reliance on forest gardens to kitchen gardens as population pressures increase.
Functional considerations

In both kitchen and forest gardening, few efforts were made to artificially encourage growth; for example, through soil preparation or clearing. With kitchen gardens, you harvested whatever plants managed to sprout. In the forest case, you harvested whatever you could find, whenever you found it. Thus, labor inputs for gardening were generally low. In comparison to swidden and wet rice cultivation, gardening required the least labor per person, per calorie (Harris 1972). However, none of the native societies used gardens exclusively: gardening was considered a supplement to these other, more dependable forms of cultivation.

One notable exception to the labor equation was durian. This valuable fruit grows on trees that tend to cluster in small, sparsely distributed groups. When a group of durian trees was found, villagers would often clear weeds from around the trees and build a small hut nearby. When the prescribed time came, someone from the village would wait by the trees for the ripe fruit to fall, a process that might take several days (Favre 1865). This commitment of labor is perhaps a reflection of the value of durian, both as a delicacy for personal consumption and its high exchange value in the marketplace.

As a supplement to field crops, gardens were often relied upon when the staple crop was threatened. Under times of low yield, villagers would trade time tending fields with time in the forests (Pelzer 1945). This fact points to one of the distinct advantages of garden culture: while environmental conditions can decimate field crops, so long as there is a forest nearby, there will always be something to harvest. Gardening should not be viewed as simply a backup to more advanced and land-intensive forms of production.
In a study of several gardening societies, Lucien Hanks found that gardening could often yield a higher caloric intake per hectare than swidden (Hanks 1972). The decision whether to garden or cultivate fields should be understood as one of many adaptations made by agricultural societies faced with shifting environmental conditions (Hanks 1972).

The proximity of kitchen gardens to households meant that food scraps and waste from pigs and chickens could be easily scattered as fertilizer. Though kitchen gardens were associated with households, there seems to have been a tradition of fair use among all residents of a village (Vergouwen 1964). Households frequently shared the produce of these village plants and trees. Among the Toba Batak, this communal approach was specific to kitchen gardens: the surrounding rice fields were still treated as private (family) property and no obligation to share rice was implied. The cultural practice of sharing kitchen gardens would find an interesting expression under the tobacco contracts of the late 19th century.

**Swidden**

Sometimes referred to as “slash and burn” or rotating cultivation, swidden is perhaps the most common form of traditional food production in the forested tropics. Van Beukering estimated in 1947 that one third of all food consumed in the outer islands was grown on rotating fields (1947). While there is no single term used to describe rotating cultivation in the native languages of Sumatra, the Malay word *ladang* is most commonly used in the literature. *Ladang* refers to any unirrigated field used to grow annual crops, and is meant to be contrasted with *sawah*, an irrigated wet rice field. Prior to the arrival of western systems of irrigation and fertilization, all *ladang*
agriculture would have been subject to rotation, hence, the synonymous use of *ladang* to indicate swidden.

Under swidden cultivation, villagers clear a plot of forest, usually in April at the start of the dry season (Marsden 1784). Trees are felled, scrub is cut, and the slash is left on the ground to dry. At the end of the dry season, the litter is set on fire. Burning saves much of the work of clearing, helps to kill off competing seeds and rhizomes, and contributes phosphates and potassium to the soil through the ashes (Hanks 1972). If the previous months were unseasonably wet, the slash may not burn fully and additional labor may be necessary to clear the remaining material. Once the land is cleared, the ashes are turned into the top layer of soil, either by hand or with the use of water buffalo. In September, seeds and roots are sown into the soil timed to coincide with the first rains. During the first weeks, villagers regularly weed the plot. Other than weeding, *ladang* requires very little ongoing maintenance. Most *ladang* incorporate a wide variety of crops, requiring a staggered harvesting cycle. In many cases, villagers will also stagger planting to take advantage of differential growth rates (Whitten et al. 1997).

A single field may be used for up to 3 consecutive seasons before it is left fallow. Fallow periods can last up to 30 years, during which time secondary forest returns. After the fallow period has elapsed vegetation on the original field is once again cut, burned, and the field replanted. The number of consecutive seasons that a field can be used before fallowing depends on the varieties being grown and a host of physical and ecological conditions. Similarly, the length of time a field must lay fallow varies from one location to the next. In general, swidden cultivation in the study area involves 2–3 consecutive harvests followed by 15–30 years of fallow (Whitten et al. 1997).
**Biological considerations**

Swidden is versatile. In a study of rotating cultivation in the Philippines, Harris (1972) observed plots in which farmers were growing over 40 different crops. Though no similar accounting of varieties among Sumatran rotators is available, evidence from early travelers suggests that communities developed similarly complex assemblages (for example, see Marsden 1784). To European eyes, swidden fields appeared chaotic and mismanaged, a far cry from the geometric precision and visual harmony of advanced, row-based monocultures (Pelzer 1945). The apparent chaos, however, belies the biological complexity that makes swidden so productive and sustainable.

In many ways, the structure of a swidden field mirrors the biodiversity of the jungle it replaces. Through experimentation, villagers developed complex systems for integrating various cultivars. If cassava and beans are planted together, cassava is planted first. Once it reaches a suitable height, beans are planted near the base of each cassava. As each bean plant grows, it uses the cassava stalk for climbing (Harris 1972). Large logs that are not fully burned when the field is cleared are often used as planters for more vulnerable crops (Marsden 1784), in much the same way that “nurse logs” foster seedlings in a real forest. When a single cultivar is used, villagers will plant a variety of crops in the subsequent season to assist nutrient regeneration. The most common form of cultivar rotation is to start with a monoculture of upland rice, burn the stubble after harvest, and follow up the next season with onions (Marsden 1784).

Despite these efforts, by the third season nutrient levels in the soil are usually depleted below the point of suitable yields (Whitten et al. 1997). Allowing the field to return to forest enables more complete regeneration. This regeneration can take up to 30
years and in that time it is left untouched. Economic and population pressures may force villagers to choose between fallowing a field or continuing to plant on it. The risks involved in continuous planting take two forms: (1) diminishing returns, and (2) permanent loss to *Imperata*. First, yields from one season to the next are dramatically reduced, particularly under monoculture. Harris (1972) estimates that yields for a second season of upland rice average only 75%. By the third season, yields rarely reach 50%. This loss is mitigated somewhat through the alternation of crops.

A more serious long-term risk, however, is conversion of the field to *Imperata*, a potential consequence of forest disturbance throughout Sumatra (Geertz 1963). Once established, *Imperata* is difficult to remove: the labor absorbed in its removal would likely threaten a community’s food production. The risk of land loss is directly related to intensification: as fields are used more frequently, the probability of Imperata increases. Thus, swidden responds to intensification up to a point, beyond which the system quickly loses productivity (Netting 1986).

Villagers learn to adapt agricultural practices to both environmental conditions and responses. On flat land, villagers may crop for consecutive seasons on the same plot. In the mountains, villagers usually crop only one season for fear of erosion and topsoil loss. This loss is particularly acute under the traditional swidden calendar whereby the ground is completely exposed at the start of the rainy season. While fallow periods are generally established through experience, cultivators learn to identify when a particular plot of land is ready for reuse by observing the plants growing on it. In this way, the level of forest succession serves as an indicator of soil quality (Netting 1986). Additionally, a sensitivity to rainfall patterns helps villagers identify whether fallow fields are at risk of conversion to *Imperata*. Long dry periods – though good for burning – increase the
chance of grass taking hold (Pelzer 1978). A sequence of dry years will encourage villagers to reduce the number of consecutive crops before fallowing, leaving enough nutrients to allow forest regrowth and discourage grass.

Finally, cultivators select the type of crop based on environmental conditions (Harris 1972). Seed crops (like upland rice) require a successful burn prior to planting: yields decline when early rains prevent proper burning of the slash. By contrast, root crops (like cassava) perform well without an effective burn. Sumatran rotators are known to have selected between seed and root crops based on the quality of each season’s burn. The importance of this distinction carries through once the season ends. Seed crops remove the greatest part of soil nutrients when harvested: it is the consumed seed that carries these nutrients, while the less nutritious stalk is returned to the soil through burning and tilling. With root crops, however, the consumed part contains mostly starches: the leftover organic material holds much of the extracted nutrients. Consequently, seed crops place greater demands on the soil than root crops, requiring longer fallow periods and fewer consecutive harvests. Geertz (1963, 121) writes: “More than anything else it is rice, demanding light, encouraging weeds, and exhausting minerals, which makes shifting cultivation ... shift.” Indeed, this fact was well-known to swidden cultivators who learned to switch from seed to root crops during times of stress (Harris 1972).

Spatial considerations

Swidden is a land extensive agricultural practice (Harris 1972). The strict limits on intensification – due in large part to the risk of Imperata – mean that villagers initially respond to population pressures by clearing larger areas of forest. Provided that
adequate fallow periods are maintained, increasing the amount of land in rotation can still result in sustainable food production. However, if rising demand continues, an upper limit may be reached where villagers lack suitable land for cultivation. Three factors contribute to this spatial limitation: (1) pheric distance, (2) fallow period, and (3) population density.

Pheric distance refers to the range a person can travel through the forest from the village (Harris 1972). Though overall labor inputs are relatively low, swidden plots must still be tended to on a regular basis. If a field is too far away, the loss in travel time can make maintaining the field untenable. Thus, pheric distance effectively inscribes the area in which swidden cultivation can take place and defines the maximum amount of land that can be kept in rotation at any given time. The available area varies from village to village depending on topography, the density of the jungle, and environmental conditions that affect human movement (for example, rivers or logging roads). Technological changes, such as the introduction of bicycles, may have affected pheric distances for many swidden villages as well.

Over time, as land is cleared around a village, the distance to the forest edge may become as significant a factor as pheric distance. As we will see with plantation agriculture, the authorized removal of forests around villages was a major contributor to agrarian change, forcing swidden cultivators into other systems of production.

The average fallow period affects the amount of land that can be simultaneously cultivated. The less time that a field needs to regenerate, the quicker it can be reused for agriculture, and, consequently, less land is held in fallow at any given time. If the effective fallow period around a village is 15 years, twice as much land can be cropped
here as around a village with fields that must fallow for 30 years (assuming the same pheric distance for both villages). In this way, some of the most valuable improvements to agricultural practice are those that reduce the fallow period. The agro-ecological strategies discussed earlier – for example, integrating rice and onions – not only increase immediate yields, but also reduce nutrient demands, shortening the length of time needed for regeneration. Lacking any external inputs of fertilizer, pesticides, or irrigation, swidden yields can only be intensified in concert with soil conservation: any practice that increases production to the detriment of soil quality quickly runs into the grassland trap.

During this period in Sumatra’s history, with very little cash crop production, subsistence demands drove the growth of swidden agriculture. Thus, increases in population played a more significant role in shaping land use than did foreign demand for agricultural products. Population density has a profound effect on land use: once yields have been maximized, the relationship between population and cultivated area is a linear one (Harris 1972). If the population of a village doubles, the area under cultivation must double as well. Among the Batak, this relationship may have encouraged cultural practices that kept the growth rate low. A study by Geoff Kushnick (2010) proposes that rules of land descent among the Karo serve to encourage two-child families, leading to small, stable villages. Village design may have also played a role. Batak villages were rarely expanded beyond their original boundaries: most maintained a small number of large houses (usually less than 12) (Vergouwen 1964). If increases in population necessitated the construction of new homes, traditional laws encouraged residents to leave and establish new villages elsewhere.
Pheric distance, long fallow periods, and high risk of conversion to grass all serve to keep population densities low. Whitten estimates that swidden cultivation in Sumatra supported 30-40 people per square kilometer. Studies in other parts of Southeast Asia show both higher and lower densities, most likely the result of different environmental conditions and different practices. In places where population densities are too high, fallow periods are too long, and pheric distances too short, villages themselves must “rotate.” The nomadic Iban of Borneo practiced such a system, where swidden communities cycle their villages through different locations every few seasons (Peluso 2009). Through a combination of favorable environmental conditions and cultural practices, Sumatran societies remained sedentary.

*Functional considerations*

While clearing of the forest for new fields is labor intensive, subsequent labor inputs are generally small compared to other cultivation systems. Indeed, with average plot sizes of around one hectare, the tasks involved in clearing, growing, maintaining, and harvesting a swidden plot can usually be accomplished by a single household: approximately 500-1000 person-hours per year (Harris 1972). Though these statistics provide us one yardstick by which to compare outlays of labor across systems, a thorough understanding requires us to delve deeper into how and when labor is organized.

In his analysis of cultivation systems, Lucien Hanks identifies two kinds of labor inputs: direct and indirect (1972). Direct labor includes clearing fields, tilling the soil, planting, weeding, and harvesting. Indirect labor may include building irrigation systems, terracing, and tending to draught animals. As a general rule, indirect labor
includes all time and energy spent preparing the *conditions* for cultivation, while direct labor includes the time and energy spent in cultivation *itself*.

Another dimension by which labor inputs can be understood is that of time. Different systems require different amounts of both direct and indirect labor at different times in the season: for example, forest clearing for swidden requires intensive direct labor at the beginning of the season, while harvesting wet rice requires intensive direct labor at the end of the season. As we will demonstrate, the distribution of labor across these two dimensions influenced cultural practice, social organization, and the choice of agricultural system.

In swidden, direct labor accounts for the majority of all labor inputs. Villagers spend most of their time clearing fields, followed by soil preparation, planting, and harvesting (Hanks 1972). Indirect inputs include maintaining agricultural tools and food storage systems (Harris 1972). In flat areas where villagers use water buffalo to plow fields, indirect labor may include animal husbandry. Most of these direct and indirect inputs can be performed by small groups of people, usually a single household. With forest clearing – the single most intensive task – occurring at the beginning of the dry season and lacking a hard deadline, villagers often complete this task without having to assemble outside help (Harris 1972). After the forest is cleared, no agricultural activity takes place for three months while the slash dries. During this time, labor is often directed to other activities, like house construction and repair, forest gardening, and participation in tool and craft economies (Lekkerkerker 1916).

Low labor inputs combined with high yields mean that swidden systems frequently produce more calories per unit of labor than permanent agriculture (Netting
1986, Harris 1972). Lost in the trade, however, is land. At any given time, fallow requirements ensure that most of the once-cultivated, arable land is in the process of regrowth. Thus, caloric production per unit of land under swidden rarely exceeds that of permanent agriculture. This dual relationship between land and labor has led Harris to speculate that communities may switch between rotating and permanent agriculture in response to environmental conditions, rather than some form of essential, technological “evolution” (1972). In situations where villages are faced with low populations and abundant land, swidden makes sense. As the population increases and available land decreases, permanent agriculture becomes more advantageous. As we will see next with wet rice, the demand for higher yields and equally high labor inputs is offset by the widespread availability of labor.

Finally, cultural ecologists have observed a relationship between the availability of protein and the movement of nomadic cultivators. While rotating cultivation is able to supply sufficient carbohydrates, communities will move from one place to the next in search of fish and game (Netting 1986). This does not appear to be a factor in Sumatra, where villages did not move. Though some communities may have hunted wild game, most dietary meat would have come from livestock: pigs, chickens, and water buffalo (Lekkerkerker 1916).

**Wet rice**

As Lucien Hanks observes, “rice is the most widely consumed and ecologically adaptable cereal on earth” (1972, vii). Rice has achieved this status through centuries of selective cultivation and human migration. Today, varieties of *Oryza sativa* are grown as far north as Hokkaido and on Himalayan hillsides above 3,000 meters. It is grown in
both wet and dry fields, as a continuous culture or rotated with fallow periods and other
crops, and certain “floating” varieties can grow under 6 feet of inundation (Hanks 1972).
The most common method of production in Asia – and the one most photographed – is
wet rice, or sawah.

Among the Indonesian islands, sawah was most commonly found in Java and
Bali. On Sumatra, swidden was more widespread, particularly in the lowlands. In the
mountainous interior, however, wet rice dominated. Today, rotating cultivation in the
lowlands has all but disappeared, while sawah still carpets highland valleys as it has for
hundreds of years. The reason for this difference in production systems is partly
topographical (terracing requires changes in elevation), partly ecological, and partly
social as we shall see.

Wet rice starts with the construction of terraced fields and canals to hold and
channel water. The rice plant itself spends most of its life with its roots in submerged soil
and only its leaves and the upper part of the stalk above the surface of the water. A
unique membrane in the stalk allows air to be passed down to the submerged roots (Bray
1994). As rice grows, farmers must maintain extraordinary control over water:
differences in water level of an inch or more can negatively affect yields, and fields with
uneven surfaces will produce uneven results. To meet these strict water level
requirements, traditional wet rice systems deploy fields in a complex stair-step of
terraces that allow both continuous movement of water and steady water levels at all
times. While the labor and capital needed to create these systems is high, a well-
constructed terrace system can last for decades with only minimal upkeep.
In our study area, villagers only grew rice during the rainy season, leaving the fields fallow (or planted with onions) during the dry months. At the start of the rainy season, laborers clear brush from the fields and introduce water buffalo to break up the ground and help fertilize. With the arrival of rain, the bare ground eventually turns to a thick mud. The area is carefully flattened and dykes are inspected and reinforced. One field is usually designated as a seedling nursery, and laborers sow rice seeds thickly into moist, but not flooded soil. When the seedlings reach 5-7 centimeters, the tops are cropped to multiply the number of shoots (also known as panicles). Approximately forty days after sowing, the seedlings are transplanted from the nursery to the empty fields, with each one placed by hand into a small, precisely measured hole. When all the seedlings are in place, laborers carefully flood each field until the water level reaches the top of the stalk. From this point on, the water is never left stagnant, and as soon as ears start to form, laborers drain the water from the fields to encourage seed production. As seed growth accelerates, labor shifts from water management to pest prevention. During this period, village children can be found busying themselves in small huts overlooking the terraces, managing a variety of string-operated scarecrows. Approximately four months from the time of transplanting, after the fields have turned a golden brown, the rice is harvested (Marsden 1784).

When harvested, the water content in the seeds is approximately 25%. The stalks are cut by hand a few centimeters below the panicles, using a small knife held in the palm of the hand. The panicles are then bundled together and threshed to separate the seeds. Seeds collected in large baskets and winnowed to remove the chaff. Though strategies vary by community, winnowing involves pouring the seeds from an elevated basket, allowing the breeze to carry away the chaff. This process is often repeated, and in
some cases the rice may be stamped (through the use of a stone mortar) to separate the chaff before being re-winnowed. The rice is then left to dry in the sun, reducing the water content in the seeds to around 20%, at which point it can be consumed or stored.

In traditional practice, villagers did not polish the grains. Polishing is used to remove the bran, an oily layer surrounding the seed that protects it during growth. Removing the bran helps to preserve the grains, as the oils in the bran can trap bacteria that speed decomposition. Without polishing, rice can be stored for up to a year, but under stress, some communities took to storing rice on the stalk, where it could last for 18 months or more (Bray 1994).

After harvest, the leftover chaff and stalks are burned and the soil in the fields is allowed to bake hard unless immediately used for another crop. At the start of the next season, the fields are once again prepared for use by introducing water buffalo to break up the hard surface. Not only does this process allow air and water penetration, it also helps to balance soil pH: a season of intensive cultivation tends to create acidic conditions in the top 2-3 centimeters of soil, with an alkaline horizon below. The small amount of vertical mixing encouraged by the water buffalo is enough to balance the soil chemistry for the next season (Hanks 1972).

**Biological considerations**

Unlike swidden, wet rice requires no fallow period between growing seasons and can be successfully cultivated year round. The fact that Batak highlanders let their fields fallow during the dry season has more to do with the drop in rainfall, rather than nutrient conditions in the soil. Rice is able to grow continuously because it does not rely on soil nutrients for growth. Instead, like modern hydroponic gardens, wet rice is
edaphic hydraulic: edaphic because it relies on external systems for fertilization, and hydraulic because the key nutrients come by way of water (Harris 1972). So long as the water in the sawah comes from natural streams and does not stagnate, rice can thrive. Nitrogen in the water is fixed anaerobically by bacterial action and algae (through accompanying diazotrophs) (Bray 1994, Hanks 1972), with rice taking up fixed nitrogen in the form of ammonia.

