

7-11-2013

TO THRIVE, WORK, AND LIVE: PROGRESS
TOWARD AND CHALLENGES TO
SUSTAINABILITY ON THE FREI GONDIM
SETTLEMENT, PERNAMBUCO, BRAZIL

William Maxwell

Follow this and additional works at: https://digitalrepository.unm.edu/geog_etds

Recommended Citation

Maxwell, William. "TO THRIVE, WORK, AND LIVE: PROGRESS TOWARD AND CHALLENGES TO SUSTAINABILITY ON THE FREI GONDIM SETTLEMENT, PERNAMBUCO, BRAZIL." (2013). https://digitalrepository.unm.edu/geog_etds/15

This Thesis is brought to you for free and open access by the Electronic Theses and Dissertations at UNM Digital Repository. It has been accepted for inclusion in Geography ETDs by an authorized administrator of UNM Digital Repository. For more information, please contact disc@unm.edu.

William C. Maxwell

Candidate

Department of Geography

Department

This thesis is approved, and it is acceptable in quality and form for publication:

Approved by the Thesis Committee:

Professor Chris Duvall, Department of Geography , Chairperson

Professor Maria Lane, Department of Geography

Professor Tim Lowrey, Department of Biology

**TO THRIVE, WORK, AND LIVE:
PROGRESS TOWARD AND
CHALLENGES TO SUSTAINABILITY ON THE FREI
GONDIM SETTLEMENT, PERNAMBUCO, BRAZIL**

by

WILLIAM MAXWELL

**BACHELOR OF ARTS IN ENGLISH LITERATURE
COLUMBIA UNIVERSITY**

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

**MASTER OF SCIENCE
GEOGRAPHY**

The University of New Mexico
Albuquerque, New Mexico

MAY, 2013

DEDICATION

To Kyongsook

ACKNOWLEDGEMENTS

A thesis is never the work of one person. Many have contributed to the success of this project. First, I would like to acknowledge the Latin American and Iberian Institute at the University of New Mexico and the federal Foreign Language and Area Studies fellowship program, as well as the GI Bill, for making my master's program financially possible. Next, I would like to acknowledge the UNM Office of Graduate Studies for providing a Research, Project and Travel Grant; and the Tinker Foundation for providing, and the Latin American and Iberian Institute, for administering, a field research grant. These two grants made my fieldwork in Pernambuco, Brazil, in June 2012, possible. If commencement of graduate school 18 years after college graduation can be traced to one 'a-ha moment,' it would have to have been an off-hand comment in 2004 by my friend Jeremy Mumford in response to my complaint about my difficulties as a journalist financing international research and writing projects. He said that, as a scholar, he had no difficulty finding funding for projects. While the comment may have been off-hand, his decades-long effect on me has been profound, as a friend and as an inspiring intellect. At the University of Oregon, I would like to thank Latin American historian Dr. Robert Haskett for his inspiring class, his enthusiastic encouragement, and his tireless recommendation-writing. At the University of New Mexico, I thank my advisor in the Department of Geography, Dr. Chris Duvall, for his inspiring example and his hard work ushering me through the stages of creating a good paper, in his classes, and finally, in this thesis. Profound thanks go to Dr. Maria Lane, the midwife for my project proposal. Dr. Tim Lowrey has been my guide on the ethnobotanical part of my project. These last three form my master's committee, and I thank each of them heartily for their grand service to my humble enterprise presented below. I want to thank Dr. Bradley Cullen for inviting me to the 2012 Applied Geography Conference, and for his discrete but consistent mentoring since the beginning of my master's program. My connection to Brazil dates back to 1994. I want to thank Steve Cannon for being the first publisher of my writing on Brazil. Michael Astor marched with the MST on the roadside all the way to Brasília in 1997, tape-recorder in hand, and ignited in me a longstanding interest. Angus Wright and Wendy Wolford wrote an essential book about the movement, and Dr. Wolford gave generously of her time and energy, advising an enthusiast on his way to becoming a grad student. Audrey Joslin kindly shared with me her first-rate master's thesis on another MST settlement, a work of frequent reference for me as I formulated my own. I thank Paul Robbins for his guidance. While I learned from all MST personnel I talked to, I would especially like to single out the Caruaru MST activists for helping to make my fieldwork a reality. I thank the people of the Frei Gondim Settlement for their patience, kindness, and hospitality. In Pernambuco, I had the untiring support of eminent Universidade Federal de Pernambuco ethnobotanist Dr. Laise de Holanda Cavalcanti, and Dra. Eugenia Pereira of the IPA Herbarium has also helped me with plant identifications. Despite the fact that many have given me advice on my project, the errors in this work are entirely my own. I owe my three parents a debt of making me who I am today, and to my three sisters I owe my sense of humor. Samara shines the light into our future. Kyongsook has taken my hand on our way there.

**TO THRIVE, WORK, AND LIVE:
PROGRESS TOWARD AND CHALLENGES TO SUSTAINABILITY ON THE
FREI GONDIM SETTLEMENT, PERNAMBUCO, BRAZIL**

by

William C. Maxwell

**B.A., English Literature, Columbia University 1993
M.S., Geography, The University of New Mexico, 2013**

ABSTRACT

The sugar plantation zone of Pernambuco, Brazil, with a conservative culture forged out of chattel slave history, has been the most challenging region for the Brazilian landless peasants' movement to penetrate in order to implement agrarian reform. The movement founded the Frei Gondim Settlement in the heart of the region in 1994 in order to present an alternative to the pollution of sugar monoculture and the injustices of landlessness around it. This thesis holds that the settlement represents a true alternative, but that the juxtaposition of a settlement socially isolated from its surroundings with a mode of production in which cooperation is limited creates challenges for economic and ecological sustainability. I submitted ethnographic data I collected on the settlement to the Netting Model, a test of family farmer success. An important part of my data was derived from an ethnobotanical study of native Atlantic Rainforest medicinal plants on the settlement.