The deceptively simple nutrient system of the rice field hides a complex ecology that has only recently been properly examined. Birds, spiders, amphibians, rodents, insects, and zooplankton all play a part in this energy transfer, leading some to observe that rice grows in “probably the most complex ecosystem of any crop” (Whitten et al. 1997, 388). In his study of Sumatran rice, Whitten identified over 650 different species of arthropod alone: some feed on the rice, others predate on the herbivores, while a host of surface- and bottom-dwelling detrivores taking care of the organic residue. While discussions over yield invariably emphasize the negative role of insects, a healthy rice field demonstrates a surprising balance of influences: of the 650 species of arthropod, only 15% are herbivores, while 65% are predators and 20% are detrivores or filter-feeders (Whitten et al. 1997).

One herbivore in particular has received recent attention. The brown planthopper (Nilaparvata lugens) eats the rice plant by burrowing a hole in the hard shell of the stalk before crawling inside to consume the soft tissue (Oka 1979). An affected plant will usually collapse under the weight of the seed-filled panicles as the planthopper weakens the stalk. With voracious appetites and high rates of reproduction, planthoppers drew global attention in the 1970s and 80s for their destruction of Southeast Asian rice crops and their successful adaptation to Green Revolution pesticides (Oka 1979). However, the
insect was present in Sumatra long before the Green Revolution (for example, see Lekkerkerker 1916).

Known locally as *walang sangit*, the planthopper did not pose a consistent threat to rice cultivation until farming practices changed in the 20th century. The tradition of leaving rice fields fallow between growing seasons acted as a biological control. Planthoppers lay eggs in the lower part of the rice stalks. Eggs that have not hatched by the end of the harvest are thus destroyed when villagers burn the leftover stalks. As rice plants disappear during the fallow period, young planthoppers die from lack of food (Whitten et al. 1997). This form of pest control is particularly effective when farmers coordinate harvest and fallow times across a large area: precisely the cultural practice in place in the rice-growing regions of the Toba highlands.

*Spatial considerations*

While swidden cultivators look for the best soil, wet rice cultivators look to the shape of the land. Demanding a steady flow of water, rice terraces can only be constructed in places with suitable stream flow and topography. In the Toba highlands (the primary wet rice zone) Batak constructed fields in the lower reaches of the deep mountain valleys. Tapping both the primary stream and those flowing down the valley walls, villagers constructed canals to divert water to the highest terraces. From these fields, water was directed into successively lower terraces, before emptying back into the primary stream at the base of the valley. In some cases, other villages downstream may take advantage of the same water. Until the introduction of agricultural chemicals that threatened downstream fields, this reuse of water may have benefited villages at lower
elevations: output water from higher fields contains a rich culture of organic matter and nitrogen-fixing organisms.

Fields located close to the edge of the forest benefit from its diversity of species. The planthopper has over a hundred natural predators, many of which do not make homes in the sawah (Whitten et al. 1997). Birds in particular will fly from the forest margins to nearby rice fields to hunt insects. Wet rice attracts rats as harvest time nears, creating a source of food for owls that nest in the jungle but hunt in the sawah during the night. With forest clearing and grassland conversion, distances from forest to field may increase, reducing the effectiveness of this natural pest control. Though there is little historical evidence that native rice growers established field location with forest proximity in mind, later studies commissioned by the Dutch demonstrated the advantages of cultivating at the forest margins (Pelzer 1978).18

Wet rice responds better to intensification than swidden. As Clifford Geertz demonstrated in his landmark study of Javanese rice, increases in seedling density, better field preparation, and enhanced pest control efforts all resulted in higher yields (1963). These improvements, of course, require additional labor. But unlike other production systems, caloric yields increase in a roughly linear relationship with labor inputs: thus, as labor demands increase, the food needed to feed that labor increases as well.

While Geertz studied Javanese rice culture – and no similar quantifiable study of Sumatran wet rice is available – it may be assumed that the relationship between inputs and yields holds for our study area as well. This relationship suggests that existing sawah may have been able to absorb increased demand without requiring more land. This
situation did not hold for swidden, where intensification quickly reached soil nutrient limits. While access to land is the primary limit on swidden production, access to labor (as we will see below) is the limiting factor for wet rice.

*Functional considerations*

High yields per hectare and less yield variability make wet rice cultivation a better choice than swidden for areas of high population density. To produce these yields, wet rice requires significant direct and indirect labor, and capital expenditure. Much of the indirect labor and capital goes toward the creation and maintenance of irrigation systems (Hanks 1972). Among the Toba Batak, cooperatives made up of several villages would often organize labor and collect funds for major irrigation projects (Vergouwen 1964). Prior to colonization, these cooperatives were made up of villages related either through family ancestry or through marriage.

As a capital-intensive form of production, wet rice tends to emphasize the role of the land owner. Land owners must assemble workers and water buffalo to prepare fields. If resources are not immediately at hand, land owners may take out loans, borrow labor, or call upon family members to assist. If the labor force is large enough, foremen may be hired to direct operations. To ease the organizational burden, land owners may lease land to tenants who are then responsible for assembling the necessary labor and capital. Meanwhile, the consistent need for a wide range of skills – everything from construction of levees, to pest control, to threshing the harvested grain – creates niche economies and opportunities for job specialization.

These imperatives of production have led to Harris to propose that wet rice tends to create and support stratified social hierarchies (Harris 1972). In such systems, a small
group of elites own the land and much of the capital used for production. A larger working class produces rice for subsistence, with the surplus going to the elites in the form of rent. This hierarchical structure may be extended to a larger scale, where communities are organized into political hierarchies that span villages, regions, or tribal groups. By contrast, Harris notes that rotating cultivation (with few capital inputs and a unit of labor no larger than the household) demands little vertical organization. In fact, strict operational hierarchies in a swidden system might have a negative impact on yields, as strict divisions of land and decision-making reduce flexibility: the very quality that allows swidden to thrive in changing environments.

While Harris finds support for this theory of social organization from cultivators throughout Southeast Asia, it does not hold for the native societies in our study area. The Karo and Simelungun Batak, both swidden cultivators, demonstrated more social and political stratification than the Toba Batak, the only wet rice producers in the region. While the Toba created elaborate family networks to support labor and capital demands, there is little evidence that these imperatives led to larger political hierarchies. Indeed, Western authors have long commented on the seeming “statelessness” of the Toba, a description hardly congruent with Harris’ prototypical wet rice society. An exploration into the reason for this divergence is beyond the scope of this thesis, but may be an interesting topic for further study.

**Cultivation systems by region**

In previous sections we identified the extent of three topographical zones, four native societies, and three cultivation systems in our study area. Using these dimensions, we can organize our analysis into four separate regions of study: Simelungun and Malay
lowlands, Karo lowlands, Karo highlands, and Toba highlands. Table 2 shows the topographical zone, cultivation system, and form of eventual conversion for each region.

Table 2: Cultivation systems by region

<table>
<thead>
<tr>
<th>Region</th>
<th>Topographical zone</th>
<th>Cultivation</th>
<th>Eventual conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simelungun and Malay lowlands</td>
<td>plains and piedmont</td>
<td>swidden with gardens</td>
<td>complete plantation</td>
</tr>
<tr>
<td>Karo lowlands</td>
<td>plains and piedmont</td>
<td>swidden with gardens</td>
<td>partial plantation</td>
</tr>
<tr>
<td>Karo highlands</td>
<td>mountains</td>
<td>swidden with gardens</td>
<td>none</td>
</tr>
<tr>
<td>Toba highlands</td>
<td>mountains</td>
<td>wet rice</td>
<td>none</td>
</tr>
</tbody>
</table>

In the following section we will develop a simple cultivation model for the Simelungun and Malay lowlands, where the majority of plantation conversion would eventually take place. This model integrates environmental and cultural agents and processes as they existed prior to 1863. While a more complete analysis of agricultural change in East Sumatra would develop models for the cultivation systems in all four regions, this thesis – as the first step in a larger project – will concentrate on cultivation in the Simelungun and Malay lowlands only.

Simelungun and Malay lowlands

The villagers of the lowlands practiced rotating cultivation, supplemented with kitchen and forest gardening.
Table 3 shows the agents and associated imperatives and resources for mixed swidden and garden cultivation in this region. In subsequent tables we will itemize the conditions and process that connect these agents. Figure 9 at the end of this section represents the model in schematic form.
<table>
<thead>
<tr>
<th>Agent</th>
<th>Imperatives</th>
<th>Resources</th>
<th>Source literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root crop</td>
<td>Soil nutrients</td>
<td>Stems &amp; tubers</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Cassava, potato, taro, yam, etc.</td>
<td></td>
<td></td>
<td>Whitten (1997)</td>
</tr>
<tr>
<td>Grain crop</td>
<td>Soil nutrients</td>
<td>Seeds</td>
<td>Hanks (1972)</td>
</tr>
<tr>
<td>Rice or maize</td>
<td></td>
<td></td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Forest</td>
<td></td>
<td>Fruits &amp; vegetables</td>
<td>Forbes (1885)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raw materials</td>
<td>Pelzer (1978)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Whitten (1997)</td>
</tr>
<tr>
<td>Kitchen garden</td>
<td>Soil nutrients</td>
<td>Fruits &amp; vegetables</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pelzer (1978)</td>
</tr>
<tr>
<td>Cultivator</td>
<td>Food</td>
<td>Food Labor</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Member of a household who</td>
<td></td>
<td></td>
<td>Lekkerkerker (1916)</td>
</tr>
<tr>
<td>gardens, labors on a swidden plot, or manufactures crafts</td>
<td></td>
<td></td>
<td>Marsden (1784)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pelzer (1978)</td>
</tr>
<tr>
<td>Household</td>
<td>Food</td>
<td>Currency</td>
<td>Lekkerkerker (1916)</td>
</tr>
<tr>
<td>Family unit that shares</td>
<td></td>
<td>Food</td>
<td>Vergouwen (1964)</td>
</tr>
<tr>
<td>resources among one or</td>
<td></td>
<td>Crafts</td>
<td></td>
</tr>
<tr>
<td>more cultivators</td>
<td></td>
<td>Land</td>
<td></td>
</tr>
<tr>
<td>Village head</td>
<td>Village security</td>
<td>Land for allocation</td>
<td>Pelzer (1957, 1978)</td>
</tr>
<tr>
<td>Founder or descendant of</td>
<td>Access to land</td>
<td></td>
<td>Vergouwen (1964)</td>
</tr>
<tr>
<td>founder.</td>
<td>Prestige</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governing council</td>
<td>Regional security</td>
<td>Land allocation</td>
<td>Andaya (2002)</td>
</tr>
<tr>
<td>Group of elders elected</td>
<td></td>
<td></td>
<td>Kipp (1998)</td>
</tr>
<tr>
<td>from prominent marga</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local market</td>
<td>Crafts</td>
<td></td>
<td>Andaya (2002)</td>
</tr>
<tr>
<td></td>
<td>Food</td>
<td></td>
<td>Vergouwen (1964)</td>
</tr>
<tr>
<td></td>
<td>Currency</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(rice)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Agents respond to, and modify, numerous environmental, social, economic, and political conditions. Table 4 shows the conditions in effect for mixed swidden and garden cultivation for the Simelungun and Malay lowlands.

Table 4: Conditions in Simelungun and Malay lowlands

<table>
<thead>
<tr>
<th>Condition</th>
<th>Affects</th>
<th>Affected by</th>
<th>Source literature²⁰</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil nutrient level</td>
<td>Grain crop yield Root crop yield Cultivator</td>
<td>Grain crop growth Root crop growth Cultivator</td>
<td>Boomgaard (1999)</td>
</tr>
<tr>
<td></td>
<td>decisions</td>
<td>decisions</td>
<td>Pelzer (1978)</td>
</tr>
<tr>
<td>Dry season rains</td>
<td>Grain crop yield Cultivator decisions</td>
<td></td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Available forest</td>
<td>Land under crop</td>
<td>Land acquisition Clearing Fallowing Pheric</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>distance Fallow period</td>
<td>Pelzer (1978)</td>
</tr>
<tr>
<td>Land under crop</td>
<td>Land under fallow</td>
<td>Cultivating Fallowing</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Land under fallow</td>
<td>Available forest</td>
<td>Fallowing Fallow period</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Fallow period</td>
<td>Available forest Land under crop Land under</td>
<td>Cultivator decisions</td>
<td>Boomgaard (1999)</td>
</tr>
<tr>
<td></td>
<td>fallow Soil nutrient level</td>
<td></td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Pheric distance</td>
<td>Available forest</td>
<td></td>
<td>Harris (1972)</td>
</tr>
</tbody>
</table>
Processes are the mechanisms by which agents modify conditions and each other. Table 5 shows the processes in effect in mixed swidden and garden cultivation, the relationship, and the direction of effect.

Table 5: Processes in Simelungun and Malay lowlands

<table>
<thead>
<tr>
<th>Process</th>
<th>Relationship</th>
<th>Direction of effect</th>
<th>Source literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade</td>
<td>Household / Market</td>
<td>Exchange food, crafts, currency for food, crafts, currency</td>
<td>Andaya (2002)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vergouwen (1964)</td>
</tr>
<tr>
<td>Land allocation</td>
<td>Governing council / Village head</td>
<td>Assigns newly acquired land to villages</td>
<td>Kipp (1990)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vergouwen (1964)</td>
</tr>
<tr>
<td>Land allocation</td>
<td>Village head / Household</td>
<td>Assigns land to household</td>
<td>Tideman (1922)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reid (2005)</td>
</tr>
<tr>
<td>Work</td>
<td>Cultivator / Cultivator</td>
<td>Exchange food for labor</td>
<td></td>
</tr>
<tr>
<td>Food storage</td>
<td>Cultivator / Household</td>
<td>Distribute/store food among household members</td>
<td>Tideman (1922)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vergouwen (1964)</td>
</tr>
<tr>
<td>Manufacture</td>
<td>Cultivator / Household</td>
<td>Exchange cultivator labor for material products for use/trade</td>
<td>Lekkerkerker (1916)</td>
</tr>
<tr>
<td>Kitchen gardening</td>
<td>Cultivator / Kitchen garden</td>
<td>Cultivator extracts food from kitchen garden</td>
<td>Pelzer (1978)</td>
</tr>
<tr>
<td>Gardening</td>
<td>Cultivator / Forest</td>
<td>Exchange labor for food and raw materials from forest</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Clearing</td>
<td>Cultivator / Available Forest</td>
<td>Exchange labor for reduction in available forest</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Whitten (1997)</td>
</tr>
<tr>
<td>Cultivating</td>
<td>Cultivator / Root crop</td>
<td>Exchange labor for increase in root crop</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Whitten (1997)</td>
</tr>
<tr>
<td>Process</td>
<td>Relationship</td>
<td>Direction of effect</td>
<td>Source literature</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------</td>
<td>------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Cultivating</td>
<td>Cultivator / Grain crop</td>
<td>Exchange labor for increase in grain crop</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Whitten (1997)</td>
</tr>
<tr>
<td>Cultivating</td>
<td>Available forest / Land under crop</td>
<td>Reduce available forest for increase in land under crop</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Whitten (1997)</td>
</tr>
<tr>
<td>Grain crop growth</td>
<td>Grain crop / Soil nutrient level</td>
<td>Reduce nutrient level for increase in grain crop</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Root crop growth</td>
<td>Root crop / Soil nutrient level</td>
<td>Reduce nutrient level for increase in root crop</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Harvesting</td>
<td>Cultivator / Root crop</td>
<td>Exchange labor for food</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Harvesting</td>
<td>Cultivator / Grain crop</td>
<td>Exchange labor for food</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Fallowing</td>
<td>Land under crop / Land under fallow</td>
<td>Reduce land under crop for land under fallow</td>
<td>Harris (1972)</td>
</tr>
<tr>
<td>Fallowing</td>
<td>Land under fallow / Available forest</td>
<td>Reduce land under fallow for available forest</td>
<td>Harris (1972)</td>
</tr>
</tbody>
</table>

Figure 9 represents these agents, imperatives, resources, conditions, and processes in schematic form. Each agent is shown as a box with accompanying imperatives (in the top row of each box) and resources (in the bottom row). Conditions are displayed below the schematic. Arrows represent processes: any single process may result in several arrows in different parts of the diagram depending on the affected actors and conditions. Arrows are also used to represent non-process relationships, for example, between fallow period and the amount of available forest. In these cases, the positive/negative nature of the relationship is indicated with plus and minus signs (+/−).
While the agro-ecological system represented here is not complete, it serves to illustrate the primary linkages between actors in the lowland swidden system. We can, for example, trace how shifting labor from cultivation to craft manufacture increases available forest and increases household dependency on the market for food. We can see how territorial acquisition can lead to increased fallow periods, soil nutrient levels, and
increased grain crop cultivation. In the following chapter we will look at the arrival of European agriculture, and in Chapter 7, explore how new agents, conditions, and processes reshaped this agro-ecological community.

12 While some communities developed and utilized hybrid systems (for example, intercropping wet rice and dry field onions), these hybrids were not consistently utilized across either space or time. In fact, the consistency of method within each cultivation system has allowed researchers to make generalizations about these systems across vastly different Southeast Asian societies (Bray 1994). Traditional swidden systems as practiced in Sumatra have more in common with swidden cultivation in Laos and New Guinea than with other non-swidden systems in the same region.

13 During forest clearing, natives would often leave standing those trees that had active bee hives (Lekkerkerker 1916). Even after plantations took over, Malay and Simelungun villagers demanded that planters leave “bee trees” untouched (Pelzer 1957).

14 Waiting for the durian to fall was not risk-free. Natives share their love of durian with Sumatran tigers, and several accounts speak of the demise of villagers who found themselves between a tiger and its favorite fruit (Favre 1865).

15 Dutch authors, many exhibiting a Java-centric view of the colony, typically referred to Sumatra, Borneo, Sulawesi, and the Moluccas as the “outer islands.”

16 Congruent with principles of cultural ecology, Harris (1972) believes the ecological differences between seed and root cultivation has led to two distinct kinds of swidden communities: “seed culture” and “vegeculture.” His evidence for this social differentiation is taken largely from Thailand, Laos, and Cambodia. Evidence from Sumatra suggests that native communities took advantage of both systems equally.

17 This is, of course, the geometric maximum, rather than the biological maximum.

18 With the arrival of oil-palm, European planters attempted to introduce owls and other birds into the plantation ecosystem to control pests. These efforts were largely ineffective (Pelzer 1978).

19 Where source literature is specified, I used the indicated sources to identify agents and their associated imperatives and resources. Source authors did not necessarily share this terminology. In almost every case authors explained the behavior of agents descriptively, rather than apply the functional and categorical approach taken herein. Thus, the task of identifying and defining agents entailed reading descriptive source material and inferring the resources and imperatives involved in the behavior of agents.

20 I used the indicated sources to identify conditions relevant to agricultural production. In each case, these conditions were explicitly identified and described by the indicated source.

21 I used the indicated sources to identify processes and the related agents and conditions. In some cases, source authors did not identify these relationships as distinct processes. In other cases, one author’s description of a processes might include agents or conditions omitted from another author’s description. Thus, the task of identifying and describing processes involved both (a) making inferences from general descriptions of processes, and (b) synthesizing varying descriptions across authors.
Chapter 6. The arrival of Europeans

Figure 10: Planters and Chinese laborers in a tobacco field (Courtesy of KITLV/Royal Netherlands Institute of Southeast Asian and Caribbean Studies)
“We have here the reason why Sumatra, whose soil and subsoil hold their own easily with those of Java in the matter of mineral and agricultural wealth, is only now commencing to attract the attention of the Dutch. Java is a country of magnificent realisation: Sumatra has only a great future. More advantageously placed than Java, on the threshold of the ocean highway from the West to the Far East, a close neighbour of the Malay Peninsula and of India, it seems to guard the entry to the China Sea, to Indo-China, China, and Japan. This advantageous position, and a more complete knowledge of its natural resources, are to-day leading the Dutch Government to develop Sumatra with tenacious energy, in spite of the courage, independence, or fanaticism of populations which render the national organisation of the country a far more difficult task than the organisation of thirty millions of Javanese has been.”

-- Antoine Cabaton (1911, 258)

What should be done about Sumatra? Dutch merchants arrived in the archipelago in 1596 (Reid 1969). Dutch soldiers captured Batavia and established a fort in 1619 (Vickers 2005). But two hundred and thirty years later, though the DEI would claim control over all of Java, the Moluccas, parts of Borneo’s west coast, and many of the islands in the Sunda chain, Sumatra was largely untouched. With the exception of a small pepper trade in the south and garrisons in Palembang and Bengkulu, the Dutch generally avoided the question of what to do with this vast, western island. Experiments in coffee production brought planters to Padang on the west coast in the 1830s, but as this trade expanded into the interior, Dutch interests became embroiled in sectarian warfare (Reid 2005). The pepper trade took merchants to the north coast, only to tangle with fellow Europeans and hostile Acehnese sultans. Despite natural resources and advantageous location, the question of how to turn Sumatra into “productive” space confounded Dutch planners whose seaward focus and attention to coastal polities concealed a profound ignorance of how to manage “interiors” (Andaya 2002). Attracted
but confused, Batavia’s governors would maintain a steady flirtation with Sumatra for over two centuries, waiting for an opening that never seemed to materialize.

The catalyst would come in 1863 in the form of Jacob Nienhuys, a nearly bankrupt planter who had tried his luck with sugar in Java (Pelzer 1978). Tipped off about the high quality of native tobacco grown in the coastal lowlands, Nienhuys sailed from Batavia to Deli on Sumatra’s east coast where he purchased and shipped home a sample of tobacco for secret auction. When word came back about the leaf’s superior quality for cigar wrappers, Nienhuys immediately sought investors. In 1865, with cash in hand, he secured a lease on 75 hectares of land from the Sultan of Deli and started Sumatra’s first European tobacco plantation. With a labor force of no more than a couple dozen Chinese from Singapore, Nienhuys’ first tenuous foray into commercial tobacco yielded staggering results: from an investment of 35,000 guilders, Nienhuys’ first crop sold for 60,000 guilders (Pelzer 1978). Such a windfall could not be kept secret for long, and within a decade, this tiny tobacco experiment exploded into a land grab unprecedented in the DEI or perhaps even colonial Southeast Asia. On the cusp of World War II, commercial plantations would occupy half a million acres, with over 60% of all cultivated land on the east coast under European control. The population of this once sparsely settled region would quintuple in the intervening years, with Chinese and Javanese immigrants comprising three-fifths of the population by 1942 (Pelzer 1982). At long last, Europeans had found a way to exploit the land and people of Sumatra, a task at which they would not waver until the Japanese swept them from the plantations in 1942.

We begin this chapter by looking at the geopolitical, religious, economic, and moral imperatives at play in and around Sumatra’s east coast. Later, we explore the plantation paradigm and its intrinsic problems of land, labor, native people, and
cultivars. Finally, we examine the Dutch answers to these problems. In Chapter 7, the dramatic consequences of these answers will become apparent.

**Setting the stage for a land grab**

Prior to Nienhuys, a vast array of challenges and opportunities faced colonial administrators intent on turning Sumatra into productive space. Immediately across the Strait from British Malaya, the string of sultanates along the east coast lay open for English conquest. For the Dutch to secure this space meant addressing an increasingly sticky relationship with Aceh and its history of inciting religious unrest throughout the northern reaches of the island. The populous highland societies were almost entirely animist: could they be converted to fight Aceh’s Muslims? Even if the east coast could be secured from the British and the Acehnese, how would it make money for Holland? Unlike nutmeg and cloves in the Moluccas, no single natural resource presented itself to those European explorers intent on uncovering Sumatra’s economic value. Had the Dutch stumbled upon some spring of wealth, how would they control a “fanatical” native population mythologized as primitive and hostile? For two hundred years, the question of Sumatra was a simple one: why bother?

**Geopolitics**

Of all the motivations for acquiring control over the east coast, the rationale that dominated Batavia’s thinking in the first half of the 18th century was strategic: contain British influence in the archipelago. British and Dutch forces fought over Batavia in 1618-19 and relations between the two sides in the intervening centuries had been strained at best (Vickers 2005). With an extensive colonial network stretching from the Middle East to India, Burma, and Malay, growing British interest in the outer islands
(South Sumatra and northern Borneo) was of particular concern for the Netherlands. A long and bloody history of European adventures had seen Spain, Portugal, France, and Britain acquire and then cede colonial real estate at the points of each other’s bayonets (Reid 2005). Add the powerful, Ottoman-backed sultan of Aceh to the mix and the question of losing territorial control became one of “when” and not “if”.

The Anglo-Dutch Treaty of London in 1824 sought to end once-and-for-all the Southeast Asian rivalry between Britain and the Netherlands. Under the treaty terms, Britain ceded their outpost in Bengkulu and all other assets in Sumatra to the Dutch, committing never to establish any future settlement on the island and further agreeing to make no treaty with any local Sumatran rulers. In exchange, the Dutch gave up claims to Malacca and factories in India, agreeing to establish no settlements on the Malay peninsula or sign treaties with Malay leaders. The treaty decreed most favored nation trading status between the two countries and bound the Dutch to keep markets in the archipelago open to British businesses. Finally, the Dutch committed to recognize the independence of Aceh, an ally of the British. In exchange, the British agreed to pursue no new treaties with the Muslim state (Reid 2005).

The political map of Sumatra’s east coast at this time comprised no less than nine minor sultanates: from north to south, Tamiang, Langkat, Deli, Serdang, Batu Bara, Asahan, Kualu, Panai, and Bila (Pelzer 1978). Sometimes referred to as “river states” for the fact that rivers often formed their de facto boundaries, these small Muslim polities competed for European trade, sought political influence over neighbors, and experimented with export commodities in an effort to gain economic ascendency. It seems that such ascendancy was hard to come by: few states could assemble a standing army, relying instead on paid mercenaries for security (Reid 2005). When Nienhuys paid
a visit to the Sultan of Deli, he was surprised to find him living in squalid conditions, occupying just “a ramshackle house” (Pelzer 1978). The weakness of these sultans was once again a consequence of the territory: with Aceh to the north and Siak (another powerful Sultanate) to the south, these nine minor states survived through skillful political maneuvers, often at the expense of economic improvement. While Aceh had maintained hegemony over most of the river states prior to 1850, by the time of Nienhuys’ arrival, the prince of Siak had begun to contest Aceh’s dominance.

From this complex patchwork of states, the Dutch and British pursued their territorial interests. Suzerainty – dominion over a state by indirect means – was Batavia’s preferred method of territorial acquisition at this time (Tagliacozzo 2005). This relationship could be established through a variety of economic or political means and often progressed through several stages. Tagliacozzo (2005) identifies five stages in the transformation of these peripheral states from suzerainty to direct control:

1. A local polity has no treaty with Batavia but is still considered part of the DEI by virtue of its geographical location within the archipelago.
2. The polity has a treaty with the Dutch, but has not received a formal representative from Batavia and there is no Dutch presence in the territory.
3. The polity has an active treaty and resident envoys from Batavia.
4. The polity has a treaty that puts local people under the jurisdiction of Dutch courts. These treaties often established taxes that must be paid to Batavia by locals.
5. The polity is completely dependent on, and controlled by the Dutch.
While some states passed through each of these stages in order, many did not, moving between the different relationships as Batavia’s influence ebbed and flowed. Though the transformation from suzerainty to direct control could take place quickly, the development of colonial control over the east coast states was slow (Reid 2005), mired for decades in phases 1 and 2.

The Sultanate of Deli was such a state. At one time a vassal to Aceh, Sultan Osman Perkasa Alam Shah sought to emancipate himself from Aceh and the growing influence of Siak. In 1854 he offered a treaty with the Dutch in exchange for arms to fight the Acehnese. Initially spurned by the Dutch, Shah approached the British for assistance, a bluff that succeeded in bringing Batavia to the bargaining table. By 1858 Deli had a permanent Dutch representative, and by the time the first plantations were established, the polity was recognized as an official part of the DEI. During this period, the sultan kept his official title and retained sole authority to grant concessions to the swelling ranks of planters arriving from Europe. But foreign policy for Deli was now controlled by Batavia, and by 1876, all administrative functions of the Deli Sultanate were subsumed into the East Coast Residency. While ordinary people may have suffered or benefited from the change in leadership, the sultans certainly benefited over the next several decades: under an agreement with Batavia that allowed the throne to collect tariffs on exports, the sultans saw their wealth soar even as their responsibilities declined (Cabaton 376). A royal family whose livelihoods had been based entirely on the fluctuations of piracy and intermittent trade now commissioned Dutch architects to build opulent palaces and gardens (Milner 1982).

I see four reasons for the delay in territorial acquisition. First, Dutch attention was focused on two more pressing conflicts: the Java War (1824-1830) and the Padri
War in central Sumatra (1821-1837) (Pelzer 1978). Second, rapid consolidation of the east coast would have antagonized the British, despite the assurances granted in the 1824 treaty. Third, taking control of the nine river states would have placed the Dutch in direct conflict with the powerful princes of both Aceh and Siak, a battle that the Netherlands had neither the troops nor treasury to support. Finally, no compelling economic or moral imperative for acquisition had yet presented itself. Suzerainty allowed the East Indies government to claim, influence, and hold territory against foreign acquisition without committing to any form of administration or development. So long as the primary reason to control the east coast was to contain the aspirations of Britain, Aceh, and Siak, Batavia was content to deploy its arsenal of diplomats and keep its soldiers and administrators at home.

Nienhuys’ success with tobacco dramatically altered this calculation. With the sudden interest in land came investment capital from Europe and political pressure in the Netherlands to “open up” the east coast. Colonial administrators saw for the first time a way to establish a permanent foothold in East Sumatra. With the British bound by the treaty of 1824 and the Sultan of Deli asking for Dutch help, the timing couldn’t have been better. Batavia mobilized to consolidate the Sumatran east coast and bring this once peripheral island into the East Indies proper.

The explosive growth of plantations in Sumatra’s coastal lowlands created something of a paradox for the British across the Strait. On the one hand, British planners were worried that Batavia was pursuing a monopoly, in violation of the 1824 treaty. Having signed away their rights to the island while it was still deemed unproductive, some in the British administration expressed bitterness at its new found profitability. On the other hand, plantation growth greatly benefited merchants in
Penang, a major British port across the Strait that saw rapid expansion during this period (Pelzer 1978). As the new plantations sought labor, the British found a lucrative trade in people, bringing Chinese coolies from Singapore, China, and Peninsular Malaysia. At the peak of plantation growth, the British were bringing 20,000 Chinese to Sumatran shores each year (Reid 2005), an enterprise that did much to soothe British bitterness.

Religion

In the mid-1800s, the Sumatran east coast was as cleanly divided along religious lines as it was ethnically and topographically. Lowland Malays practiced Islam while highland Batak were almost universally animist (Vergouwen 1964). A long history of warfare between Batak tribes in the north and Acehnese Muslims had cultivated strong resentment between the two sides; a tension that the Dutch would later seek to exploit (Reid 2005). Islam spread through the lowlands via trade and the Malay language (Lekkerkerkerker 1916). Meanwhile, more isolated highland societies resisted religious incursion from all sources until the arrival of Western missionaries in 1856, a project motivated as much by security concerns as moral ones.

With the arrival of plantations and a shift in policy from suzerainty to direct control, Batavia needed to establish new strategies for managing remote territory. To this end, religion would come to influence Dutch policy-making in two distinct ways: as a tool for territorial control, and as part of a moral program for social “improvement”.

From the 1860s through the 1940s, the Dutch government encouraged missionary activity among the highland Karo and Toba Batak. Administrators saw the conversion of highlanders to Christianity as a way of creating a spatial buffer between the
vulnerable plantation lands and “fanatical” Muslims from Aceh in the north and Angkola in the south (Lekkerkerker 1916, Kipp 1990). Administrators reasoned that if the Batak could be converted to Christianity, they could be mobilized to fight off Muslim invasion directed at the lowlands (Lekkerkerker 1916). Evidence for this “buffer policy” comes from the observation that the Dutch made little effort to convert lowland Muslims, concentrating almost all missionary activity among highland animists. It seems the solution to the problem of lowland Muslims standing in the way of plantation expansion was, simply, displacement.

Although the arrival of missionaries in the highlands got off to a rough start – for example, the “martyring” of Samuel Munson and Henry Lyman by the Toba Batak in 1856 – mission work accelerated through the latter half of the 19th century (see Lyman and Lyman Willard 1856). By the 1930s, the vast majority of Toba Batak had converted to Christianity, with traditional animism confined to isolated villages (Vergouwen 1964). With the establishment of churches and schools, and the prohibition of traditional forms of social organization, Western social structures gradually replaced customary hierarchies and networks of social intercourse (Vergouwen 1964). This program of religious modernization set the stage for a more complete integration of Batak territory into the Dutch administrative framework. To this end, the east coast residency appointed “annexation chiefs” to help missionaries lay the groundwork for native assimilation into the colonial machinery (Lekkerkerker 1916). While lowland planters tilled the soil in preparation for tobacco, highland missionaries planted churches in preparation for Dutch hegemony.

The plan to create a religious buffer zone could only succeed so long as the newly converted population did not move. The residency quickly realized that the rising
demand for labor in the lowlands was attracting increasing numbers of Batak toward jobs in Deli. As the plantations expanded, the Dutch experimented with a range of policies to keep highlanders in place; in some cases, bringing the territorial imperative and the moral one into direct conflict. In line with the moral imperative, missionaries built schools alongside churches to further religious education and facilitate the penetration of Western discourses of social behavior (Kipp 1998). In the case of the Karo, these schools offered instruction in the local Karo language, but refused to teach Malay or Dutch. Administrators directed missionaries to withhold language instruction so as to discourage Karo youth from migrating to the Malay-speaking lowlands in search of work. Administrators also worried that students who spoke Malay would be more susceptible to Muslim conversion, undermining the integrity of mission work and the whole point of the religious buffer zone. So long as territory could be organized along religious or linguistic lines, the Dutch used churches and schools to control the movement of people.23

The Dutch fear of Islam and their desperate need to consolidate territory would lead to war. In 1870, Aceh increased political pressure on the sultan of Deli, seeking suzerainty over the new tobacco regions. The Dutch had yet to establish full control over the east coast and retaliated with threats of war with Aceh, despite the terms of the 1824 treaty with Britain that forbade any military action. When, in 1870, the Acehnese sought to form a new strategic alliance with Britain (another violation of the 1824 treaty), the Dutch took Britain’s betrayal as an annulment of the treaty terms and promptly attacked Aceh (Reid 2005). It is interesting to note that the Netherlands did not go to war with Britain, the violators of the treaty. Rather, Batavia’s military strategists saw this as a perfect excuse to end the threat of Acehnese aggression immediately through military
action. To smooth over any hurt feelings with their European neighbors, the Dutch granted the British trading rights with Siak in 1871 (Reid 1969).

The subjugation of Aceh would be far from immediate. A costly war dragged on for 30 years and claimed over 100,000 lives by the time hostilities ended in 1903 (Reid 2005). With 37,000 dead among the Dutch, the Aceh War was the bloodiest chapter in the history of the DEI and contributed to the rise of humanitarianism in the Netherlands (see below). For the plantation lands, the defeat of Aceh spelled the end of any remaining sultanate resistance on the east coast. Capital investment in plantations accelerated into the new century, where it would conspire with the newest and most extraordinary commodity yet to emerge from Europe’s colonial gardens: rubber.

Economic liberalism

As European planters boarded ships bound for the plantation lands, two emergent philosophies would make a similar journey to the colony in the minds of a new generation of Dutch civil servants. On the economic side, liberalism championed the role of private enterprise (Furnivall 1939). On the social side, humanitarianism advocated a colonial state more concerned with the welfare of its population (Gouda 2008). In the ensuing decades, liberalism and humanitarianism would at times clash and at other times collude, each playing a key part in the transformation of agricultural space.

The rise of economic liberalism in the 19th century can be traced to the success of European manufacturing during the industrial revolution. Flush with a surplus of goods thanks to labor-saving technologies and cheap raw materials from the colonies, European businesses sought markets for their excess production. The populous colonies – once seen merely as resource peripheries ripe for exploitation – now provided a
potential market for these goods. The ascent of liberalism marked a change in how colonies were understood and, consequently, a shift in the perceived role of the colonial state.

Prior to liberalism, the colonial state maintained significant control over the means of production: the DEI made a profit from the production, milling, and sale of sugar, for instance. In this system, where local labor supplied resources to the state, colonial administrators were little motivated to improve the financial wellbeing of the native population: low wages ensured cheap production. Transforming the colony into a consumer market, however, would require the creation of local wealth. Such wealth creation could not be universally applied: the colony still needed to keep down the cost of resource extraction, which entailed low wages. The solution to the paradox was to promote large-scale class stratification (Marx 1967). So long as wealth could be concentrated among members of a consumer class while conditions for poor workers stayed the same, the colony could simultaneously produce cheap materials and buy manufactured goods. The profits for the mother country, which retained the means of manufacture, would be astounding.

To encourage class stratification and benefit European businesses seeking to invest in the colonies, liberalism mandated the withdrawal of the state from the means of production. No longer would the colony make money from the direct production or extraction of resources, as this would be opened up to private enterprise. Instead, the colony would profit from the taxes and tariffs applied to exported and imported goods. Rather than invest its own resources in plantations and mills, the colony invested in infrastructure (irrigation projects, railways, and agricultural research stations) to encourage foreign investment in the private sector. Beyond infrastructure, the liberal
imperative demanded that the state write new property laws allowing individual and corporate control over land, and eliminate legislation regulating the operation of banks and the restricting the free flow of capital (Furnivall 1948). Of all the mandates of economic liberalism, these legislative changes would have the greatest impact on Sumatra’s agricultural production.

On the east coast, liberal economic policies had four distinct effects: (1) the expansion of a money-based economy, (2) the privatization of land ownership, (3) class stratification, and (4) a focus on agro-industry.

Money-based economy – Though some historical trade with lowland Malays and Simelunungun had involved monetary exchange, most local economies were still organized around rice. Beyond its value as a food product, rice was used to pay rent to landlords, pay debts to lenders, pay wages to laborers, and purchase all conceivable goods and services. Wealth was thus correlated to a household’s capacity to produce rice, and as rice production depended on available fields, wealth was similarly associated with land. The prohibition among many native groups against buying and selling land helped to ensure that all households had the ability to produce both food and “money.” The arrival of a currency-centered system did not immediately destroy these local rice economies. It did, however, allow plantation owners to deploy wage labor. With no rice to offer for work, but plenty of foreign exchange gained through export, planters created a massive market for certain native groups willing to work for cash. With increasing numbers of people seeking to spend their paychecks in local markets, the pressure on the rice economies to switch over to currency eventually became insurmountable. This sudden injection of cash aided the development of Western-style banks, quickly dissolving traditional systems of lending and debt-repayment (Vergouwen 1964). One of the most
common consequences was the replacement of village lenders with large, remote, corporate banks, unconnected to local community or family. While rates of repayment and interest were traditionally negotiated between neighbors in the same village, the new system put borrowers at the mercy of lenders concerned with making money from high interest rates and debt management. Finally, the proliferation of currency allowed colonial administrators to deploy methods for collecting tax that were far simpler than the older systems in Java linked to agricultural production. The simplicity of these systems for tax collectors belied the heavy burdens placed on rice-centered households that now had to find a source of cash to pay the state.

Privatization of land – In legislating private property (see the Land Law of 1870, below), Batavia inaugurated a land market that would eventually destroy almost all forms of traditional land tenure in the region (Furnivall 1939). As the monetary economy expanded and the number of landholders selling or leasing their land for cash increased, foreign companies with significant financial resources quickly snatched up available plots. The situation in East Sumatra mirrored a similar phenomenon in other parts of colonial Southeast Asia, where changes to land policy created a burgeoning landless class whose choices were now limited to wage labor or tenancy (Scott 1976). The dramatic social consequences of this change will be developed further in Chapter 7.