THIS ENTIRE WORK IS © 2013 BY WILLIAM MAXWELL.

TABLE OF CONTENTS

List of Tables	vii
List of Figures	viii
1. Introduction.....	1
2. Literature review	3
2.1. The environmental context	3
2.2. Agriculture in Northeast Brazil.....	13
2.3. Sustainable peasant agriculture.....	17
2.4. Peasants organize.....	22
3. Research questions.....	28
4. Site description.....	29
5. Methods.....	41
5.1. Focus on the farmers.....	41
5.2. Ethnobotany of native Atlantic Forest medicinal plants on the settlement	45
5.3. The role of the Movimento Sem Terra	47
5.4. Analysis: Application of the Netting Model.....	49
6. Results and discussion	50
6.1 Production.....	54
6.2 Subsistence and market benefits	83
6.3 Practices of stewardship and conservation of resources	98
7. Conclusion	123
8. References.....	130
Appendix: Ethnographic interview questions.....	137

LIST OF TABLES

6.1. The most important crops on the settlement, based on informant reports	62
6.2. Informants' gross reported income by crop	64
6.3. Average income	65
6.4. Personal-use cultivated plants.....	85
6.5. Medicinal plants of the Frei Gondim settlement.....	113

LIST OF FIGURES

2.1. A Brazilian latifúndio	6
2.2. Brazil ecoregions	12
4.1. The location of Pernambuco in Brazil	29
4.2. The state of Pernambuco.....	30
4.3. Pernambuco broken down into biomes.....	31
4.4. Plaza in the town of Gameleira, with church in background.....	36
4.5. The view from a settler plot on the Frei Gondim Settlement	38
4.6. The Frei Gondim Settlement from space	39
6.1. A diversity of agricultural products	61
6.2. Soursop on the Frei Gondim settlement.....	63
6.3. Manioc	67
6.4. Step 1 is peeling the manioc	68
6.5. Grinding	69
6.6. Pressing out the poisonous juice.....	70
6.7. Roasting the flour.....	71
6.8. Women sift the flour	72
6.9. Manioc flour mill participants at the agrarian reform market.....	75
6.10. President of Frei Gondim women’s association sells wares	77
6.11. AFG producers arrive at agrarian reform market with bananas on the minibus.....	87
6.12. Cilantro at the agrarian reform market.....	88
6.13. Settler Samuel Costa effectively combines subsistence and market benefits.....	96
6.14. KIT-PAIS garden	101
6.15. Appropriate technology in the KIT-PAIS garden.....	103
6.16. Neves’s farm	105
6.17. De Braganza sees no use in cane	107
6.18. Beans enrich the soil	108
6.19. The açai nursery	110
6.20. The family’s drinking water.....	111
6.21. Settlement land use compared to surrounding sugar plantation	115
6.22. Caladium bicolor Vent.....	119

LIST OF FIGURES, CONTINUED

6.23. <i>Heliconia psittacorum</i> L.f.	121
7.1. MST frustration with slow pace of reform	127

1. Introduction

What comes to mind when you think of Brazil? Most North Americans would say that it is colorful *carnaval* in Rio de Janeiro; toucans in the Amazon rainforest; a beach with Rio's Sugarloaf Mountain in the background; people dancing the samba. These colorful and joyful images, while an inarguable reality of Brazil, also hide a legacy of human injustice and environmental destruction that is inherent to one of the world's most unequal land tenure systems. Nowhere are the symptoms of that system more evident still today than in Brazil's sugar growing Northeast, among the country's first regions to be settled and cultivated by Europeans. Rapacious land greed and subjection of African slaves combined to form one of the world's primary sugar growing areas, the cornerstone of the Brazilian economy for centuries, and still today carrier of some of the country's deepest wounds.

Even while this region, the former site of the vast Atlantic Forest, with its rich dark massapê soil (a clay-rich rainforest soil, fertile but relatively shallow, and therefore vulnerable to depletion of nutrients), yielded up its fertility for a good part of the world's sugar consumption, the irony was that many of the workers producing the sugar were going hungry.¹ This was just one of the ironic facets of a single-minded agricultural export system.

Brazil's entrenched land tenure system hardly budged for centuries. One of the outgrowths of democratization in the mid-nineteen-eighties, Brazil's land reform movement, the Movimento de Trabalhadores Rurais Sem Terra (The Movement of

¹ Dean 1995

Landless Rural Workers) (alternatively known as the Movimento Sem Terra or MST), finally sought to empower the nation's millions of desperately poor landless peasants. Over a million MST members have occupied, cultivated, and successfully struggled for title to land in Brazil since 1984. The MST is arguably the Western Hemisphere's most successful and prominent social movement today. Using a combination of radical and coalition-building tactics, MST members have been phenomenally successful in obtaining land.² A group of idealistic and desperate rural laborers founded their own MST settlement in the heart of the sugar zone in 1994. The Frei Gondim agricultural settlement in the county of Gameleira puts forth an innovative agricultural program and helps to feed the state's population.³

Livelihood became an organizing principle for my research because of what I knew about the settlement and the region it arose from. Given Pernambuco's agricultural export system of worldwide importance, and the local hunger that it ironically caused because of its land use priorities, it seemed to me that any farm producing food for subsistence and for the local market met the fundamental definition of right livelihood. To understand the livelihoods of the Frei Gondim settlers and related issues, I spent June, 2012, in Brazil. I spent about two weeks in São Paulo, and in Pernambuco, in Recife, in the town of Gameleira, and in and around Caruaru, interviewing MST activists and preparing for the ethnobotanical portion of my fieldwork. I spent about two weeks on the Frei Gondim settlement, interviewing settlers, visiting agricultural plots, surveying native Atlantic Forest medicinal plants and other plants growing on the settlement, and recording locations with a GPS device.