Class stratification – The creation of a landless class was furthered by the increasing wealth disparities that accompanied economic liberalism. Capitalism’s introduction to East Sumatra did not take place on an even playing field: like other colonial powers, the Dutch took for granted a racist understanding that privileged certain groups over others, a system of social ordering in place long before the arrival of economic liberalism. In this racial hierarchy, Europeans occupied the top of the pyramid,
superior to all others by way of education, “civilized” upbringing, base intelligence, and moral fortitude. Such qualities meant that Europeans were best suited to positions in colonial administration and business leadership. Below Europeans, a “middle-man” class of merchants and small business owners ran the secondary economies needed to support primary commodity production (Bonacich 1973). Having worked extensively with Chinese in Java, the Dutch encouraged the migration of wealthy Chinese merchants to Sumatra during the early years of plantation growth. Seen as shrewd and well-connected, if not altogether trustworthy, Chinese worked in privileged positions with European elites who enjoyed the benefit of having this buffer between themselves and the restive locals. At the bottom, poor Chinese and Javanese occupied the laborer ranks. Often retained as indentured servants (or the euphemistic “contract workers”), members of this poor laboring class lacked the political, social, or economic capital to improve their livelihoods (Stoler 1985). Finally, most Malays in the plantation zone were not deemed suitable for even physical labor (Pelzer 1978). Characterized as indolent, backward, and deficient in moral character, the Dutch made little effort to employ Malays on the plantation, preferring to let enlarging economic and political currents carry them from the land, or in the case of the Simelungun, driven into submission through military action. 

Not only did this hierarchical understanding serve to establish relationships of power between races, it also prescribed “proper” economic activities to each race. This “functional racism” prevailed throughout the DEI and much of colonial Southeast Asia. By equating one’s rightful job and coterie with one’s racial, ethnic, linguistic, and religious identity, functional racism served to curtail economic mobility. Liberalization and privatization did not give poor Malays the chance to become successful
entrepreneurs; rather, it bestowed wealth upon those already groomed: those in the right social class, with the right characteristics, and of course the right complexion.

Focus on agro-industry – Finally, with its late arrival on the colonial stage, Sumatra’s “empty” lowlands were seen as a tabula rasa ripe for a new kind of exploitation. Elsewhere in the DEI, commodity production rode on the backs of local producers already established in traditional agriculture: the question for Java and the Moluccas was how to extract more sugar, indigo, and coffee from peasant farmers (Schrieke 1929). On the other hand, colonial luminaries saw Sumatra as a space for large-scale agro-industry (Pelzer 1978), a space that would produce raw materials like rubber and palm oil for industry, not the dinner table “condiments” that had come out of Java (Geertz 1963, 105). Economic liberalism played a key role in encouraging this new approach. In Europe, an expanding manufacturing sector fostered an insatiable demand for industrial commodities. Meanwhile, liberalization of lending conditions encouraged corporations to move to Sumatra and experiment with a wide variety of cultivars and cultivation practices. A rejuvenated lending industry helped the state as well. Borrowing from private lenders, the state “built railroads and modern irrigation works, set up agricultural experimental stations to improve yields, and in general created a comprehensive agro-industrial structure probably unmatched for complexity, efficiency and scale anywhere in the world” (Geertz 1963, 85).

As the new champion of business, the colonial state became entangled with the interests of private capital, a happy romance that might have shown even greater promise but for the emergence of that Dutch collective consciousness: social humanitarianism.
While the champions of economic liberalism were decrying the colonial state for its restrictions on private enterprise, a Dutch public frustrated by decades of atrocities in Java decried the colonial state for its heavy handed excesses. During the 1850s, the horrors of the “culture system” – a brutally oppressive form of sugar taxation in Java – gained public attention through travelers reports and newspaper columns (Furnivall 1939). Reacting to the economic oppression of millions of Javanese farmers forced to convert their rice fields to sugar, and the bloody suppression of dissent by the military, the public demanded change from their government. Blaming the too-close relationship between the state and the means of production, humanitarians wanted the colonial administration to break its ties to commodity profits. For the humanitarians, the role of government should be that of a parent to a child: responsibility for the healthy, education, and spiritual well-being of the native population, not simply its subjugation for profit. Toward this goal, humanitarians wanted the state to focus on the construction of public works that might develop the colony’s social capital: sewer systems, hospitals, schools, and institutions to train locals for civil service.

With a shared commitment to reducing the influence of the state in everyday affairs, humanitarians and economic liberals found common ground, and by the mid-1850s, the coalition successfully purged the administration of its old “culture system” champions (Furnivall 1948). However, as free-market capitalism unfolded in the DEI and a new set of abuses were brought to the attention of the public, humanitarians and liberals parted ways. Thanks in large part to both the Sumatran land grab and the government’s headlong free-fall into the Aceh War in 1871, humanitarians quickly realized that human exploitation under liberalism had the potential to exceed even the
worst abuses under the “culture system”. From this point on, the humanitarian
philosophy of responsibility would clash directly with the interests of capital.

Humanitarianism led to a shift in the state’s approach to Sumatran expansion. By
the time Nienhuys’ first crop inaugurated the land grab, total subjugation of the natives
(as had happened in the Moluccas and parts of Java) was out of the question. Batavia,
initially playing little part in the contracts signed between European planters and the
Sultan, gradually intervened in the interest of the local population. Pressure from
humanitarians in the colony and at home forced Batavia to spend money on public
works, keep an eye on the excesses of planters, and enact legislation to curb the
pandemic of capital. The internal conflict between government’s dual roles would not be
resolved before World War II. Indeed, as planters clamored for more freedom to carve
out profits, and as locals set fire to Dutch property in protest over lost land, the
government had to walk an increasingly finer line. The legacy of Batavia’s high-wire act
is written throughout the social, economic, political, and ecological landscape of the
DEI’s plantation paradigm.

**The plantation paradigm**

Once again, we return to the question of Sumatra. If geopolitics, Christian
conversion, liberalism and humanitarianism answer the “why”, Nienhuys’ experiment
with plantation tobacco answered the “how”. In lieu of any endemic, exploitable
resource, Europeans would plant one. Later, they would import many more. Without a
servile labor force, Europeans would import people too. Surrounded by native
ecosystems and societies, the plantation was a true expatriate. Foreign run and export-
oriented, the outward-facing plantation demanded only one asset from Sumatra: land. Such was the theory.

In an effort to produce a commodity for profit, plantation agriculture sought to take advantage of another commodity: labor. In most plantation systems during the colonial period, planters moved labor onto available land. These labor movements comprise some of the largest ethnic “migrations” in history: slave traders brought West Africans to Latin and North America to work on sugar and cotton plantations, while the British moved thousands of Chinese across South and Southeast Asia to cultivate rubber and mine tin, to name two examples. In some places today, these ethnic communities make up a majority of the population (Bonacich 1973). In economic terms, Sumatra presented Europeans with the same dilemma as other plantation zones: a vast land surplus and labor shortage. With abundant land, local farmers felt little incentive to work on the plantations for their livelihood. Their own labor could be better spent directed towards subsistence, and the absence of a currency-based economy entailed little demand for wages (Geertz 1963). As elsewhere, labor would come from abroad.

The plantation paradigm on the east coast presented four challenges for owners and colonial officials alike: (1) access to land, (2) access to labor, (3) the problem of people, and (4) the problem of cultivars.

The problem of land

Despite the physical abundance of land on the east coast, planters needed political assistance acquiring and securing it. In the early plantation years (1865-1870), prospective owners approached the sultan to request land. In most cases, the sultan would grant a concession under a long term lease (between 75 and 99 years), identifying
a tract of land for cultivation suitable to both parties. The sultan rarely charged rent for these concessions; instead, levying an export tax per pikul of tobacco. This business model, no doubt mirroring the colonial state under its new liberal mandate, made for wealthy sultans. As vassals of Batavia, contracts between the sultan and planters were considered legally binding in Dutch courts (Pelzer 1978).

By 1870, the land grab had depleted the sultans of available land. However, this didn’t stop them from attempting to grant concessions to land over which they lacked in authority. At this time, lowland Karo rebelled against the incursion of tobacco plantations by setting fire to tobacco drying houses (Kipp 1990). Karo villages objected to the sultan granting permission for plantations on traditional Karo land. Dutch soldiers successfully quelled the rebellion, but as a consequence, the Karo managed to negotiate a percentage of tax revenues, paid to Karo headmen and the governing council (Kipp 1990). The Karo rebellion served to remind Batavia of the need to resolve the land issue between natives, the sultan, and corporate interests. It would also result in the creation of the Model Contract (see below), generalizing and codifying land exchange and management between all parties. While later rebellions by Malay and Simelungun were similarly met with Dutch force, no subsequent negotiations took place: once ossified in the law, the relationship between land and its use could not be reexamined.

Significant land remained beyond the hegemonic reach of the Sultan and it was over this terra incognita that the DEI sought to stake its claim. For this purpose, Batavia turned to its legislative apparatus, passing a series of laws between 1870 and 1874 that would radically reshape agricultural space and cement the foundations of the emerging liberal state.
The Land Law of 1870 (sometimes referred to as “The Agrarian Law”) was a masterstroke of political ingenuity and came to be the central legal instrument for land reform. Though most colonial histories see land conflict in Java as inspiration for the law, the historical record suggests the law was deployed to its greatest effect in the outer islands, particularly the growing plantation industry in Sumatra. Geertz observes that the Land Law of 1870, “which inaugurates the Corporate Plantation period in East Indian economic history, represents one more effort to superimpose commercial economy upon subsistence economy in such a way as to stimulate the first and tranquilize the second” (1963, 84). Indeed, with its preferential treatment of corporate land ownership and its acquiescence to large scale (and long term) concessions, it’s clear that Batavia’s legislators were looking far beyond the rigid, smallholder mosaic of Java when they drafted the new law.

The Land Law of 1870 established the following (Furnivall 1939):

1. All land that is customarily used by the natives is a native holding.
2. Natives can apply to have their holding recognized as private property.
3. Thus, there are two kinds of native holdings: customary holdings, and private property.
4. No native holding can ever be sold to a foreign individual or company.
5. All native holdings can be leased: if it is a customary holding, it can be leased for up to 5 years at a time; if it is private property, it can be leased for up to 20 years at a time.
6. All land in the colony that is not private property is State land.
7. There are two kinds of State land: that which is a native customary holding, and that which is “free” (called empty land).
8. The State can lease State land to any Dutch subject, colonial resident, or company registered in the DEI, for a period of up to 75 years.

Figure 11 shows how a plot of land became rationalized by the state under the Land Law of 1870.

*Figure 11: Land categorization under the 1870 law*

In a political landscape dominated by both economic liberals (seeking easy access to land) and humanitarians (seeking to preserve native land rights), the law struck a masterful compromise. Among the supporters of private capital, the Land Law was deemed a “Liberal Manifesto” (Furnivall 1939, 179). By establishing lease markets for all categories of native and state land, the law ensured that every hectare in the DEI could
be leased. No territory was off limits, and though some individuals with private property rights might hold out, a land market the size of the archipelago effectively guaranteed that someone would lease, and likely lease for cheap. All a corporation needed to do was identify who had authority over the land in question and offer a price.

The law also answered humanitarian calls. In the DEI, the Land Law of 1870 was the first colonial decree to grant natives the right to own property. (It is possible that this was the first colonial law anywhere in Southeast Asia to grant such a right.) Once land was privately owned, the owner could lease it for up to 20 years, ensuring a steady, long term income. Even if natives did not convert their land to private property, it still could never be sold to any foreign interest. For a government seeking to appeal to both economic liberals and humanitarians, the land law seemed to offer something for everyone.

Of course, prohibiting the sale of native land was of little consequence once all native land became leasable. By establishing a leasing market for vast quantities of state and native land, the law ensured that wealthy European companies and individuals could acquire sizeable concessions at bargain prices. The law effectively commodified Sumatra's greatest resource, opening it up for exploitation by plantation syndicates that wasted little time snatching up the best hectares the island could offer.

The key to native land control rested in private property: once a plot was privately owned, only the owner could determine how the land would be used, and only the owner could profit from its lease. Until converted to private property, however, a native holding was considered a “customary holding” and property of the state. Potential concessionaires interested in customary holdings made offers to the state, and if Batavia
accepted those offers, the land was leased out from under any farmers or villagers using the land. All profits from the lease of customary holdings went to pad colonial coffers, with local communities seeing no financial benefit. This distinction between private property (where landholders retain control) and customary holdings (where landholders could be forcibly displaced) was designed to encourage individual ownership at the expense of communal ownership. The Dutch sought to end the nearly universal practice of communal ownership “partly because communal occupation was seen as an obstacle to good cultivation, but chiefly because this would help Europeans to secure land” (Furnivall 1939, 180). It’s easier to secure land when there’s only one person on the title.

While the law established private ownership, obtaining such ownership was far from simple. First, converting communal property to private property meant identifying a single person whose name would be identified on the title. If land was shared between family members with usufruct passing directly from one generation to the next, selecting a single person to “own” the land was rarely straightforward. Assuming a person could be identified, he or she had to travel to the nearest city with a Dutch administrative office, sometimes several days away. At the office, the candidate owner would be asked to present proof of the land claim, including any witnesses who could testify to its legitimacy. If the authorities questioned the authenticity, the candidate would be forced to leave empty-handed. But if everything proceeded smoothly and the candidate’s claim was approved, the new land owner would leave with a signed title document guaranteeing private ownership. On the flipside, that document now opened up that plot of traditional land to market forces.

To expect native landholders who were generally illiterate in Dutch to navigate such administrative procedures and commit to such sacrifices was, quite simply, absurd.
Statistics reveal the senselessness: no more than 2% of all native holdings in East Sumatra were ever converted to private property under the 1870 land law (Furnivall 1948). This fact exposes the bare ambition of the Dutch to eliminate communal ownership and open up land for foreign exploitation. While the promise of private property gave lip service to humanitarian concerns, the Land Law of 1870 was designed to guarantee the elimination of communal ownership, whether by native conversion to private property, or by the state, now equipped to lease land out from under the natives for corporate consumption.

Four years later, the Clearings Ordinance of 1874 further constrained landholders. Under the ordinance, all clearing of “waste land” – usually for swidden cultivation – had to be authorized by a government official (Furnivall 1948). Such authorization was rarely granted. The forestry service justified this extension of its power by declaring that swidden practices were increasing soil erosion and threatening water quality. Behind its mock concern for resource conservation, the Clearings Ordinance sought to eliminate swidden cultivation altogether. In fact, the swidden practice of clearing and burning tracts of forest (known among the Dutch as raubbau or “robber economy”) was despised by administrators because it deprived foreign logging companies of valuable wood (Pelzer 1978). Notably, when the ordinance passed, it placed no restriction on forest clearing performed by logging companies (Geertz 1963). Thanks to the Clearings Ordinance, privately owned cultivation on land with no foreign claim and no lease agreement was still controlled by the state, this time in the name of conservation.
The problem of labor

Almost without exception, the plantation paradigm demanded surpluses of labor. In the case of tobacco, men and women were employed to clear forest, prepare fields, plant the tobacco, harvest the leaves, arrange the drying racks, sort the leaves by size and quality, and package the tobacco for shipment. Sumatra’s low population density posed a significant obstacle to plantations. Indeed, Johannes van den Bosch, former Governor General and architect of the Javanese Culture System, once referred to Sumatra as an “unprofitable burden” for this very reason (Furnivall 1948). Van den Bosch’s oppressive Culture System – which forced rice producers to shift to sugar – demanded high labor inputs, available in crowded Java but impossible to find along Sumatra’s sparsely settled coast. While low density may have spared Sumatrans the horrors of the Culture System, it would not prevent the arrival of plantations. Under the plantation model, the labor problem had been solved by the French in the West Indies, by American slave traders in North America, and by the British in India, Burma, and Malaya: when you can’t move the land, move the people.

Chinese workers from Singapore and peninsular Malaya were the first to arrive. Traded by British brokers, Chinese laborers were generally free (that is, non-indentured), though plantation wages were miserable. Other Chinese were encouraged to move to Sumatra to participate in the merchant economy. Able to take advantage of existing connections and extensive trade networks in China and around Asia, this merchant class of Chinese emigrated to Sumatra from elsewhere in the DEI or nearby British Colonies. In most cases, Europeans sought to bolster the ranks of this “middleman minority” to act as a buffer between the elites and the rancorous rabble (Bonacich 1973).
The opening of the Suez Canal in 1870 would dramatically alter the ethnic landscape of Sumatra. As liberalism expanded in Java, the privatization of sugar production was turning the Chinese owners of milling and transport syndicates into wealthy men. In 1870, sugar milling was still a labor intensive task employing thousands of poor Javanese who had left the rice fields for the cities in search of work. With the opening of the canal, ships were finally able to transport heavy milling equipment – available in Europe for decades – to the colonies. With sugar production in private hands, milling companies in Java quickly invested in the new labor-saving equipment and divested employees (Geertz 1963). During the 1870s and 1880s, the loss in milling jobs reinforced a developing crisis of impoverishment among tens of thousands of landless Javanese. Administrators were searching for a solution as the Sumatra land grab was hitting its stride. With East Sumatra’s insatiable appetite for labor and overcrowding among the poor in Java, the Dutch hatched an idea.

In its simplest form, the plan involved moving destitute Javanese to Sumatra, but without the offer of any reasonable wage, the prospect attracted few Javanese. There were few guarantees that Javanese transmigrants would stay there for long. Once again, legislation provided an opening. The Police Penal Regulation of 1872 made it a criminal offense for anyone in the colony to disobey a master’s orders (Pelzer 1978). Violations of the law included such simple acts as failing to show up to work on time, or not responding to a police officer in timely fashion. In Java, the punishment meted out to violators was usually a period of 7 years indentured labor in Sumatra. Should this penalty be refused, the “criminal” was sentenced to prison. While we do not have statistics on the total number of Javanese convicted under the Penal Regulation, the population of indentured Javanese in Sumatra swelled dramatically between 1872 and
1890, continuing its meteoric rise until the start of World War II. Early census figures for East Sumatra are not available, but unpublished Dutch reports indicate that by 1930, the number of Javanese in the East Sumatra residency topped 641,000, or 43% of the total population, more than all Batak and Malay combined (cited in Pelzer 1978).

Meanwhile, protests in Java over the Penal Regulation forced its repeal in 1879, but the practice of forcing those convicted of petty offenses into plantation labor continued. By the time of the law’s repeal, there were so many coolies working in East Sumatra that legislators reinstated the Penal Regulation in 1880 to apply specifically to agricultural labor (Stoler 1985). Thus, plantation coolies who disobeyed orders, fell sick, or found themselves singled out by maverick supervisors could be found in violation of criminal law and sentenced to further time on the plantation (Stoler 1985).

Despite the influx of Chinese and Javanese between 1863 and 1910, rapid plantation growth outstripped the labor supply, and by the turn of the 20th century, numerous opportunities for wage labor started to appear. This burgeoning wage labor market, however, pursued the same logic of functional racism that had organized the plantation paradigm to being with. Planters targeted select groups for employment: Malay and Simelungun were excluded, while Toba Batak were encouraged to apply. I see six reasons for this selective hiring: (1) Europeans viewed the Toba as fiercely loyal (to family, community, and employer) and responsive to economic incentives (Vergouwen 1964); (2) by 1910, most Toba had converted to Christianity, a fact that may have lubricated their interactions with European elites; (3) the Aceh War was over and the threat of a Muslim incursion into the highlands had been assuaged (Reid 2005); (4) the Toba highlands were experiencing a population explosion, with an increase in youth of working age (Vergouwen 1964); (5) wage labor increased the penetration of a currency
economy into the highlands where the Dutch sought to increase their influence; and (6) selective employment of Toba supervisors over Simelungun, Malay, and indentured Javanese helped to cultivate animosity between these ethnic groups who, if ideologically united, could pose a serious nationalist threat to the Dutch.

The problem of people

With access to land and labor secured, a new question emerged: what to do with the people that lived on the land? Two options immediately came to mind: (1) the local population could be converted from swidden cultivation to wage labor on the plantations, or (2) these Malay and Simelungun villagers could be forced off the land entirely. The administration’s approach to the problem would emerge from a confluence of factors, including economic imperative, perceived history, moral mandate, and racial narrative.