² Wright and Wolford 2003.

³ Also referred to as AFG, the abbreviation of Assentamento Frei Gondim, below.

2. Literature review

To elucidate my subject of the livelihoods on the Frei Gondim Settlement, I will approach the subject from four avenues. The following questions will frame my literature review, organized into four sections below: What is the ecological basis for the settlers' life and livelihoods? In other words, what is the environmental context that they stumbled upon when they decided to make their lives on the Frei Gondim Settlement? What is the environmental context they emerged from? What is the agricultural context? Second, I offer a short history of agriculture in Pernambuco as it pertains to the settlement; and, third, a discussion of the literature as it relates to sustainable peasant agriculture more generally. Fourth, the agrarian reform context: What is the political and cultural background of this settlement? For in all likelihood it would still be a sugar plantation today if the MST had not been founded and if it had not established a foothold in Pernambuco's sugar monoculture region in the early 1990's. I show that the Frei Gondim Settlement grows out of a tradition of peasant resistance to agri-business, both inside and outside of Pernambuco.

2.1. The environmental context

While received wisdom holds that human activity felled the Atlantic Rainforest, a survey of the history of agricultural activity in the forest reveals that different agriculturalists' differing methods and ways of life influenced Brazilian forests in very different ways. It is no coincidence that the coastal zone of Northeast Brazil became one of the world's most important sugarcane regions. One of the world's most biologically

diverse rainforests stood for millions of years in the region where the charred remains – black stubble of the overgrown grass called cane – now stand twice a year at field-clearing time on the sugar plantations.⁴ The Atlantic Rainforest, which extended along almost all the southeastern seaboard of what is now Brazil, is a cousin biome to the Amazon Rainforest. In fact, paleobotanical research has revealed that, in wetter times, they formed one vast rainforest. Indeed, the drier country north of the region that is the focus of my study was in the Neogene and Quaternary periods a thickly forested link between the two forests. Epochal climate change, coupled with human activities, has severed the link.⁵

Agriculture was not absent from the Atlantic Rainforest before Pedro Álvares Cabral became the first European to make landfall in Brazil in 1500. The Tupi extended a vast empire along the continent's southeastern coast, a society which also reached into the continent as far as the Amazon.⁶ They used a variety of sophisticated farming techniques, and the agricultural basis of their society was an important part of their military success and demographic transfusion, as was the case with other peoples in the hemisphere, including the Inca, the Aztecs, and the Maya.

Cabral and his cohorts gazed upon a cacophony of life from their ship. Species of trees including *Araucaria angustifolia* (Bertol.) Kuntze, the araucaria, with its canopy like a thick-spoked umbrella, used to tower over wide reaches of the southern half of Brazil's Atlantic Forest. *Caesalpinia echinata* Lam., the Brazilwood tree, was one of the first trees Portuguese explorers encountered along the coast of Pernambuco. The dye extracted from its deep-red wood was prized in Portugal and all over Europe, and gave

⁴ Rogers 2010, Santos *et al.* 2009, Silvano *et al.* 2005, Begossi *et al.* 2002, Dean 1995.

⁵ Dean 1995.

⁶ Dean 1995.

Brazil its name. Portuguese common names for the Brazilwood tree are *Pau-Brasil* and *Pau de Pernambuco* (literally, Brazil wood or Pernambuco wood).⁷

This vast forest, once running down the southeastern flank of South America, was the victim of a rapacious mercantilist empire, and later the object of a no less greedy and destructive elitist export-based republic.⁸ It fell to the ax (and the firebrand) as neo-Brazilians deforested for wood export; for shipbuilding; to set up vast sugar plantations, coffee plantations, and cotton plantations; for ranches; for farms; and for cities. Today, the former expanse of the Atlantic Forest forms the cordon of Brazil's most densely populated and economically most important zones: the Southeast around São Paulo and Rio de Janeiro, and the Northeast, around Recife, Salvador, and João Pessoa.

Brazil's rainforest soil is famously fertile, and famously sensitive. Indigenous Amazonian and Atlantic Forest agriculturalists built the practice of burning vegetation into their agricultural strategy in order to maximize fertility in a thin layer of rainforest soil. The Atlantic Forest's fertile *massapê* soil is black and rich in clay, and turns brownish or reddish when dry. It is rich in nutrients, but also superficial and in need of replenishment if over-taxed.

Brazil's colonial and republican coffee barons and sugar barons historically ignored the soil's need of replenishment, preferring to abandon depleted plantations in order to found new *latifúndios*.⁹ Over the last 50 years or so and increasingly, Brazil's Green Revolution farmers have added concentrated chemicals to the soil, turning the soil into an artificial matrix of biological mono-fertility.

⁷ Dean 1995.

⁸ Dean 1995, Stein 1985.