Like other colonial powers of this period, the Dutch were constrained by geographic and social imaginaries that made their dreams of conquest challenging, to say the least. Antoine Cabaton sums this up:

“Her European rivals being thus disposed of, Holland set herself the arduous task of rendering her domination actual instead of nominal, as it was at the beginning of the nineteenth century. The size and configuration of the island, and the independent spirit of its peoples, have made the task a matter of interminable patience in which diplomacy has more than once been forced to fall back upon the force of arms.” (Cabaton 1911, 284)

In writing about the “independent spirit” that so tried the “interminable patience” of the Dutch, other authors used somewhat more specific terms. Lekkerkerker described the Batak as a “coarse and dirty, but industrious people” (Lekkerkerker 1916,
The Simelungun, however, are “uncivilized cannibals” whose indolence will ensure they “will not make much of themselves” (Lekkerkerker 1916, 145). Native societies were routinely described as “wild tribes” (Favre 1865), lacking any forethought or ethic of preservation (Forbes 1885), at best “a motley assemblage and an extremely wild and savage looking group” (Anderson 1826, 58). With respect to industry, van den Bosch famously quipped that his colonial subjects, if left to their own devices, would “do nothing but grow rice all day” (Furnivall 1939, 532). Indeed, in the mind of Governor General de Jonge, locals were so incapable of productivity and self-sufficiency, that the Dutch would need to stay on as overlords for “another three hundred years” (de Jonge 1933, cited in Gouda 2008).

Such a racist discourse cast much of the native population into a category unfit even for plantation work. Had such work been offered, the experience of other plantation ventures in Southeast Asia suggests that local populations would have fiercely resisted any participation in the conversion of traditional lands. Chinese and Javanese, with no place attachment to East Sumatra, could be convinced to clear forest and occupy traditional villages – even assemble into armed gangs to quell local resistance (Pelzer 1982, Stoler 1985). The potential for exploiting imported labor to “do the dirty work” ensured that planters did not consider local Malay and Simelungun for employment.

With local employment out of the question, administrators were left with the prospect of displacement. From an economic perspective, the Malay and Simelungun stood squarely in the path of advancing tobacco. The opinion of early planters was crystal clear on this point: local swidden cultivators had to go (Pelzer 1978). Racist discourses no doubt played a part here too: it may have soothed the conscience of planters to believe
that the people being rooted out were coarse, motley, indolent, and therefore undeserving of civil consideration in the first place.

In direct opposition to displacement was the rise in social humanitarianism, eventually taking form in the *Ethische Politiek* (Ethical Policy) enacted by Queen Wilhelmina in 1900 (Gouda 2008). Through this declaration, the Netherlands sought to shift the focus of colonial administration from profit making (*wingewest*) to humanitarian and moral concerns. In practice, this meant greater state expenditure on medical services, education, and civilian infrastructure. Commissioned under this new moral imperative, civil servants trained in the Netherlands flocked to the colony during this period under the admittedly cynical label of “humanitarian dreamers” (Gouda 2008). Upon arrival, the good intentions of these young officials would clash with the profit motive of an entrenched plantation establishment. Criticized for losing sight of Dutch interests and the “imperative logic of Western capitalism,” many civil servants either left the colonies in disillusionment, or stayed on in resignation (Gouda 2008, 24).

Even where the policy succeeded, the tendrils of capital became entangled in the fabric of *Ethische Politiek*. One component of humanitarian political organization was the creation of Rural Councils. Administrators created these groups to address rural native concerns within each residency. In every other Rural Council in the DEI, native members outnumbered Europeans. In East Sumatra, however, of the 27 members, 24 were European. Planters could not allow profits to be jeopardized by native interference.

Despite the failures of *Ethische Politiek*, the humanitarian turn did succeed in preventing widespread eviction. Against the wishes of planters, the state legislated that villages within concessions must be allowed to stay and cultivate (Pelzer 1978). This
setback for the planters would only be temporary: although removal of the population was the primary goal (one which the planters continued to pursue under the Ethical Policy), a secondary objective involved converting the locals from swidden to intensive cultivation. To this end, planters enjoyed considerable success.

The rationale behind this conversion is as follows. Rotating subsistence cultivators meet their food needs directly through their own labor, creating little incentive for them to participate in a currency-based economy. Rotating cultivation is also land extensive, depriving concessionaires of valuable acreage. If Europeans could convince (or force) local farmers to switch to permanent cultivation, several benefits would result: First, permanent cultivation under lowland conditions (where wet rice was not an option) could not support subsistence needs, so farmers would have to switch from staples to perennial cash crops. Second, switching to cash crops would force farmers to sell these goods for export in exchange for staple food, ensuring participation in the larger currency economy. The state and Sultan would profit from the increase in exports and imports. Finally, intensive perennial cultivation would make it easier to demarcate legal boundaries, establish permanent infrastructure, and keep track of people. With the arrival of liberalism and agro-industry came technocratic approaches to agriculture that demanded quantifiable production, taxation, and land use. Not only did rotating cultivation fail to conform to the lines of concession maps, it failed to fit between the lines of Dutch ledger books as well.

In Chapter 7 we will examine the legal apparatus used to compel local farmers away from swidden and towards intensive cultivation. This tool, known as the “Model Contract” evolved over several decades from a simple compact binding planter and
Sultan in the exchange of land, to a complex authority prescribing appropriate native behavior and granting planters near-complete sovereignty over their concessions.

The problem of cultivars

Of course, land and labor were prerequisites to cultivation, the essential purpose of a plantation. Though nearly all plantations established between 1863 and 1880 seeded their first fields with tobacco, many would experiment with other cultivars in subsequent years (Furnivall 1948, 568). The problem of what cultivar to grow can be seen as a function of three interrelated calculations. For any given crop, (1) how suitable is it for local climate, soil, and biological conditions; (2) what is its economic value; and (3) how well can its cultivation integrate with local practices.

Ecological Suitability – Rubber prefers well-drained soils. Tobacco yields decrease with soil acidity. Tea needs the cooler temperatures of the piedmont. These and other maxims comprised a growing list of best practices for colonial agronomists. As plantations quickly expanded and experimented, East Sumatra became a giant laboratory for Dutch agricultural research (Lekkerkerker 1916). Early failures led to increased state expenditure in research, until by 1910, East Sumatra was the most described, charted, and cataloged residency in the outer islands (Pelzer 1978). Large plantations that started out growing tobacco frequently changed cultivars based on what seemed to work best in different parts of the concession.

Suitability was not limited to initial environmental conditions. Within a rotating system, planters were concerned with diseases spreading from one season’s crop to the next. Tobacco planters burned down drying sheds to prevent an epidemic in one harvest infecting the following season (Pelzer 1978). Multicropping was discouraged for similar
reasons: in lieu of scientific research, many plantation owners feared that pests or pathogens from one cultivar might jump to another. As we will see in the next chapter, this fear (more than any specific evidence) helped planters impose serious constraints on local cultivators.

*Economic benefit* – Cultivar choice went hand in hand with expected profits. In the 80 years between the first tobacco plantation and World War II, the rise and fall of cultivars is correlated with the rise and fall of each commodity’s price on the global market: as tobacco prices dropped, plantations diversified. As prices rose, companies returned land to tobacco production (Furnivall 1939). When British agronomists at Kew Gardens made rubber available to plantations in Malaya, the global price of latex was at an all-time high (Tully 2011). Almost overnight, Sumatran planters began clearing land for rubber.

Though labor costs in per-hour terms were generally low, the amount of labor needed for clearing, weeding, tending, harvesting, processing, packing, and shipping varied with each cultivar. Such costs played a role not only in cultivar choice, but in choices made about intensification. In the early years of tobacco, laborers would harvest the leaves from each plant once, at the end of the season. By contrast, local Karo villagers practiced a tiered harvest in which the largest leaves were picked first, followed a week later by the next largest, and so on. By staggering leaf collection, Karo farmers encouraged the plant to produce more leaves. European planters eventually copied the Karo strategy: even though this increased labor costs, the improved yields made up the difference (Pelzer 1978).
Integration into local practices – Thanks to a growing humanitarian mandate, planters had to work with (or around) local cultivation practices. Here, the distinction between annual and perennial crops was critical. Annual crops occupy a field for a single growing season, while perennial crops produce from the same field for numerous seasons (in the case of rubber, as long as 30 years) (Jackson 2008). As with plant lifespans, soil demands between annuals and perennials vary as well. Annuals need to extract all the nutrients necessary to produce fruit within a single season, quickly depleting soil quality. In a tropical environment and lacking edaphic fertilization, annuals force farmers to rotate fields. By contrast, perennials grow slowly and don’t always produce fruit immediately or consistently. Thus, nutrient demands are less extreme: in the case of some tropical perennials (like rubber) no fallow is required after the growing period. Finally, annuals and perennials require different outlays of labor. For rotating annuals, most of the work is concentrated at the beginning of the season when fields require clearing and burning, and at the end of the season when crops are harvested. For perennials, varying amounts of labor may be spread throughout several years.

By the end of the 19th century, most locals cultivated rotating annuals, usually dry-field rice, corn, and root crops. On the other hand, as far as planters were concerned, the most profitable cash crops – tea, coffee, cacao, and oil palm – were perennials. Though the infamous Englishman Henry Wickham had stolen rubber seeds from Brazil by this time, botanical research gardens had yet to turn it into a plantation-ready cultivar (Jackson 2008). The Dutch company NV Verenigde Deli-Maatschappijen (VDM) did not plant the first Hevea brasiliensis in Sumatra until 1907 (Pelzer 1978). This distinction between annual staple crops requiring rotation, and perennial cash crops that occupied
land for decades, was a serious challenge for planters forced to comply with the state’s insistence on local integration.

Tobacco was an anomaly, and for planters, a godsend. A fast-growing plant with high nutrient demands, the leafy crop was both an annual and a cash crop (Geertz 1963). Indeed, tobacco was the only significant annual cash crop grown in East Sumatra (from export data acquired by Pelzer 1978). Tobacco’s biological requirements forced planters to mimic local rotation patterns: clearing forest, planting, and then fallowing empty fields. Due to land-extensive crop rotation, tobacco’s profitability per hectare could not compare with intensive perennials like tea or rubber. This made it naturally less attractive to capital-conscious planters. However, as the “pioneer” cultivar, tobacco’s rotation requirement had one significant upside: this annual cash crop could be integrated into existing swidden patterns. And once integrated, the legal and political institutions that piggybacked on tobacco could complete the transformation of agricultural space and the obliteration of lowland cultivators. Integrated tobacco would, thus, set the stage for sovereign rubber.

In the final chapter, I will use the socio-ecological model to unravel how this transformation took place.

---

22 The war between Aceh and the Batak (1540-1630) has been described as an attempt to spread Islam into the interior (for example, see Reid 2005). While this may have motivated Acehnese actions, I believe both sides used the war as an opportunity to grab a greater share of the pepper trade which was in full bloom at the time. For evidence, see Reid (2005) as well.

23 Missionary attempts to control language instruction among the Karo would backfire. In 1930, Karo villagers demanded that Malay be taught in local schools. When the missionaries refused, the Karo abandoned the mission schools and established their own, with Malay as part of the curriculum. The mission schools eventually recapitulated and ended the prohibition on Malay instruction (Kipp 1990).
The Dutch generally respected the Toba and Karo Batak, allowing members of both groups to occupy civil service offices and positions in plantation administration during the late plantation period. I believe there were four reasons for this privilege: (1) highland Batak did not directly challenge European authority in the lowlands; (2) by the 1930s and 40s, most Toba and Karo had converted to Christianity; (3) unlike the lowland Malays, Dutch ethnologists characterized the Batak as aggressive, head-strong, and shrewd: qualities with some political utility for the Dutch (see Lekkerkerker 1916); and (4) privileging the Batak against the Malay allowed the Dutch to divide any inter-ethnic sources of native resistance.

Geertz sees the unwillingness of the native population to work on the plantation in economic terms (Geertz 1963). In the long and difficult evolution of post-colonial thought, this is indeed an improvement over the classic rationale, namely, laziness. I wish to point out two other factors that contributed to the lack of native plantation labor: (1) local resistance to the physical and legal transformation of land that had been “owned” by one’s community or family for generations; and (2) a conscious decision on the part of Europeans to deny plantation opportunities to native residents. Fearing a threat to plantation security and constrained by discourses of functional racism that saw natives as incapable of a Western-style labor regime, planters steered clear of employing the Malay and Simelungun whose land they occupied (Pelzer 1978).

One pikul is between 60 and 64 kilograms. Pikul comes from the Malay word for the maximum weight a man can carry.

Swidden cultivation was universally despised by colonial administrators. The Dutch referred to it as raubbau or “robber economy” because it was land-extensive and deprived logging companies of valuable wood (Pelzer 1945). By the time of the rubber boom, the British had banned shifting cultivation altogether in Malaya (Pelzer 1945). In his review of South Africa, Lord Hailey noted (with uncommon insight) that “shifting cultivation has there reached the point where it has become the source of problems that tax the ability of the colonial administrator ... The problems which arise today are mainly due to the changes forced on this system by the restriction of land, the stabilization of population ... and the extension of cultivation in order to produce crops for sale” (Melland 1938).
Chapter 7. The ecology of post-European cultivation

As planters and administrators sought to turn the vast alluvial plain into organized and profitable space, they faced two interconnected problems. First, how best to expand cash crop production into the concessions without disturbing the native population; and second, how to maximize yields under the tough environmental constraints of the lowlands. The answer to both of these problems would be addressed under the Model Contract, an agreement between planters, Dutch administrators, and the Sultan (who Europeans understood to represent the interests of natives).

The model contract

Planters seeking to acquire land between 1871 and 1919 signed an agreement based on what came to be known as the Model Contract. These contracts defined (1) the boundaries of the actual concession; (2) the lease period; (3) the authority of the sultan, local princes, and the Dutch state with respect to taxes and tariffs; and (4) the planter’s allocation of land with respect to native cultivation. This last would be the most contentious.

In the early years, tobacco companies applied to the Sultan for concessions. Dutch administrators were not always a party to these contracts, and many disputes that arose between planters and the Sultan lacked effective legal remedy. With no overseeing body, this framework made it easy for planters to encroach upon the rights of natives (Geertz 1963). After the bloody Karo uprising of 1871, the state drafted the Model
Contract to govern all future concessions. Under this new instrument, local princes and headmen who had authority over tribal areas were not paid rent, but rather a portion of export tariffs. The largest representative portion of tariffs went to the Sultan and his family (Pelzer 1978). Such payments were considered “personal income” and neither the Sultan nor his associates were obligated to pass on this fortune to the local population. In exchange for exceptional wealth and diminishing responsibilities, the feudal leaders of lowland East Sumatra had no qualms signing away every hectare they could claim. While the first contracts guaranteed the land to planters for 99 years, most subsequent leases established lease periods of 70-75 years. Within the first 5 years, planters were required to clear and cultivate a percentage of the concession land, or their contract would be voided. The government instituted this requirement to prevent land speculation (Pelzer 1978).

With respect to the allocation of land for native use, the Model Contract stipulated the following:

1. Within the defined concession, the planter can use any land, except (a) land occupied by a village, (b) a space 100 meters around the village (known as “hundred land” or *tanah seratus*), and (c) land currently being cultivated by villagers. However, all fallowing fields were available to the planter.

2. Planters must allow *4 bouws* (2.8 hectares) of land for each head of household living within the concession. This land could be located anywhere in the concession, at the discretion of the planter.

These stipulations presented some serious problems for native cultivators. First, the regulation against taking land currently being cultivated did not prohibit planters
from taking any non-cultivated land, including any fallowing fields that had recently been used, or were about to be used. This regulation simply meant was that the planter would not take land which villagers were in the process of cultivating. Under a swidden system in which villagers must fallow fields for eight years, 7/8 of cultivated territory would still be available to the planter.

Second, planters could allocate the designated 4 bouws of household land anywhere in the concession, without consideration for distance or quality. Invariably, if the best land for tobacco was located near a village, the planter would take this land, allocating less suitable land to the villagers, sometimes at distances that made the allocated land impossible to use.

Third, the contract allocated acreage per household. In some communities, a single physical house might be occupied by multiple families: among some Karo villages, 3 or 4 families live under the same roof (Kipp 1998). These larger households were forced to feed more mouths on the same allocation of land, suffering even greater subsistence pressure.

Finally, the allocation of 4 bouws per household fell far short of subsistence needs. Administrators were well aware of this fact: concession contracts in Borneo at this time allowed 21 bouws per household for cultivation (Pelzer 1978), and though yields in Borneo and Sumatra probably differed, it is unlikely that they differed by a factor of five. Indeed, based on observed practice in East Sumatra, Malay and Simelungun households were able to survive on an average of 18 bouws, far above the amounts allocated in the model contract (from data cited by Pelzer 1978). Karl Pelzer argues that this deliberate constriction of land proves that the Dutch were interested in forcing villagers into
intensive cultivation. If he is right, such a policy is an ironic role reversal: while Europeans were busy learning from the natives how to rotate their crops, the government was trying to convert locals into sedentary cultivators.

I believe the 4 bouw restriction reveals a secondary objective: depopulation. With less land available for cultivation, subsistence pressures would force any villages that did not convert to cash crops to seek land elsewhere. And the more households forced out of concession lands, the less land planters were required to give up for native use. The depopulation agenda becomes clear when we look at how the Model Contract was implemented and modified over the years.

Implementation and evolution of the contract

In short order, planters would radically change the 4 bouw stipulations of the model contract. In the early years, the planters believed that tobacco would only grow on freshly cleared virgin forest. Making no attempt to rotate into old fields, laborers simply cleared new fields and moved on. This strategy made economic sense where there was no rent on land and only a tax on what was produced. But with increasing competition in the land market from other planters, companies sought to make their existing concessions more sustainable, and looked for ways to implement rotating cultivation.

Rather than set aside 4 bouws for each household within the concession (as the Model Contract stipulated), planters implemented an ingenious compromise that took into account the biological demands of tobacco, native land requirements, and the asymmetric distribution of labor in swidden cultivation. Tobacco can only grow on cleared land that has been under forest fallow for at least seven years. So, in the first season of cultivation, plantation workers cleared forest and planted a crop of tobacco.
When the season was over and the tobacco harvested, villagers were allowed to plant one season of swidden crops in the now empty tobacco field (known as a jaluran). Once the swidden crops were harvested, the field was left fallow for seven years, at which time plantation workers would once again clear it and plant tobacco (Geertz 1963). Thanks to the biological similarities of these rotating annuals, native staple crops came to be integrated into cash crop tobacco.

This new “swidden-follows-tobacco” system had significant advantages over the 4 bouw system for both planters and villagers:

1. Planters now had access to all land within the concession, not including village land and the tanah seratus which were still off-limits.

2. Villagers could take advantage of more land as well. By planting in cleared tobacco fields, villagers had access to approximately 8 bouw on average (Pelzer 1978).

3. Villagers did not need to clear fields. This sizeable reduction in labor may have been the primary impetus behind native acceptance of the new system (Pelzer 1978).

There were, however, some noteworthy disadvantages for villagers:

1. Planters prohibited the cultivation of root crops, fearing that diseases might spread from these plants to the tobacco crop. Over time, planters expanded this prohibition to include everything except rice and maize (Pelzer 1978).

2. With the 4 bouw system, skilled cultivators could get three seasons of crop (usually rice, cassava, and onions) from a single bouw before falling. This meant that in any cycle, a household could harvest 12 bouw-seasons of food.
Under the swidden-follows-tobacco system which allocates about 8 *bouws* per household, farmers were allowed only one season per *bouw*. Thus, the maximum a household could harvest was 8 *bouw*-seasons of food (Pelzer 1978).

3. Cultivating on old tobacco fields made all swidden crops a second-season harvest, subject to yield reductions due to nutrient depletion.

4. A cleared *jaluran* available for village use might not be located anywhere near the village, making it difficult or impossible to utilize.

Over time, planters amended the land contracts to include additional restrictions. Villagers could not interfere with any drainage systems. They were also prohibited from removing any young bushes or trees that had taken root during the tobacco season. While such vegetation helps forest regrowth (a distinct advantage to the planter), these bushes and trees reduced the space available for village cultivation. Within a *jaluran*, villagers could only grow upland rice, maize, long bean, and Job’s tears. This prohibition would be gradually expanded, until villagers could only plant upland rice (along field boundaries) and maize. Not only did such restrictions materially deprive local residents of food, this creeping legalism served to re-inscribe the power of European planters over land. It was the planter who determined what could be grown, where, when, and how. The native followed in the planter’s footsteps, her survival subordinated to the demands of capital.