⁹ Stein 1985.

Figure 2.1: A Brazilian *latifúndio*



Source: <http://revista-amauta.org/2009/10/agricultura-brasil-mucha-tierra-en-poder-de-pocos/>

In his ecological and labor history of the cane plantation in Pernambuco, Rogers wrote that “cane expansion came at the cost of fetid streams, ash-filled skies, slashed forests, and increased floods.”¹⁰ Also, chemicals such as those used for fertilizer by littoral sugarcane plantations in Pernambuco have been shown to cause a significant die-off of estuarine organisms.¹¹

Ecological challenges are not only associated with plantations using Green-Revolution type agriculture. As one study shows, even family farmers in the Atlantic Forest have been known to resist reforestation on their properties, citing failure to see

¹⁰ Rogers 2010, 201.

¹¹ Santos *et al.* 2009

economic benefits. Simultaneously, they tend to blame their neighbors, rather than themselves, for pollution of streams that flow through or run along their properties.¹²

However, some farmers make efficient use of ecosystem services provided by forests neighboring their properties. Some farmers on the Chico Mendes MST settlement in the somewhat drier county of Pombos west of Gameleira in Pernambuco allow forests abutting their plots to provide shade, wind breaks, and erosion control benefits for the organic vegetables they are growing. To provide further nuance to the extent to which farmers use forest ecosystem services, it is relevant to point out that even on this agro-ecological settlement, farmers make use of ecosystem services to varying extents. Those plot holders not so lucky as to have a forest abutting their property tended to resort to ecologically more impactful agricultural activities such as cattle grazing.¹³

Historically, calls for the conservation of the Atlantic Forest, whether late in the eighteenth century to protect the Crown's assets; in the nineteenth century for the sake of economic botany; or in the twentieth century on modern conservationist principles, went largely unheeded.¹⁴ The announcement of the death of the Atlantic Forest was premature, however. Some stands still remain between Recife and São Paulo, more than 2,500 kilometers away from each other. More importantly, the forest continues in the crops farmers plant, the trees they have on their properties, the plants they have in their gardens, the pests they contend with, the soil the forest left behind, and the landscape in general.¹⁵ In this sense, the forest has agency. Far from being a sorry mat of vegetation

¹² Silvano *et al.* 2005.

¹³ Brasileiro 2009.

¹⁴ Rogers 2010, Dean 1995.

¹⁵ Brasileiro 2009, Movimento Sem Terra 2009: "Associação 21 de Novembro," Albuquerque 2005, Dean 1995.

ripped off and dumpstered by a careless colonial culture, it was and is a living being -- shaved -- perhaps today hard to see, but still there, if only in a tragically reduced state.¹⁶

The conflict between biological conservation and rural peoples' rights is one of the classics of political ecology.¹⁷ But there is an emerging literature arguing that it is a false dichotomy.¹⁸ A growing body of evidence, and an increasingly important school of thought, maintains as a matter of fact, that long-term ecological conservation has no chance if the rights of rural peoples, the birds' and trees' neighbors, as it were, are not taken into account.¹⁹ The antagonistic relationship between biological conservation and rural peoples' rights, for one thing, rests on the assumption that rural people will inevitably contribute to the deterioration of the biome. However, some Brazilian indigenous agriculturalists have been shown to maintain their environment sustainably, or even improve it. William Balée (1994), in a thoroughly researched ethnobotanical study of the Ka'apor people of the pre-Amazon north of Pernambuco, demonstrated that the Ka'apor and their ancestors have lived and farmed in the forest for thousands of years. They have altered the landscape, but within recent memory, Balée shows, the Ka'apor have not had a significant impact on biodiversity. As a matter of fact, Balée's data show that Ka'apor agriculture and domestic activities can lead to an increase of biodiversity in the landscape. Similarly, Rogers (1995) showed that while the agricultural Tupi-Guarani altered the Atlantic Forest before the arrival of Portuguese colonists, this was not

¹⁶ Robbins 2007, Clements 1936. Robbins, while not talking about forests, asserted, citing the work of Bruno Latour and others, that lawns have agency, that they have a purpose that ends up controlling the lives of suburban homeowners. While Clements did not use the 'agency' terminology, Clements described the biome (such as a forest) as "a complex organism inseparably connected with its climate and often continental in extent." (Page 60.)

¹⁷ Joslin 2008, Robbins 2004.

¹⁸ Perfecto 2009.

¹⁹ Neumann 1998.

comparable in any way to the clear-cutting approach of the settlers. These authors' main argument is that agricultural life in the forest is possible without destroying the forest.

Is biological conservation a peculiarity of isolated groups of extremely specialized indigenous people living in a sparsely populated environment? Or is it a possibility for other rural peoples? Sustainable occupation of the forest by settler agriculturalists in Brazil is a more controversial question than the effects of indigenous people. Not only did the Atlantic Forest fall to make way for sugar plantations in the Northeast. Those same sugar plantations have continued to degrade the environment by polluting the air and the water, providing habitat for plant pests while eliminating their predators, and failing to provide habitat for native species. Does peasant agriculture have potential for charting an alternative path? While some bemoan the progressive retreat of the world's great forests, others focus their attention on the spaces left behind.²⁰ Not all are charred landscapes. Some are agricultural landscapes that function fairly well as waystations for animals and plants between remaining forest islands.²¹ Ensuring that the farmers in these landscapes use sustainable methods benefits not only them but also the local populations of flora and fauna that depend on travel through these cultivated spaces in order to keep the metapopulation alive.

Those cultures with a longstanding tradition of inhabiting a particular place and refining their agricultural methods and ways of life over centuries and millennia in order to provide for their sustenance without resorting to revolutions in technology may be a model for the Frei Gondim settlers, a comparably new community, as they continue to assess strategies for ecologically and economically sustainable livelihoods.

²⁰ Lockie 2004.

²¹ Perfecto 2009, MacArthur and Wilson 1967.

Smallholder farmers in places as diverse as Switzerland, Nigeria, China, and Meso-America have been shown to minimize their environmental impact by controlling soil erosion and effluent, and managing pests. Simultaneously, they provide services back to the ecosystem by providing habitat and sustenance for native plants and wildlife, multiplying ecological niches through their activities, and extending the dispersion of some native (and introduced) plants in the form of crops, in household gardens, and inadvertently, for example through seed dispersion.²²

Smallholder farmers do not spend all their time working their plots. However, their impact on their environment continues with their other activities. A complete discussion of the environmental effects of peasant livelihoods would be impossible without an intimate look at how people are using the plants in their environment. Ethnobotany is a syncretic field, a combination of anthropology and biology. It deals with understanding what plants have been used by people, what those uses are, and what the ecological effects of the uses are, both on the environment as a whole, and on human society. Ethnobotany within the field of anthropology has tended to focus on indigenous people. Scholars are still studying the ethnobotany of indigenous peoples in the Atlantic Forest and nearby forests.²³

By closely examining the plant-people relationship, scholars have found that the Ka'apor tribe in the pre-Amazon have over millennia evolved a way of life that not only conserves the forest around it, but actually contributes to biological diversity within it. This research was done with the use of painstaking lists of the plants tribal members use, whether it be for food, medicine, lashing material, furniture, homebuilding materials,

²² Duvall 2007, Netting 1993.

²³ Balée 1994, Begossi *et al.* 2002.

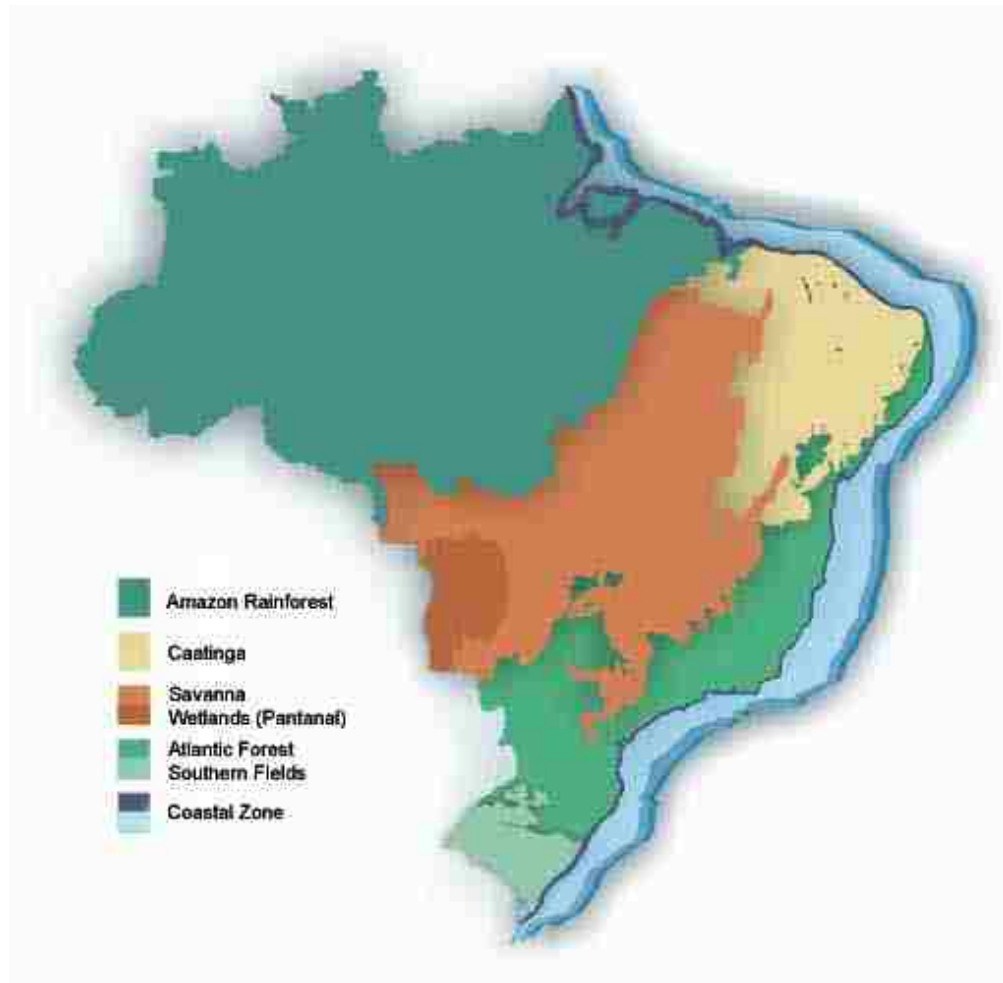
ceremonial purposes, and other purposes. Further, species counts were done in selected plots of old growth forest and fallow fields that had returned to forest in the Ka'apor landscape.²⁴

The region inhabited by the Ka'apor is similar to what the Atlantic Forest used to be. As a matter of fact, paleobotanists have found evidence that, in climatic periods of higher rainfall, the Amazon, the pre-Amazon, and the Atlantic Forest occupied contiguous space.²⁵

²⁴ Balée 1994.