Karl Pelzer referred to this integrated system of cash and staple crops as “symbiotic” (1957, 15). Writing in 1963, Geertz challenged Pelzer’s characterization, arguing that “in ecological terms it was not symbiotic, if by that is meant a relationship from which one or both ecosystems benefit and neither is harmed. Rather it was neutral
... or, perhaps, mildly antagonistic” (1963, 108). As we will see in subsequent sections, the social consequences of this integrated system will make “mildly antagonistic” seem a gross understatement.

The model contract prevailed until 1919 when it was replaced by a straight “waste land” lease. This new arrangement cut out the Sultans and princes, allowing planters to lease land directly from the government. By then, the DEI had established enough control over the area that the government could enforce such contracts without the political influence of the Sultan. In addition, the new lease system did not take account of any traditional land claims (Geertz 1963). Rather than integrate native cultivators into the plantation matrix, companies chose to relinquish small parts of their concessions to resident farmers in exchange for kicking them off the plantation altogether (Geertz 1963). What we see by 1919 is, essentially, the creation of “reservation lands.” With planters hoarding the best land, we can be sure those places where locals found themselves sequestered were not ideal for agriculture.

In the following sections we will look back at the lowland agro-ecological model developed in Chapter 5 and explore the effect of European intervention generally – and swidden-follows-tobacco specifically – to this model. In addition, we will look at two new cultivation systems: rubber, and wet rice. As in Chapter 5, our investigation of each model is organized into three sections: environmental, spatial, and functional considerations. From this three-part analysis we derive the consequences of European intervention for local agriculture.
Swidden-follows-tobacco

Under the Model Contract, villager cultivators were prohibited from growing crops on concession lands except as part of the larger tobacco rotation. Plantation workers began each cycle by clearing a plot of forest. In the first year, the tobacco crop was planted and harvested. In the second year, villagers were allowed to plant traditional crops on the cleared tobacco field. After one year of traditional crops, the field was left to fallow for at least seven years, before plantation workers return to clear it. With swidden cultivation following tobacco, colonial administrators believed they had implemented a satisfactory compromise between the demands of planters, the need to protect native swidden, and the environmental requirements of cultivation.

Environmental considerations

As a plantation crop, tobacco is a rain-fed annual, with a short growing season, and without any technical discontinuities in scale: in other words, no technological or procedural improvements are necessary to support increased production (Geertz 1963). For these reasons, Geertz notes that tobacco could have been introduced into virtually every agricultural pattern in Indonesia (1963, 106). I believe there are three reasons why it was so successful in East Sumatra and less so in other parts of the DEI. The first two reasons are socio-political: (1) availability of land, and (2) an autochthonous swidden system centered around sedentary villages. The third reason, however is environmental.

Nienhuys’ was first introduced to Sumatran tobacco by lowland Karo who were growing it on the alluvial plains around Deli. When it came time to request his own concession, Nienhuys wisely (or just fortuitously) selected 75 hectares on the same
alluvial plain. The astounding productivity and quality of his early harvests encouraged other prospectors to grab land in the Deli region. As the plantation zone expanded to the southeast, however, tobacco planters experienced decreasing yields, poor leaf quality, and reduced profits (Pelzer 1978). With the failure of tobacco in the central and southern parts of the plantation zone, companies turned to government geologists for help.

Most alluvial soils on Sumatra’s east coast (indeed, throughout much of the outer islands as well) are liparitic-rhyolitic (Druif 1932). These acidic soils came from parent material ejected either during the eruption of the Toba volcano or earlier volcanic events. The soils in and around Deli, however, trace their origin to more recent volcanism. The eruptions of Sibayak and Sinabung, both located on the Karo plateau, sent dacitic and andesitic lahars down the steep valleys and into the Deli lowlands. It was into this alkaline soil that the Karo had been successfully planting tobacco.

Planters eventually discovered that tobacco prefers alkaline soil, but it wasn’t until Dutch researchers completed their extensive soil maps of East Sumatra (around 1910) that the implications for locating a plantation could be fully understood. In the meantime, tobacco concessions on liparitic soil suffered: per hectare, the difference in value between a northern and a southern plantation’s harvest could be as high as 110% (Gibbs 1940). These reduced margins led many planters to diversify and experiment with other cultivars: after all, their concessions were guaranteed for at least 75 years rent free. While tea, coffee, and cacao all fared better in acidic soil, rubber would flourish, and its introduction in 1911 turned southern plantations into fiercely competitive enterprises (Pelzer 1978).
For the first couple decades of the plantation era, European companies believed that the best tobacco could only be grown from cleared virgin forest (Pelzer 1957). With little economic incentive to reuse fallowed land, planters proceeded to cut down tracts of primeval forest, plant densely, then abandon fields with little consideration for regrowth. Such intensive planting with no post-harvest conservation dramatically increased the chance of grassland takeover. Indeed, by the 1880s, vast expanses of rainforest had been replaced by “man-made savannas” (Hagen 1890, 111). Even before land pressures forced planters to reuse old fields, the wildfires that plagued these new grasslands during the dry months threatened tobacco crops, and forced planters to seek ways of mitigating the spread of Imperata (Pelzer 1978). Once converted to grass, any chance a field had of returning to forest was lost if the field burned: the heat from such a fire effectively killed remaining tree and plant seeds in the soil, but left the hardy grass rhizomes untouched.

By the 1890s, companies had learned to plant “fireguard belts” of teak (Tectona grandis) along plantation roads. The natural fire-resistance of teak acted as a primitive protection against the spread of grassfire. To encourage forest regrowth during the fallow period, companies planted pioneer species like Macaranga and Trema (Pelzer 1945). These fast-growing and light-loving trees shaded emerging grasses, allowing slower growing plants to compete (Whitten et al. 1997). These conservation strategies became widely used as land pressures forced planters to switch from clearing primeval forest to a more classical system of rotation.

In the swidden-follows-tobacco system, planters allowed locals to cultivate one season of staple produce on harvested tobacco fields. The impact of this extended period under cultivation increased the chance of grass, a threat the planters used to justify progressive restrictions on what locals could plant and how it should be planted. When
this integrated system was first introduced, villagers were allowed one year of staple crop production. Eventually, planters reduced this allowance to one growing season of staple production. In the warm lowlands with little seasonal variation, skilled swidden farmers could get two, and sometimes three growing seasons per year from the same field. Thus, the change from one year to one season meant a reduction in total staple yields of between 50 and 67% per bouw. While the threat of grass conversion was shared by both planter and villager – such that conservation was arguably of interest to both parties – the Model Contract ensured that the interests of tobacco always trumped those of rice and maize. While planters forced villagers to cut back on production, I have found no evidence in the literature that planters reduced the intensity or duration of tobacco production to conserve soil quality.

As previously mentioned, without replenishing soil nutrients through fertilization, every season after the first returns a reduced yield. In the integrated system, all staple produce was grown second season, and as a result, villagers experienced an average yield 20% below what they could expect from a first season crop (from unpublished research by I. de Haan 1950, cited in Pelzer 1978, 8). When combined with the constraints placed on the number of growing seasons, some villagers may have experienced an extraordinary 73% net loss in staple crop yields.

Prior to the Model Contract, Malay and Simelungun cultivators might have switched to root crops under these environmental conditions. Cassava, potato, taro, and yam perform better in nutrient poor soils than grains, and local cultivators were known to switch from one crop to the other depending on environmental stress. However, the Model Contract’s strict prohibition against anything other than rice and maize eliminated this potentially beneficial adaptation.
Another traditional method of adaptation – increased reliance on forest gardening – was similarly lost. With forested land now increasingly scarce, access to fruit trees and hunting opportunities steadily decreased. Though secondary forest in regrowth might be within range of villagers, low biodiversity meant that these tracts of forest could not support subsistence needs. Short fallow periods of eight years also ensured that the most valuable tree species for forest gardening (like durian) would never take hold and become productive.

**Spatial considerations**

Under traditional swidden, three variables determine the whether available land will meet subsistence needs: (1) population density; (2) the fallow period, itself a function of soil quality and nutrient regeneration rates; and (3) pheric distance, or the range that farmers can travel to tend fields (see Chapter 5). Under the Model Contract, the land made available for cultivation was frequently beyond this pheric distance. With no obligation to plant tobacco where villagers could conveniently access their *jaluran*, planters selected land that was convenient for coolie labor and in the best interest of tobacco. In seasons where the available land was distant, increased travel time impacted how much land could be tended by each villager, and therefore, the total yield per person.

Initially, planters allowed villagers to use any harvested tobacco field as their *jaluran*. In later versions of the Model Contract, companies constrained access to only 50% of the harvested tobacco fields. As with every other stipulation, the planters determined which fields could and could not be used by villagers. This change increased the likelihood that land necessary for subsistence would be out of reach. If all tobacco
fields are available for use, a certain number of fields will be within the pheric distance of any given household. But if the total number of available tobacco fields is cut in half, the number of fields within the pheric distance will be halved as well (assuming a random selection). Meanwhile, the needs of the household haven’t changed.

If this was still “swidden,” it was a twisted hybrid indeed. Villages couldn’t move (in fact they were cemented into place by the dictates of the Model Contract), and yet the available land did move, far enough away at times to prevent its use. Villagers did not select land, but had it selected for them by Europeans who were removed from the subsistence cycle. In traditional swidden, farmers work within the limits of the environment, encouraging conditions conducive to food production and implementing cultural practices to increase sustainability. Under the Model Contract, farmers were forced to work within the limits imposed by companies that encouraged conditions conducive to tobacco, and dictated new cultural practices to increase their profits (see below). Capitalism had stepped between farmer and field to exploit the resources of both.

The only land over which villagers had some control was the village itself and the tanah seratus that surrounded it. Planters were obligated to respect these native spaces and generally did so. Places of cultural significance beyond the tanah seratus, however, were available for planter’s use: for example, it was not until 1892 that planters were forced to respect native cemeteries, and only then, under protest (Pelzer 1978). As available land and yields decreased, many villagers found themselves without any opportunities for subsistence. Though there is no evidence of widespread famine in the historical record, we can infer from some strategies of adaptation that hunger was clearly a concern for many households. Over time, villagers who didn’t move out of the
plantation lands began to convert the *tanah seratus* into agricultural land (Pelzer 1978). This 100 meter buffer around the village was too small for staple crop rotation, but could be used to plant perennial cash crops. In many cases, this simply meant expanding kitchen garden practices into the village margins. This conversion to intensive cash crops was exactly what the plantation companies and the Dutch government wanted. Even better, the government could claim to humanitarians that villagers were making this “economic” decision on their own. To further encourage this conversion, the Resident enacted changes to the Model Contract in 1892 that increased the *tanah seratus* to a 200 meter buffer.

Despite all of these spatial constraints, those villages that found themselves captured by the plantations were, perhaps, the lucky ones. Many planters, aided by government administrators, drew the lines of their concessions so as to exclude villages near the boundaries (Pelzer 1978). By excluding a village, planters no longer had to provide *jalurran* to its residents, effectively depriving the locals of any concession land. Neighboring concessions were frequently contiguous (see Figure 12). A village situated on the border between two concessions and excluded from both could be deprived of all land. If villagers did not successfully convert the *tanah seratus* to cash crops, the only recourse for natives would be outmigration, leaving an abandoned village with homes and gardens intact. What did plantation companies do with abandoned villages? Convert them into dormitory towns for thousands of Chinese and Javanese coolies.

Figure 12 shows a sample concession with internal and external villages.
Figure 12: Concession boundaries and affected villages

- Village within Concession B
  Has jaluran within Concession B.
  Has no jaluran or tanah seratus within Concession A.

- Excluded village
  Has no jaluran in either Concession B or C
Functional considerations

In addition to its environmental and spatial effects, the swidden-follows-tobacco system that replaced traditional practices in the lowlands produced numerous and wide-ranging social consequences\textsuperscript{31}. Of those, we will look in greater detail at the following:

The new, integrated system

1. Removed the Sultan and tribal leaders from the political hierarchy
2. Dispossessed family lines of traditional land
3. Pushed subsistence cultivators towards cash crop production
4. Established a new racial hierarchy
5. Ensured no native “planter class” would threaten European dominance

*Removal of the Sultan and tribal leaders from the political hierarchy* – While the Model Contract effectively eliminated much of the Sultan’s responsibilities from the outset, over time, modifications to the contract eventually deprived the political hierarchy of its one last power: the authority to grant concessions (Furnivall 1948). In 1898, the government assumed the right to lease all land, finally codifying the “empty land” clauses of the Land Law of 1870. The key difference, however, was that while the 1870 law provided an opportunity for native claims, the 1898 revision to the Model Contract did not, declaring all native holdings to be “empty land” (erfpacht) leasable by the state. By 1898, the Resident had the political clout to enforce such a declaration, no longer requiring the hegemonic influence of the Sultan or local leaders.

While the Dutch explicitly sought to control the distribution of land – a power that affected planters more than natives, the resulting diminishment of tribal leaders had
a more significant effect on local villages. For the Malay, the Sultan and his princes had little remaining social standing (Reid 2005). But among the Simelungun, tribal elders and some village penghulu still wielded symbolic power. The perception that tribal elders still had a seat in negotiations over land and native rights allowed many leaders to retain prominent social standing. Traditionally, the welfare of the community was the responsibility of the penghulu and the tribal elders. But with the rise of humanitarianism, government employees established clinics, inoculated children, engineered irrigation works, and taught animal husbandry; undermining the authority of community leaders (Vergouwen 1964). The penghulu were slowly being replaced by the modern state and its army of civil servants. With the government’s assumption of land control, this last vestige of tribal authority was lost, and with it, the remaining Simelungun – once subjects of marga and tribe – became subjects of the Resident.

Dispossessed family lines of traditional land – With the physical allocation of land no longer under the control of local communities, systems of family land tenure practiced by the Simelungun quickly dissolved. Under traditional rules (adat), land was divided between male descendants, bequeathed to daughters at the time of marriage, or gifted to other family members. With the integrated system, families no longer had rights to any land per se. Rather, the Model Contract granted jaluran to heads of household. Jaluran was a right that ensured access to fields after the tobacco harvest. These fields could be located anywhere in the concession and could be of varying quality. The amount of land available under jaluran was a function of how much tobacco was harvested in the previous season and what planters were obligated to provide under the Model Contract. From the villager’s perspective, it is hard to imagine that the new system based on “access” could ever substitute for the old system based on physical land.
Yet, in what seems to be a clear move to appease the local population, Dutch authorities expected (and encouraged) households to treat jaluran as a substitute for traditional land claims. Thus, under the Model Contract, planters allowed villagers to divide their jaluran among male descendants and bequeath it to daughters. However, fearful that extended family relations might burden the system, administrators did not allow jaluran to be exchanged or gifted to non-descendants. In fact, the revisions to the contract in 1892 declared that a villager only had rights to farm on concession land if (1) he was currently living within the concession, and (2) he or one of his direct ancestors was living in the concession at the time the plantation contract was signed (Pelzer 1978).

These two conditions ensured that the number of cultivators within a concession was directly tied to natural increase or decrease. Non-descendants from outside the plantation could never migrate onto the plantation and cultivate land within it. If a villager died without heirs, his jaluran rights were recovered by the plantation and permanently lost to all other villagers. Thus, the only way the number of cultivators could increase was through birth. With other spatial and environmental conditions suppressing yields (and a plantation labor market that was effectively closed to them), villagers may have chosen to keep family sizes small.

As a final punctuation mark on their plans for removing rotators, administrators prohibited the establishment of any new native villages on concession land (Pelzer 1978). Thus, the traditional pattern of establishing “child villages” in response to population pressure became impossible. As Chinese and Javanese arrived by the thousands and companies built government-authorized settlements to house them, the blatant hypocrisy of the no-village policy became apparent.
Pushed subsistence cultivators towards cash crop production – I believe the evolving restrictions of the Model Contract were intended to tighten the noose around local inhabitants in general, and around swidden cultivators specifically. In the spatial and *jaluran* limitations we see policies intended to benefit tobacco by reducing both the number of staple cultivators and the number of mouths needing those staples. For those villagers that remained, the goal implicit in the Model Contract was conversion to perennial cash-crop production.

This push toward cash-crops is evidenced by two contemporaneous modifications to the Model Contract. The first seems intended to discourage non-agricultural trades. In 1892, administrators required that all heads of household with *jaluran* must continuously cultivate or lose their rights to land (Pelzer 1978). If a household head could not make ends meet through farming and temporarily took up another trade, the plantation would assume his *jaluran* and he would never again be allowed to cultivate on concession land. If he was not farming at the time the contract was signed, his *jaluran* was automatically forfeited. Even if he did cultivate his allotment, but fell sick and had to temporarily abandon it, the plantation would abrogate his land rights.

The second modification entailed moving back to the original 4 *bouw* allotment. Rather than grant the use of harvested tobacco fields, planters increasingly demarcated 4 *bouws* of land per household for cultivation. As previously discussed, an allocation of 4 *bouws* under rotating staple production was inadequate to support a household’s subsistence needs, even if planters gave villagers the best land (a rare outcome indeed). However, if converted to perennial production, the income from a harvest of fruit, copra, or other tree crops might have been sufficient to purchase the necessary staples. With increasing constraints on *jaluran* yields and new pressures placed on non-agricultural
trades, many villagers who remained in the plantation lands saw the writing on the wall. By 1910, village swidden production was almost completely replaced by cash crops (Pelzer 1978).

To discourage non-agricultural use of the 4 bouw jaluran, the contracts forbade villagers from leasing or selling their allotment to anyone outside of the village (Pelzer 1978). This policy had two consequences: (1) By preventing transfer to non-residents, the contract further dissolved the traditional patterns of land exchange within and between family groups. Thus, sick or elderly villagers who might ordinarily gift land to nieces and nephews in other villages could no longer do so. In this way, the contract sought explicitly to prevent both in-migration (which would increase population pressure) and remote tenure (which could suppress productivity). (2) By requiring that land could only be leased or sold to other villagers who, presumably, already had jaluran, the contract implicitly encouraged accumulation of land by the wealthiest households. Each village became a land market, and with competition from outside speculators prohibited, the richest households could quickly consolidate the allotments of poorer households. Once their jaluran was sold, these households would lose all present and future rights to land under the Model Contract for failure to continuously cultivate. With more land, these new jaluran “capitalists” could start leveraging economies of scale in cash crop production.

These modifications were some of the final steps in the transition between rotating tobacco and perennial rubber (cite). As a tree crop, rubber demands a well-defined space for up to 30 years, a condition incompatible with any form of crop rotation. For planters, the ideal spatial arrangement with native cultivators was to establish separate, well-defined, and permanent spaces. As planters prepared for rubber,
administrators adjusted the terms of the Model Contract to now segregate and sequester native cultivation. By discouraging rotating cultivation (through environmental, spatial, and functional constraints) and other non-agricultural trades (through the loss of *jaluran*), planters left locals with only one viable option: grow money to buy food.

Figure 13 shows the evolution of the decision-making process for a Malay or Simelungun household living under the Model Contract. Outcomes in the left column left households without land, while options in the right column retained land rights. This progression shows how decision-making was forced to adapt to changing contractual conditions. In many cases, modifications to the Model Contract were applied retroactively to existing concessions even though the 75 year lease terms were far from expiration. As a result, a household might have to re-evaluate its land use decisions several times, as shown here.
Figure 13: Decision-making process for head of house under Model Contract
Established a new racial hierarchy – From 1863 on, first Chinese, then Javanese arrived by the thousands on Sumatra’s shores (Reid 1969). By 1943, the population of East Sumatra was 45.7% Javanese and 15% Chinese. Those of Batak and Malay ethnicity, who comprised nearly 100% of the population in 1863, now made up just 39% (from unpublished Dutch reports, cited in Pelzer 1978). These impressive numbers, however, fail to reveal how this population was organized, and how the DEI architected a social structure to take advantage of ethnic and racial rifts.

While Dutch reports do not represent the Residency’s labor statistics by ethnicity (divided as they are by estate and commodity), we can infer that nearly all of the Javanese and Chinese of working age were connected to plantation labor. We can also infer from the European disinterest in employing locals, that few Batak and Malay worked the plantations. Indeed, in 1913, of the 85,000 workers employed in East Sumatra’s tobacco estates, less than 1,000 (or 1.2%) were of Batak or Malay origin (Geertz 1963). Already distinguished in linguistic, religious, and cultural terms, this separation of ethnic groups by economic function helped to turn initial resentment into outright hostility.