²⁵ Dean 1995.

Figure 2.2: Brazil ecoregions



SOURCE: WWW.SOUTHTRAVELS.COM

A land bridge of rainforest linking the great Atlantic and Amazon forests in Paleolithic times and earlier extended across parts of the *caatinga* (scrubland, tan area on map) and the pre-Amazon.

Ethnobotanists have found that rural people – in this case the Caiçara indigenous people -- have the potential to deplete local populations of native Atlantic Forest medicinal plants in Rio de Janeiro state. However, they also learned that many of the plants used are weeds that grow in disturbed areas, and that this particular extractive activity does not impact old-growth stands. Ethnobotanists have called for the creation of extractive reserves for medicinal plants for local rural peoples in the Atlantic Rainforest

zone, and pointed out that management programs including education and development of economic alternatives are key to sustaining the Caiçara and the forest.²⁶

Recent data suggest that there is a potentially strong market for the development of a non-timber forest product economy around medicinal plants in Pernambuco. The selection of this type of product increased significantly over time at an urban market in the state.²⁷ However, an indication that there is a market for such products does not in itself provide proof that this would be an economically or ecologically sound management of local native medicinal plants on the Frei Gondim Settlement.

To sum up, previous ethnobotanical studies in the Atlantic Forest zone have shown that this research method can provide useful data in an analysis of a local population's way of life and environmental effects.

2.2. Agriculture in Northeast Brazil

Centuries of slavery in the sugar regime of Northeast Brazil were followed, after 1888, by over a century of worker exploitation and the ironic phenomenon of regional hunger in one of the world's most productive agricultural areas.²⁸ However, so strongly is sugar entrenched in the minds of Brazilians, and of scholars worldwide, when they think of Northeast Brazil, that people seem to forget that the region has always been agriculturally diverse. There is a centuries-old tradition of smallholder farmers growing food for local sugar plantations and the general populace.²⁹ There are records of a

²⁶ Begossi *et al.* 2002.

²⁷ Albuquerque *et al.* 2011

²⁸ Rogers 2010, Welford 2010, Dean 1995, Colson 1981.

²⁹ Rogers 1995, Silva 1985, Garcia 1983.

produce market in the municipality of Bonito in the nineteenth century.³⁰ There are ranches and food farms on the periphery of sugar plantations. And perhaps most importantly, there has been a segment of the rural agricultural population that splits its time between subsistence plots and wage work on the sugar plantations.³¹

However, the literature shows that prospects for small farms in the sugar monoculture region of Pernambuco were historically not good, and it appears that they got worse over the twentieth century. Land distribution became more concentrated in the hands of the rich in Pernambuco in the last century.³² This local trend paralleled a national trend in the second half of the twentieth century in which the growing articulation of modern land-intensive Green Revolution agriculture put ever increasing pressure on the smallholder way of life. The peasants of Mato Grosso, in western Brazil, are a good example. One study found: “This case study of rural change in traditional communities in Brazil has shown that rural restructuring towards modernised agro-food production has driven the local peasant population into social exclusion, poverty and marginalisation.”³³ The author of the study found problems including insecure land tenure, reduced access to agricultural land, exclusion from adequate technical assistance, and political exclusion, among other problems. She concludes: “In order to achieve ecologically sustainable, empowered, and creative rural communities based on participatory structures, distributive issues will have to be given priority in the political agenda. Since this involves distribution and equal access to resources and opportunities among all citizens, its success depends very much on the alteration of local power

³⁰ Garcia 1983.

³¹ Garcia 1983.

³² Silva 1985.

³³ Gutberlet 1999, 234.

relations, as well as on the implementation of fair economic structures, not only on a local, but also on a global scale.”³⁴ Without mentioning the movement, the author describes the social and economic relations in the countryside that the MST addresses with agrarian reform.

The de-emphasis of peasant agriculture for the benefit of export agriculture in Pernambuco had an appreciable effect on the region’s food supply. Food scarcity, high food prices, and hunger are sadly ironic problems in this prime agricultural area. A 1963 federal rural workers’ rights law, passed the year before the military dictatorship descended on Brazil, helped raise the Pernambuco cane worker’s daily calorie intake in the early 1960’s.³⁵ However, in this time period, food prices also almost doubled. A Pernambuco agricultural worker union president complained in 1966 that the high food costs were impacting the lives of his members severely.³⁶ In Pernambuco, there was a longstanding tradition of resident sugarcane plantation workers having small subsistence plots on which they could grow foods. This tradition went back to the era of slavery. But with changes in the economic system in the twentieth century, there were fewer and fewer resident cane workers, and more and more landless cane workers who lived off-site and often shifted temporary employment from one plantation or mill to another.³⁷ More and more workers’ losses of their on-site food plots further aggravated the problem of cane workers’ access to food.

In the 1970’s, the aggrandizement of the sugar market and expanding cane cultivation in the region led to planting *Saccharum* on the steep northern table lands of

³⁴ Gutberlet 1999, 235.

³⁵ Rogers 2010. 158-9.

³⁶ Rogers 2010, 162.

³⁷ Rogers 2010.

the forest zone of Pernambuco. “Traditionally excluded from cane cultivation, these areas had provided food crops for the region. Expansion onto broad ridges, then, further aggravated the region’s ongoing struggle to feed its population.”³⁸ In 1980, less than 20 percent of the state’s forest zone land area was “devoted to food crops such as corn and manioc.”³⁹ But starches were not the only food stuffs that were lacking. Workers and peasants grumbled about the region’s disappearing game and fish due to rising environmental pollution from the cane industry, which prompted a sugar refinery technocrat to cynically point out in an internal memo that local fish die-offs stood to the refinery’s benefit: the less time workers spent fishing for sustenance, the more time they would spend working at the refinery.⁴⁰

Peasant agriculture in Pernambuco thrived and shrank along with the ebbs and flows of sugar plantation agriculture. For example, a bust phase in the cycle of sugar monoculture in the state in the nineteen-forties and nineteen-fifties was a boon for smallholders. It was a rare time in Pernambuco history when smallholders increased their holdings and their mode of agriculture thrived. In general, however, peasant agriculture in the state has always been under threat from the plantations, ranches, and mill owners. Many of the gains made in smallholder holdings in the middle of the twentieth century were soon erased as unprofitable plantation owners turned more and more land into cattle ranches.⁴¹

However, since the turn of the millennium, efforts to improve the economic and ecological sustainability of smallholdings have increased. These efforts have been led

³⁸ Rogers 2010, 183.

³⁹ Rogers 2010. 210.

⁴⁰ Rogers 2010. 188.

⁴¹ Garcia 1983.

not only by outside “experts,” but also by the smallholders themselves. Small farmers have since the turn of the millennium been seen to cooperate, share knowledge, and make a concerted effort to develop sustainable methods, both economically and environmentally.⁴² But progressive ideals are limited by economic resources. Farmers, especially smallholders, complain of a lack of resources and training to implement desirable, environmentally sustainable practices.⁴³ Contrary to popular perception, the challenge does not lie in convincing farmers to use agriculturally sustainable practices. The challenge is funding those practices. Sustainable agriculture is more and more on the minds of the farmers in this region. The turn in philosophy does not stop at the gates of the smallholdings. Catende, one of Pernambuco’s most prominent and long-lived sugar plantations, is today owned and managed by its workers. This ecologically sensitive workers’ cooperative grows cane among many other crops.⁴⁴

2.3. Sustainable peasant agriculture

Pernambuco smallholders did not invent peasant agriculture. As a matter of fact, there is well-documented research that peasant agriculture has a long history, providing a sustainable livelihood to millions, in varied ecosystems across the globe, and from the dawn of organized agriculture to the present.

Robert Netting, in his 1993 book, *Smallholders, Householders: Farm Families and the Ecology of Intensive, Sustainable Agriculture*, constructed a model of classic peasant agriculture based on what happens when agriculturalists are subjected to a situation of growing population density and scarcity of land. Netting found that peasants

⁴² Sabourin 2005, Tonneau 2002.

⁴³ Bolliger 2006, Sabourin 2004, Tonneau 2002.

⁴⁴ Rogers 2010.

tended to intensify production on small plots of land, and used a variety of resourceful methods to maintain the fertility of their land. Netting wrote:

My contention is that smallholder intensive systems achieve high production, combine subsistence and market benefits, transform energy efficiently, and encourage practices of stewardship and conservation of resources.⁴⁵

I will henceforth describe the above as the Netting Model in this thesis. Netting, compiling decades of research among family farmers across the globe and a wide body of documentary evidence, concluded with the above. He admonished the reader to remember that the announcement of the death of the family farmer's way of life is premature. Particularly in the United States, where since the 1970's the charge to farmers has been, "Get big or get out!"⁴⁶, and in which the 1980's saw the bust of so many family farms, the smallholder mode of production seems to many quaint, old-fashioned, and except for the independently wealthy, impracticable.

In his carefully documented book, Netting showed that family farmers, sometimes using tools that have not been improved since the Stone Age, can not only hold their own against factory farmers economically. They do so with much higher energy efficiency (the ratio of calories won in produce to calories invested in work and materials) than the energy-intensive Green Revolution mode of production. In doing so, family farmers – whether it be *Bauern* in the Swiss alps, African farmers using wooden digging sticks, Mexican farmers, Chinese farmers before and during the Cultural Revolution, or

⁴⁵ Netting 1993, 320.

⁴⁶ Neil and Tykkyläinen 1998

Indonesian farmers -- cooperate with neighbors, protect the environment, and secure the requirements for social reproduction.⁴⁷

The field of peasant studies certainly did not start or end with Netting's book, and could arguably be traced to the earliest writings of humankind. Since the publication of Netting's book, a number of other authors have affirmed the sustainability of peasant agriculture, both in terms of the livelihood it provides to the peasant class, and in terms of the longevity of the livelihood through history. Martinez-Alier affirmed the ecological approach Netting took, even while criticizing the book "for its attempt to explain land tenure by land use rather than social struggle."⁴⁸ Biodiversity has been shown to go hand in hand with peasant livelihood not only in the places Netting described, but also in the Peruvian Andes. "Abiding cultivation and de facto conservation of diverse crops did not infer a retardation of farm commerce in the southern Paucartambo Valley," Zimmerer found. "Quite the contrary, its farmers contracted barley and vigorously adopted potato commerce ... without pushing landrace-rich cropping below crucial thresholds."⁴⁹

Peasant agriculture has been found to be so persistent that it has at times even survived great economic odds against it. After Netting did his fieldwork among the Kofyar of Niger, another author found that this people continued peasant farming even after "the economic rationale for homeland farming had all but disappeared." This researcher found that culture and expediency are also compelling factors for smallholder farming. "Home settlement is kept viable as a facility to support ethnic identity and to attract government resources."⁵⁰

⁴⁷ Netting 1993.