Legislation in 1873 further provoked these hostile feelings. Under the new labor law, anyone who was (a) working on a plantation, and (b) not born in East Sumatra, was deemed a subject of the DEI and no longer a vassal of the Sultan (Pelzer 1978). This effectively turned plantations into political enclaves, with all working inhabitants now responsible to Batavia. Meanwhile, Malay and Simelungun who lived within the plantations were still considered non-citizens; legally outside of the system and deprived of any remedies therein. Native villages – ostensibly “protected” by the Model Contract from capitalist exploitation – became enclaves within enclaves, making their residents
invisible to the law. The 1873 labor law is just one example of how legislators turned informal racial and ethnic divisions into legal code.

In the late plantation period, administrators would stir this pot once again. As we will see later in this chapter, officials invited Toba Batak to the lowlands to plant wet rice in exchange for wages (Pelzer 1978). They also encouraged Toba to work on the estates as overseers and foremen: a position that buffered European elites from the legions of indentured Javanese. By moving Toba into these positions of authority once held by privileged Chinese, the planters succeeded in alienating Toba against both Javanese and Chinese (Stoler 1985). By offering wage labor to highland Toba and not Malay or Simelungun, the Dutch set native societies against one another. As before, by offering the fruits of capitalism to one over another, official Dutch policy advanced the humanitarian imperative of native economic improvement, while assuaging persistent fears of a budding nationalism.

In the absence of a counter-example, it’s difficult to say for sure if this strategy of divide-and-conquer helped to maintain European control over the plantation lands. After World War II, the legacy of this ethnic pigeonholing would be bloody, and one that would barely stain the hands of its architects.

Ensured no native “planter class” – Beinart observes that the implementation of plantations in British Malaya effectively prevented the growth of a local class of planters (Beinart and Hughes 2007). The same held true in Sumatra. Large, contiguous concessions deprived any potential smallholders of land. With all the concessions in European hands, the profits from production served to reinforce and reproduce an established, elite class of capitalists. This social class was the same one to which colonial
officials belonged, commingling the interests of capital with the authority of the state. Even those rare times when the state resisted giving away native welfare to the planters, the economic argument frequently won out in the long run. Planters begrudged the Resident for forcing them to adopt pro-native policies (Pelzer 1978). Similarly, planters begrudged locals for their supposed “unwillingness” to work, all the while making no attempt to open up the labor market for them. Even after conceding to natives the right to cultivate, planters prohibited them from growing tobacco or, later, rubber, for fear it would erode plantation profits (Furnivall 1939).

In other areas of the archipelago, local smallholders frequently adopted new cultivars that arrived in the colony: rubber became a majority smallholder crop in South Sumatra and Borneo prior to World War II (Geertz 1963, Peluso 2009), while pepper production in South Sumatra was universally run by local farmers (Reid 2005). The plantation matrix that consumed the east coast, however, suffocated local producers interested in participating in the larger economy. Though administrators encouraged some cash crops, they prohibited the most valuable ones; all the while, the spatial limitations of the Model Contract ensured that no individual could accumulate enough land to be profitable. Now dependent on Europeans to meet subsistence needs, Batak, Chinese, Javanese, and Malay labored at the interstices of one of the most profitable economies in Southeast Asia, with little hope of material benefit.

It is one thing to say that the DEI failed utterly to create a native planter class in East Sumatra. It is more accurate, however, to say that they never tried. Like hybrid swidden, hybrid liberalism created a playing field that benefited one side over another in the profit game. And I believe the co-option (and at times complicit participation) of
humanitarian philosophy in the pursuit of profits should be seen as the final indictment of Holland’s *Ethische Politiek*.

**Consequences of intervention**

The long term impact of swidden-follows-tobacco on East Sumatra’s agricultural spaces is summed up below.

The swidden-follows-tobacco system:

1. Led to the removal of nearly all primeval forest in the lowlands. Land that was not converted to cultivation was either logged or left standing in small conservation areas established to prevent soil erosion (Pelzer 1978).
2. Led to the conversion of some agricultural land to grassland monoculture. This conversion permanently removed the land from cultivation.
3. Inaugurated a technocratic approach to agricultural production in the colony.
4. Quintupled the population of the region mostly through the importation of labor.
5. Dramatically altered both the ethnic balance (in terms of representation) and social structure, establishing the plantation as an “enclave space” populated almost entirely by foreigners.
6. Defined space, codified its use, and established European-style institutions as legal authority. These laws and policies dissolved traditional patterns of land use and tenure.
7. Depopulated concessions of local swidden cultivators.
8. Converted any remaining swidden cultivators to sedentary, cash crop producers. In doing so, the system made natives dependent on plantations for subsistence (by way of access to land).

From a socio-ecological perspective, one final outcome is perhaps the most interesting. In the late 1860s, the Dutch needed a profitable commodity that could be integrated into the existing system of swidden cultivation without either baiting a rebellion or raising the ire of humanitarians. Having little direct control, the Dutch needed the new system to fit as neatly as possible into the existing mosaic of authority; and yet it also had to establish a framework that would allow Europeans to gradually gain complete control. The new system had to satisfactorily answer the questions of land, labor, and local people. It had to father institutions that would outlast its own economic life, and it had to do this while still making a profit. If planters were ever going to convert East Sumatra into a perennial commodity garden, they needed a tool that could simultaneously transform biological, political, economic, and cultural space without inciting revolution.

Tobacco was that proverbial fox in the henhouse. Under these conditions, it was the perfect cultivar, and the Model Contract – designed around tobacco’s biological and spatial contingencies – was the perfect legal instrument. The legacy of Jacob Nienhuys and the integrated system that followed him is not the first 45 years of world class cigar leaf. Rather, it’s the last 112 years of Sumatran latex.

**Rubber**

In 1876, an Englishman by the name of Henry Wickham famously stole 40,000 rubber seeds (*Hevea brasiliensis*) from the forests of Para, Brazil (Jackson 2008). His
bounty – spirited away by steamer to the researchers at Kew Gardens in London – would give rise to a small crop of productive seedlings and, in time, an extractive industry that consumed vast quantities of land and labor throughout South and Southeast Asia. Over a century later, the genetic descendants of Wickham’s cache of seeds still cover most of East Sumatra’s plantation lands.

By 1905, experiments with cloned *Hevea* had produced a cultivar and cultivation system ready for mass production (Beinart and Hughes 2007). In cooperation with Kew Gardens, Dutch agricultural research stations assisted plantations in the conversion to rubber, so that by 1910, the new crop was making significant inroads into existing tobacco concessions. The evolution of the Model Contract paved the way for this expansion: with complete control over land, a depleted population of rotators, and native cultivators converting to intensive cultivation, plantation owners could clear tracts with impunity in preparation for rubber’s 30-year lifecycle.

Rubber expansion quickly outpaced all other plantation commodities, even those that also benefited from the socio-ecological conditions created by the Model Contract. Between 1905 and 1930, the area under rubber cultivation increased at a rate of nearly 10,000 hectares a year (Pelzer 1978). Over the same period, oil-palm plantations grew at a rate of 3,800 hectares per year, while tea expanded at just 800 hectares per year (van Hall 1946). Meanwhile, the number of plantations growing tobacco plummeted, from 120 at the turn of the century, to 45 by the outbreak of World War II (Mohr 1944).

While fluctuations in commodity prices between 1905 and 1942 affected both the decisions made by planters and the foreign capital available for crop conversion, I believe
environmental, spatial, and functional considerations contributed significantly to the planters’ preference for rubber.

*Environmental considerations*

The success of rubber was due in part to its ability to integrate into the lowland forest matrix. As a tropical tree species, *Hevea brasiliensis* was already well-adapted to nutrient poor soils. Throughout its 30 year lifespan, the tree itself made few demands on soil nutrients (Beinart and Hughes 2007). Comparing tobacco to rubber, Geertz notes that although tobacco could be integrated into local swidden systems and grown on formerly cultivated soils, it did not fare as well in “true tropical forest” (Geertz 1963, p 113). Rubber, by contrast, could be readily adapted to converted forest lands.

To support the demands of industrial agriculture, plantations did not plant trees from seed, but used grafting techniques developed by scientists in the Netherlands in 1910. The proliferation of cloned trees had a dramatic impact on production: while figures are not available for Sumatra, Malaysian plantations using the Dutch bud graft doubled their yields between 1920 and 1940 (Beinart and Hughes 2007).

In its Brazilian habitat, *Hevea brasiliensis* was most abundant in hilly topography above the level of inundation (Jackson 2008). This preference for well-drained soils should have hindered the expansion of rubber into the boggy lowlands of East Sumatra. But here again, time and tobacco helped the planter. Forty years of investment in extensive canal and levee systems to support tobacco had converted vast expanses of swampy forest into usable plantation land32. In areas that were still too wet for rubber, planters kept the forest cover intact, planting rubber all the way to the
margin. Once the trees were mature, the boundary between the forest canopy and the rubber canopy was often difficult to distinguish (Whitten et al. 1997).

Unlike oil palm, latex harvesting did not involve disturbing the tree above head-height, leaving the nests of birds and small mammals untouched. This, in combination with a contiguous canopy, allowed greater integration of rubber into the overall forest ecosystem than for any other large-scale plantation cultivar (Whitten et al. 1997). While a comparison of biodiversity indexes is not available from this period, modern rubber agroforestry systems exhibit higher biodiversity than oil palm, with up to three times as many non-crop plant species (see van Noordwijk et al. 2001).

By establishing tree cover for long periods, rubber slowed the spread of Imperata cylindrica. Under both swidden and the integrated tobacco-swidden system, fields were exposed to grassland conversion between the time of harvest and recolonization by pioneer trees and shrubs. Not only would grassland conversion decrease the land area available for cultivation, Imperata increased the risk of damaging brush fires. As noted in Chapter 4, planters had to construct teak firebreaks to manage the fire threat. Under rubber, tree cover could be maintained over any given plot for up to 30 years. As with rotating cultivation, planters learned encourage fast-growing pioneer shrubs on cleared plots to maintain ground cover as the rubber saplings were growing (Beinart and Hughes 2007).

Spatial considerations

When we look at the transformation of agricultural space initiated by this conversion to rubber, one environmental adaptation stands out. While tobacco grew well in the dacitic and andesitic topsoil around Deli, it suffered in the southern half of the
planted on plantation lands where liparitic soils from Toba tuff dominated. By contrast, rubber flourished under these acidic soil conditions. The flexibility of *Hevea* under the soil regimes of southern plantations encouraged rapid adoption of the new cultivar. As Pelzer notes, “rubber was a godsend for many bankrupt tobacco and coffee plantations on the liparitic soils of East Sumatra” (Pelzer 1978, 53).

Once planters had converted land to rubber production, plots had to be maintained for up to 30 years. After clearing an old plot, workers did not allow the land to fallow, but returned it directly to production with new rubber saplings. This intensive system of cultivation could not be easily integrated with swidden or with any form of intercropping. While some agroforestry systems today mix rubber with shade crops, there is no evidence that Sumatran planters experimented with these techniques. As a result, the proliferation of rubber effectively ended all forms of rotating cultivation.

In parts of Southeast Asia where wet rice was the primary form of staple production, rubber plantations were able to integrate into local cultivation (Beinart and Hughes 2007). I believe such integration succeeded for three reasons. First, sawah and rubber were both land-intensive, requiring control over productive space for an extended period of time. This minimized land competition between the two systems. Second, while the construction of sawah benefited from poorly-drained soils, rubber performed better in well-drained ones. This difference in environmental preferences helped ensure that rubber and wet rice infrastructure selected different spaces. Finally, both systems required sizeable outlays of indirect labor prior to production. For sawah, this meant building level fields and irrigation systems. For rubber, workers had to clear forest, burn scrub, plant saplings, and weed out competitive plants while the rubber trees matured. It is conceivable that the organizational infrastructure needed to support the labor
demands of one system could be adapted to support the other. Both sawah and rubber benefited from high population density, and so long as the timing of direct labor inputs (such as planting and harvesting) was coordinated, the same labor force could be utilized for staple and cash crop production.

In Sumatra during the period of plantation expansion, wet rice was limited to the Toba Batak highlands where rubber was not suitable (for a variety of environmental and political reasons). In the lowlands, where environmental conditions benefited *Hevea* and plantations had control, Malay and Simelungun did not practice wet rice cultivation. Thus, the two systems initially lacked any common space in which to integrate. The dominant mode of staple production in the lowlands was swidden: a system with spatial requirements diametrically opposite to rubber.

_Functional considerations_

By the time rubber arrived on the scene, plantations had well-established systems for acquiring and mobilizing labor. Working with British intermediaries and the Dutch government, planters had assembled Chinese and Javanese laborers into a network of work communities spread across the plantation lands. As the transmigration programs in Java expanded and the flow of indentured workers into Sumatra accelerated, the replacement of Malay and Simelungun villagers with Javanese continued apace (Stoler 1985). The growing resentment between local Malay and transplanted Javanese may have helped assuage the state’s security concerns. Deeply fearful of nationalist sentiments (Gouda 2008), Dutch authorities sought to reconstitute social space in ways that discouraged collective action.
In 1907, Batavia completed the armed annexation of the remaining Simelungun states to the south of the plantation belt, allowing European agriculture to expand still further (Pelzer 1978). Much of this new land was established under rubber cultivation from the start, unlike the tobacco lands to the north that had converted from rotating to perennial cultivation through the evolution of the Model Contract. The quick and forceful removal of local cultivators from these new concessions stands in contrast to the steady transformation of space experienced under the Model Contract. While the political power of the DEI in Sumatra during the late 1800s was in very much in question, the end of the Aceh War in 1898 allowed the Netherlands to relocate military assets throughout the archipelago in an period that saw the rapid annexation of states in Sumatra, Bali, Sulawesi, and Borneo (Reid 2005). By 1907, with the major obstructions of the Ethische Politiek eliminated, there was little use left for the subtle approach.

The emergence of rubber in Sumatra helped the Netherlands end its strategic dependence on Britain for latex. In lockstep with the rapid militarization of Western Europe at the turn of the 20th century, access to latex had become a question of national security for many colonial powers (Tully 2011). The need for secure sources drove the market price of rubber to unsteady heights: between 1890 and 1910 the price per pound of latex rose from $0.73 to $3.06, only to collapse in 1921 to $0.12 (Firestone 1923). Despite the numerous downturns, rubber continued to be a sound long term investment for plantation owners until World War II, and during the boom years, planters became exceedingly rich. With no local planter class and little consideration given for small-holder rubber production, these profits did not benefit locals in any commensurate way.

With its emergence from World War I as a new industrial powerhouse, the United States sought to gain a share of the latex market. Driven in large part by demand
for automobiles, U.S. rubber consumption in 1922 topped 290,000 tons, more than double the amount consumed by Europe, and approximately two-thirds of the world total (Firestone 1923). Tire manufacturers like Firestone and Goodyear sought to purchase rubber concessions in Sumatra in an effort to circumvent British-dominated trade, and petitioned the U.S. Congress for assistance in acquiring rights to production and establishing beneficial trade terms. Indeed, throughout the 1920s and 30s, U.S., Canadian, Australian, French, and Italian industrialists saw Sumatra’s plantation lands as a way to pry loose Britain’s stranglehold on the rubber trade (Jackson 2008).

Notably, by 1940, Sumatran latex was also attracting the attention of the Japanese. It seems reasonable to question whether Hirohito’s onslaught through Southeast Asia and along the Malay Peninsula would have been quite so rapid had the plantations awaiting him at the end been growing tobacco and tea rather than rubber.

Consequences of intervention

The long term impact of plantation rubber on East Sumatra’s agricultural spaces is summed up below.

The plantation rubber system:

1. Reduced the spread of grassland.
2. Increased inter-ethnic conflict through the perpetuation of functional racial segregation and the displacement of native Malay and Simelungun.
3. Effectively destroyed Malay and Simelungun social order in the lowlands.
4. Increased geopolitical interest in the region.
5. Solidified a pattern of export dependence initiated under tobacco.
6. Eliminated all remaining swidden cultivation within the plantation lands.
7. Occupied all areas suitable for agriculture. Leftover areas of empty land were generally too wet for cultivation or settlement.
8. Destroyed local food production, creating import dependence.

With rubber’s adaptive flexibility, an institutional system that fixed the boundaries between European and native agricultural space, and a local population neatly sequestered both spatially and functionally, rubber took over the plantation lands. Staple food production in the lowlands – in steady decline since the arrival of Nienhuys – now suffered complete collapse. By 1940, with a population five times larger than in 1863 and rice production at an all-time low, the residency of East Sumatra became the largest importer of food in the DEI (Geertz 1963). This fact becomes even more remarkable when we consider that East Sumatra’s population density was still only one sixth that of the Javanese residencies (From data in Pelzer 1978, and Reksohadiprodjo and Soedarsono 1960, cited in Geertz 1963).

The wholesale realignment of land from subsistence production to the export market would eventually backfire on the Dutch. In yet another example of commodity succession, changes on the geopolitical stage in 1940 conspired with local conditions to force the Dutch government into a radical policy reversal. With Japanese imperial expansion leading to the loss of food imports from other parts of Southeast Asia, colonial administrators forced plantation owners to cut down thousands of hectares of productive rubber trees for conversion back to staple crops. In an irony not lost on either native or European, planters had to approach the villagers they had just sequestered and ask them to return to the concessions to plant rice (Pelzer 1978).
Wet rice

Little has been written about wet rice cultivation in the lowlands. For the Dutch, wet rice was a peripheral economy, established as a means of feeding workers rather than making a profit. The conversion of plantation to wet rice took land away from “productive” use. While the switch from export production back to staples was initiated in 1939, the loss of Dutch control three years later to the Japanese did not provide much time for the same technocratic approach applied to other cultivars.

By 1939, East Sumatra had a deficit of approximately 20,000 tons of rice, or about 50% of food requirements. To meet this shortfall, between 1931 and 1939, the residency imported rice from other parts of Southeast Asia, a trade that accounted for roughly half of all food imports into the DEI (van Hall 1946).

The problem of staple production was common to many colonial adventures in Southeast Asia. As Ricklefs (Ricklefs 1983) and Reid (Reid 1969) observe, all states intent on export production faced the same fundamental problem: how to feed the non-agricultural population with the least impact to labor and land. We see evidence of this dilemma throughout the historical record, in the decisions of the VOC, Acehnese sultans, and the Malaccan Portuguese (see Reid 2005, Ricklefs 1993, and Pelzer 1978). In many cases, the solution lay in the hinterlands: if peripheral space beyond the ports and plantations could be used to grow food, the colony could satisfy two critical security imperatives at once. First, peripheral food production would help support the colony’s non-agricultural population. Second, by converting subsistence cultivators in the periphery to food exporters, the colony would establish relationships of dependency with
the hinterlands, linking core outcomes with the periphery and establishing pathways for economic and, eventually, political control.

At first, the solution to the food problem in East Sumatra involved both an expansion of peripheral rice production and reliance on imports. As the share of tobacco and rubber enlarged throughout the lowlands, plantations came to rely increasingly on wet rice cultivation in the Toba Batak highlands (Vergouwen 1964). This dependence on highland rice had serious consequences for Toba political and moral economies, including a collapse of the traditional rice-based economy, widespread insolvency, and an increased birth rate. By 1939, with much of highland rice going to feed plantation workers, many Toba Batak communities who had been self-sufficient in food could no longer meet their own subsistence needs (Vergouwen 1964).

Through the Compulsory Cultivation Ordinance of 1939 (and subsequent legislation up to 1941), colonial authorities sought to correct these imbalances through a redistribution of East Sumatra’s most abundant commodity: land. Planters were required to open areas of concession land to staple production. In some cases, Malay and Simelungun villagers were allowed to return to these areas and resume swidden cultivation. In places with suitable topography and soil conditions, authorities supported the construction of sawah. Deemed to possess the greatest skill at wet rice cultivation, Toba Batak were encouraged to move to the lowlands to operate the new rice fields (Vergouwen 1964). For administrators, this transmigration of Toba Batak into the lowlands had the added benefit of reducing population pressure in the highlands where production was reaching the limits of intensification (Lekkerkerker 1916).
Environmental considerations

As noted earlier, wet rice requires flowing water. This topographical prerequisite greatly restricted the places in the lowlands where sawah could be constructed. While this research did not uncover maps or other documentation indicating the locations of sawah within the plantation zone, it is reasonable to assume that the terracing requirement would have confined sawah to the lower reaches of the piedmont zone, where fast-flowing streams and deep valleys transitioned into flatter and slower middle stages suitable for irrigation.

With an expanding labor population on the plantations, demand for wet rice continued to grow, encouraging growers to try various intensification strategies. One such strategy was year-round cultivation. In the highlands, seasonal rainfall variations prevented Toba from growing wet rice during the dry season. In the dry months, villagers either fallowed their rice fields or planted a season of onions. But, in the lowlands, less rainfall variation and higher humidity allowed farmers to keep fields inundated during the dry months.

While this adaptation may have increased yields, year-round cultivation was similarly beneficial for a heretofore innocuous rice pest: the brown planthopper (Nilaparvata lugens). The brown planthopper came to the attention of agronomists in the 1980s when it ravaged the Indonesian rice harvest, decreasing yields by over 30% in 1982 (Oka 1979). Under traditional methods of rice cultivation, yearly fallowing helped suppress the planthopper population by depriving newly hatched nymphs of food. Nearby villages often synchronized fallowing of fields, thereby eliminating the planthopper’s primary food source from large areas of the highlands. Though empirical
studies of pest propagation under the traditional system are not available, modern horticultural studies concur with anecdotal evidence from the historical record: synchronized, large-scale fallowing appears to have worked well to control the planthopper population (see Cabaton 376 and Lekkerkerker 1916).

With the addition of year-round cultivation in the lowlands, growers eliminated this natural constraint on the planthopper. Notes from this period indicate that the brown planthopper posed a continuous threat to yields, destroying whole areas of contiguous fields (Oka 1979). The pest would plague Indonesian rice farmers long after independence. With the arrival of Green Revolution technology, the planthopper quickly developed resistance to both pesticides and the defenses genetically engineered into the new varieties of high-yield rice (Oka 1979).

Spatial considerations

Sawah construction benefits from soils with low permeability (Hanks 1972). With rubber’s preference for well-drained soils, planters frequently left the boggiest areas in their concession to forest. These “empty lands” were converted to sawah without affecting existing rubber trees (Pelzer 1978). As in other parts of Southeast Asia, wet rice and rubber occupied distinct environmental spaces without interference.

Functional considerations

The construction of rice fields and irrigation works required considerable outlays of labor. Such a supply was available in the lowlands, but construction efforts had to work around plantation demands. Despite tens of thousands of laborers in the immediate area, rice field infrastructure was slowed by lack of people. In response to this
need, colonial planners deployed corvé labor, a system of labor mobilization perfected during the darker days of The Company.

Under corvé, administrators assembled Batak villagers into work groups of between 10 and 30 men, organized under a foreman appointed by the overseeing colonial officer (Vergouwen 1964). Deployed for one day out of 10 to work on behalf of the colony, Dutch administrators used work groups to build roads, construct buildings, dig canals, lay railroads, and now, build sawah to feed the plantations (Lekkerkerker 1916). Before Ethische Politiek, village contribution to corvé was demanded as a form of tax. Later, when the system was implemented in Sumatra, villages could contribute to corvé in lieu of paying the standard head tax (Lekkerkerker 1916). Prior to the arrival of a currency-based economy, corvé was one of the few options available to villages facing colonial tax (Lekkerkerker 1916). It is unclear from the record how successful this corvé system was at assembling labor in the 1930s, under an economic regime already tied to the Straits Dollar and the Guilder.

As Toba Batak migrated from the highlands to the lowlands to cultivate rice and seek wage labor with plantation companies, religious tensions mounted. The predominantly Christian Toba clashed with local Muslim Malays who saw the influx of highlanders as yet another imposition on traditional cultural space and practice (Pelzer 1978). Malay animosity was compounded by the fact that the government gave preference to Toba Batak over Malay for any administrative and civil service jobs (Vergouwen 1964). Initially overlooked in favor of immigrant Chinese and then Javanese, local Malays now found themselves subordinate to the Christian Toba. Malay villages, in concert with the greatly diminished power of the Sultan, worked hard to keep Toba Batak out. While this research did not uncover specific instances of violence
between Toba and Malay in the lowlands, religious and ethnic tensions must have played some role in everyday social life: despite Toba outnumbering Malays throughout the plantation belt by 1930, there were no Christian Toba churches built in the lowlands until 1940 (from data in Pelzer 1978 and 1982).

Paradoxically, the colony’s investment in missionaries to secure a Christian buffer against Muslim incursion from the outside would create upheaval on the inside. As Christians flooded into the predominantly Muslim agricultural core, the Dutch deployed functional racism once again to great effect, pitting ethnic and religious groups against each other to extinguish any sparks of nationalism. As they had demonstrated throughout their colonial tenure in the archipelago, the Dutch found a way to turn internal threats to the advantage of the colony. Such skills in social engineering had helped Holland retain control for 340 years, a legacy that would only end at the hands of yet another imperial power.

Consequences of intervention

The long term impact of wet rice cultivation on East Sumatra’s agricultural spaces is summed up below.

Implementation of wet rice in the lowlands:

1. Reduced the area under rubber through the Compulsory Cultivation Ordinance.
2. Consumed some of the empty land left over from conversion to rubber. The impact to biodiversity and forest loss due to this change is unknown.
3. Increased inter-ethnic and inter-religious tensions through the movement of Christian Toba into Muslim Malay territory.

4. Increased the integration of highland societies into the lowland economy.

5. May have increased the proliferation of the brown planthopper.

6. May have helped mitigate the emerging food crisis in the 1930s and 1940s, though the benefit is unknown.

28 In other areas where cash crops interfaced with staples, for example, western Borneo, rotating cultivators were semi-nomadic (see Peluso 2009). The occasional movement of villages as well as fields would have further complicated the allocation of concession lands.

29 While these figures are empirically derived for East Sumatra, Harris (1972) estimates that yield reductions for a second season of upland rice are approximately 25%. Harris’ calculations are based on swidden cultivation throughout Southeast Asia.

30 Late modifications to the Model Contract sought to prevent this “boundary effect” by requiring companies to offer land to villages outside of the concession. Lekkerkerker notes, however, that planters rarely obeyed this regulation, and then, only under protest (1916).

31 From the literature it is sometimes difficult to distinguish between intended and unintended consequences. Of the intended outcomes, there are some that were explicitly stated, and others left unexpressed. Historians of this period are not always clear with respect to either distinction. While the intentionality of human directives is secondary to the goal of this paper (the primary goals being descriptive and explanatory), I will nevertheless indicate when the record clearly shows that outcomes were intended or explicit.

32 As an annual, tobacco offered a distinct advantage for capital investment in infrastructure. Seasonal harvests gave planters regular income to pay off loans from investors, thereby decreasing investment risk and increasing available capital for canals and earthworks. Compare this to rubber, where trees take seven years to become productive. Under rubber, investors and planters must absorb greater initial risk of market fluctuation, social unrest, and shifts in agricultural policy. These risks constrain investment capital and constrain large scale projects.
Chapter 8. Conclusions

“So soon as there is a complete political understanding between Holland and the peoples of Sumatra, and the latter at last consent to exploit the riches of their island; so soon as good highways or further railways make transport and travelling an easy matter, Sumatra will be able to rival Java in wealth; and its population will rapidly increase tenfold.”

-- Antoine Cabaton (1911, 306)

Cabaton’s glorious pronouncement in 1911 was darkly prescient. The population did indeed grow, in part by natural increase but largely through migration. Sumatra did surpass Java: by 1930, the monetary value of Sumatran commodities was 6.6 times greater than Java’s (Furnivall 1939). Indeed, the riches of the island were being exploited, but notably by foreign companies rather than the “peoples of Sumatra.” It seems a perverse distortion to say that this exploitation of land and labor took place under terms of “consent” or “political understanding” when unjust policies were driven home on the points of bayonets. And yet, perhaps we can forgive Cabaton. He was, after all, just one author writing in a long tradition of colonial self-flattery. Beneath the veneer of economic development, social advancement, and Christian duty, lay a troublesome history of environmental destruction, exploitation, and bloodshed to which the chroniclers of empire could hardly confess.

The transformation about which Cabaton writes certainly brought East Sumatra to the attention of both Batavia and the world. It did so, however, for none of the reasons
Cabaton expressed. The catalyst for this transformation was not good highways or railroads. The only riches the east coast could offer were land, rain, and sunshine. The commodities that turned planters into millionaires were all imported. The labor that produced these commodities was also imported. The “peoples of Sumatra” – the native Malay and Simelungun who cultivated the alluvial plain when Nienhuys arrived – were seen as less of a resource than an obstacle.

Villagers, headmen, planters, and politicians, all sought to transform East Sumatra in pursuit of their own imperatives. While much is written about technological innovation, social upheaval, and cultural imperialism in the plantation lands, I believe that agricultural transformation – as a site of contested spatial practices – was key to simultaneously unlocking political, economic, and social spaces for European exploitation.

The objective of this thesis was to explore this transformation from a socio-ecological perspective: to understand how the conversion from subsistence cultivation to large-scale commodity production took place by dissecting the biological, cultural, legislative, geopolitical, and ethical forces brought to bear upon the agricultural landscape. The outcome of this study is a distinctly spatial story.

**The colonial plantation and the transformation of space**

The shift from subsistence cultivation to plantation has traditionally been understood as (1) an agricultural change, (2) confined to the lowlands, and (3) motivated by European economic imperatives. By contrast, this study finds that this transformation was:
- **Multidimensional in its consequences** – responsible for reconfiguring the connections between non-agricultural agents and processes;

- **Far reaching** – altering seemingly peripheral spaces and actors in unexpected ways;

- **Broadly applicable** – used not only to make money, but to address a wide range of strategic, racial, and ethical concerns.

    **Multidimensional in its consequences** – The repercussions of the conversion to plantations were not confined to those actors participating in agricultural production. On the colonial side, the promise of plantations inspired new land laws that were friendly to foreign companies, and labor laws that created new forms of human exploitation. The Penal Sanction turned tens of thousands of destitute Javanese into indentured labor. With expanding economic clout came political influence in the Strait of Malacca, improving Holland’s position in negotiations with the British.

    The conversion to plantations also spelled the end of Sultanate power. It dissolved Malay and Simelungun social practices by reconfiguring the relationship between land and culture. Through progressive restrictions to both land access and land use, planters deprived villagers of a means of subsistence, forcing both outmigration and conversion to the export economy. Dutch security fears, coupled with a modernizing and civilizing mandate, led to government-sponsored missionary efforts and the Christian conversion of the Toba Batak. The importation of Chinese and Javanese labor into Malay and Simelungun social space spurred ethnic resentment that still reverberates today.

    Meanwhile, the destruction of 10,000 square kilometers of lowland rainforest had consequences for the local ecology that are still difficult to measure. Plantation
agriculture rationalized land – and its conversion – in ways that now form the basis of Indonesian forestry law. It is not far-fetched to say that today’s runaway train of oil palm expansion rides on the rails of colonial land policy.

Far reaching – The impact of the plantation belt was not confined to the lowlands it occupied. Opportunities for wage labor attracted workers from the neighboring highlands and across Southeast Asia. Government transmigration programs reshaped Java, where destitute individuals and families were given the Hobsonian choice of moving to Sumatra or facing time in jail.

The integration of currency into the lowland economy altered social relationships traditionally organized around descent and affinal patronage. Through new economic linkages, these changes led to both negative and positive social outcomes in the highlands, despite plantations never setting root there. From 1900 until independence in 1945, the highlands would experience a population explosion, outmigration, insolvency, agricultural over-intensification, and deforestation; all of which are processes that can be linked to the arrival of plantation agriculture in the lowlands. While the effect of European plantations on peripheral space was not a significant part of this study, I believe the consequences chronicled by Vergouwen among the Toba (1964) and Kipp among the Karo (1998) warrants a socio-ecological look.

Broadly applicable – Few will dispute that the plantations made money, or that profit was the primary motivation for planters coming to Sumatra. However, plantations also provided both material resources and discursive justification for Europeans to reshape society, culture, and environment. The government needed to establish legal
authority over land, diminish the power of petty states without antagonizing the sultanates, extract revenue for ongoing annexation, and inhibit nationalist sentiments.

Plantations answered the call. The Model Contract inscribed concession boundaries on native land and established new authorities to govern its use. Planters purchased the compliance of sultans and headmen through lucrative export tariffs. Imported labor created a social buffer between European elites and locals, denying a restive native class access to the means of economic advancement and political influence. This transformation did not occur because of plantations *per se*. Rather, the design, implementation, and timing of both planter and government intervention seems to have been tailored to promote this gradual, but inexorable metamorphosis.

Many of the imperatives and accompanying challenges facing planters and administrators seemed to coalesce around a basic question: how can plantations expand production without inciting violent resistance? For administrators, a more basic question lay at the heart of the issue – one that had troubled Batavia since the rise of economic liberalism: how should the government balance capital accumulation with native rights?

Some authors conclude that the colony answered this question and overcame these challenges through evolving land laws; the legislative remedy. Others point to draconian civil policies and racial engineering; the social solution. I argue that a key (and often overlooked) participant in the transformation of East Sumatra’s agricultural space was the crop itself.
Commodity succession

As described in Chapter 7, the system of cultivation established under the Model Contract allowed plantations to integrate cash crop production with traditional swidden. Tobacco was key to this integration: as a nutrient-intensive annual, tobacco required field rotation and a distribution of labor similar to the swidden systems practiced by lowland villagers. Tobacco was already being grown by some Karo villagers, whose expertise helped early planters learn best practices. Its presence in and around Karo villages helped convince the Dutch of tobacco’s future productivity in the soils near Deli, while its inclusion with other village crops demonstrated tobacco’s potential for integration.

Once planters and villagers had integrated tobacco with traditional swidden, the institutional apparatus that piggybacked on tobacco could be set to work transforming social space. The Model Contract codified and quantified jaluran. It permanently demarcated village boundaries, defined native agricultural space, and provided a legal apparatus – in the form of European-style courts – to resolve disputes. Tobacco’s biological requirements provided convenient justification for progressive restrictions on native cultivation. Meanwhile, the labor necessary to produce tobacco on such a scale convinced the government to support policies of native depopulation. For Dutch administrators, the plantation paradigm made the dispossession and displacement of natives seem necessary, despite the high-minded ideals of humanitarianism.

In the late 1800s, seeking a permanent cash crop but faced with a local rotation system that could not be forcibly displaced, plantations quickly adopted tobacco. Like the trees that first colonize cleared fields, tobacco was the perfect pioneer cultivar for East
Sumatra. Not only did it adapt to local conditions, but over time, the agro-ecological community that developed around tobacco created ideal conditions for the next cultivar: a form of commodity succession. By the time tobacco’s agro-industry had fully demarcated the lowlands, depopulated native communities and turned all those that remained into intensive cultivators, the Dutch were ready for rubber.

To suggest that planters and administrators foresaw this evolution in 1863 may be giving them too much credit. High quality tobacco was already being grown in East Sumatra when Nienhuys arrived. Conditions in both the local environment and the global market were ideal for plantation growth in tobacco, making it a worthy cultivar in its own right. The fact that tobacco could be integrated into native cultivation – a condition imposed by Batavia – was an added bonus. However, the continued planting of tobacco under the terms of the Model Contract suggests that planters were well aware of its transformative potential. In the late 1800s, new plantations still cleared land for tobacco and integrated native swidden, even on unsuitable soils. It seems that after several decades of observing tobacco, planters were willing to accept lower productivity and reduced profits in favor of the crop’s adaptability and potential for transformation.

While much recent work in political ecology demonstrates the transformative effect of markets, land reform, social movements, and political upheaval on agriculture, this study highlights an agent often-overlooked in discussions of agrarian change. Cultivars – those biological agents at the center of any agro-ecological community – are themselves culturally and environmentally transformative. This capability ensures that under certain conditions, crop selection will be politically motivated and contested.
Further applications

This research offers one other insight for the study of agricultural space. The history of East Sumatra serves as a reminder that agrarian change is always taking place, even in what appears to be a stable plantation monoculture. It took fifty years for tobacco to pave the way for rubber through small and incremental changes to environmental, social, economic, and political spaces. At any given point, an observer might have declared these spaces to be stable, when in fact the succession from one commodity to another was in full swing.

Over the last fifty years, scientific agriculture has introduced new varieties of staple crops into virtually every cultivation system in the world. Supporters and detractors have framed a debate about agrarian change that essentializes hunger, yields, profits, intellectual property, biodiversity loss, privatization, petroleum-dependency, farm consolidation, land reform, and environmental destruction; to name but a few points of contention. Lost in this melee is the transformative role of the crop. When Indonesian rice farmers adopt GM seeds, or Guatemalan peasants switch from maize to cashews, we ask who benefits and suffers today. But who will benefit or suffer in the future, and how is that future being determined by the selection of current agro-ecological systems?

Like Nienhuys in 1863, “modern” crops and cultivation systems have now made landfall in virtually every agricultural space on Earth. What socio-ecological histories will be written about the next fifty years?

---

31 This includes tobacco. Boomgaard traces the variety of tobacco grown in the Karo lowlands when Nienhuys arrived to seed stock brought from South America by the Portuguese (1999).
Glossary of non-English terms

Adat – (Batak) Among the Batak, general term for cultural tradition. Includes rules of social conduct, obligation, and land tenure.

Alang-alang – (Malay/Indonesian) Local term for saw grass, usually Imperata cylindrica.

Bius – (Batak) Among the Toba Batak, a semi-religious organization above the level of the village that set social and political policy.

Bohorok – (Malay/Indonesian) Adiabatically warmed, föhn-type winds occurring in the northern plantation zone between July and September.

Bouw – (Dutch) A unit of area, approximately 0.7 hectares.

Erfpacht – (Dutch) Literally “empty land.” Under the Land Law of 1870, any land that was not used by natives for traditional purposes. Under later revisions to the Model Contract, any land that had not been converted to private property.

Ethische Politiek – (Dutch) The “Ethical Policy” enacted by Queen Wilhelmina in 1900 which sought to balance capital expansion with humanitarian and moral concerns.

Jaluran – (Malay/Indonesian) Literally “in the wake of [a ship].” Under the Model Contract, the right granted to villagers to plant swidden crops in fallow tobacco fields.
Kampung – (Malay/Indonesian) Village or small town.

Ladang – (Malay/Indonesian) Any unirrigated field. Contrasted with sawah.

Marga – (Batak) A family line, organized through male descent.

Martutus – (Batak) Practice of tracing common ancestry to identify social relationships.

Merga silima – (Karo Batak) The five originating family lines. Used to define membership in the tribal governing council.

Nipa-atap – (Malay/Indonesian) Roofing and siding material made from the fronds of the Nipa palm (*Nypa fruticans*).

Orang Melayu – (Malay/Indonesian) Literally “Malay person.” Referred generally to people of ethnic Malay descent.

Pematang – (Batak) Old beach ridges, the remains of former shorelines found in the lowlands.

Pembagin tanah – (Batak) Tradition of dividing land equally among male descendants.

Pikul – (Dutch) A unit of weight, approximately 60 to 64 kilograms. Derived from the Malay/Indonesian word for the maximum weight a man can carry.

Raubbau – (Dutch) Literally “robber economy,” an informal term used by the Dutch to describe swidden cultivation.

Sawah – (Malay/Indonesian) A wet rice field.

Tanah seratus – (Malay/Indonesian) Literally, “hundred land.” From the Model Contract, a one-hundred meter buffer established around villages within a
concession. This buffer was property of the village and could not be used by the plantation.

Walang sangit – (Malay/Indonesian) Local term for the brown planthopper

(Nilaparvata lugens).

Wingewest – (Dutch) Dutch term for the “profit making” policy seen as the source of native social problems prior to the declaration of Ethische Politiek.
Bibliography


Earl, G. W. 1853. *Contributions to the physical geography of south-eastern Asia and Australia*. Oxford University.

Firestone, H. S. 1923. *American should produce its own rubber*. SN.


Marsden, W. 1784. *The History of Sumatra, Containing an Account of the Government, Laws, Customs, and Manners of the Native Inhabitants: with a Description of the Natural Productions, and a Relation of the Ancient Political State of That Island*. Thomas Payne and Son Benjamin White.


Available from