⁴⁸ Martinez-Alier 1995, 140.

⁴⁹ Zimmerer 1998, 172-173.

⁵⁰ Stone 1998, 239.

Netting made much of peasants' practicing of intensive agriculture, defined by intensive use of a limited amount of land; as opposed to extensive agriculture, defined by agriculture practiced over a large and expanding or shifting area. Intensive agriculture, as that practiced by peasants, has not only been found to be persistent. Some have argued that it was a prerequisite to civilization.

In 1977, Robert Netting proposed a model for the Prehispanic intensification of agriculture in the Maya Lowlands that spurred a change in the way Mayanists viewed tropical agriculture. Before his article, most models of ancient Maya subsistence still began with the assumption that ancient Maya farmers practiced nothing but swidden (Hammond, 1978), which was by definition an extensive strategy. The problem for the swidden model was that, as archeological evidence grew in quantity and quality, it became clear that there were too many people living too close together to have been fed with an extensive system alone. It is no coincidence that Netting's paper was written for a volume on the rise of Maya Civilization; without intensive agriculture it was hard to envision how civilization of any kind could arise. Netting's paper made the points that other types of agriculture besides slash-and-burn are possible in a tropical setting, and that some types of swidden can be quite sustainable and intensive.⁵¹

Another researcher has pointed out an example of the part of the Netting Model that contends that smallholder intensive systems "encourage practices of stewardship and conservation of resources" in another work, which Netting co-authored. Brookfield pointed out that in Netting and Stone (1996), "a common supposition that a decline in biodiversity follows adoption of more intensive practices was questioned." Brookfield wrote that Netting found that, on the plains of the Kofyar, "a lot had also been conserved by being protected for its utility. A large number of wild plants remained or became

⁵¹ Pyburn 1998, 267-268. Netting 1977.

established on vacant land, by paths, and on field breaks.”⁵² Like other authors influenced by Netting’s work, Brookfield expanded on Netting’s model. He found smallholder intensive systems “even under low population densities.”⁵³

The logic that lower overall production capacity, limited by size, provides environmental and economic benefits, is not limited to discussions of arable *land* in the agrarian literature. Campling *et al.* cited a ”neo-populist” strain in the literature on world fisheries.

Greenpeace (2009) argues that replacing large, capital-intensive industrial tuna fishing boats with smaller, labour-intensive vessels will improve environmental conditions and create development opportunities. Likewise, UK supermarket retailers and other major buyers of fish products have incorporated ‘small is beautiful’ into their ‘sustainable’ procurement strategies, committing to purchase, for example, only canned tuna products caught using smaller scale fishing boats (Hamilton *et al.* 2011).⁵⁴

To return to Pernambuco, Brazil: There is strong evidence that circumstances in the last century matched the two prerequisites for the Netting Model, as outlined above: Namely, that Pernambuco peasants found themselves in a situation of high population density and scarcity of available agricultural land. There were 200,000 sugarcane workers in Pernambuco’s relatively small (less than 10,000 square kilometers)⁵⁵ Atlantic Rainforest sugar monoculture region in the early 1990’s.⁵⁶ And as discussed above in Section 2.2, while the Portuguese Crown’s land distribution strategy created a class of owners of immense estates and made very little land available for humble people, land holdings in Pernambuco became even more concentrated in the hands of large

⁵² Brookfield 2000, 210. Netting and Stone 1996.

⁵³ Brookfield 2000, xiii-xiv.

⁵⁴ Campling *et al.* 2012, 181. Greenpeace 2009. Hamilton *et al.* 2011.

⁵⁵ Wikipedia in Portuguese 2013 : ” Mesorregião da Mata Pernambucana.”

⁵⁶ Sigaud *et al.* 2010, 270.

landowners over the course of the 20th Century. In conclusion, peasant agriculture has been shown to be persistent, multi-faceted, environmentally sustainable, and global.

2.4. Peasants organize

The Frei Gondim Settlement would likely still be a sugar plantation today if eleven men had not crowded into an old VW bus in the waning days of Brazil's military dictatorship in 1982, taken a ferry across the Iguaçú River, and attended a meeting at a Lutheran church in the town of Medianeira, in the southern state of Paraná. This has been considered the first meeting of a core group who would go on to found the Movimento Sem Terra. The MST has played an important role in addressing problems of hunger, landlessness, and lack of political participation by rural workers in Pernambuco and in the rest of Brazil. Relevant to the Frei Gondim Settlement is the following capsule review of a long and complex history.

To entrench its relationship with the class it saw as its most important ally, the Portuguese Crown made a series of vast New World land grants to its favorite vassals.⁵⁷ This practice of making *latifúndio* grants to members of the elite lasted into the nineteenth century. Some were no more than a square league, others extended over hundreds of square kilometers and rivaled the size of entire British colonies in North America. The culture of the elites, mercantilism, the country's export economy, and the legal system, made land distribution to freed slaves, peasant immigrants, and other agricultural workers, extremely rare. Over centuries, this dynamic created a vast underclass of millions of dispossessed rural people, a reality that lasts to today.⁵⁸ The

⁵⁷ Dean 1995.

⁵⁸ Wright and Wolford 2003.

latifundistas help make Brazil a nation with one of the most unequal distributions of wealth in the world. Impatient with the lack of land reform, and the sordid reality of land concentration, a group of activists and landless rural workers organized the MST in the dying day of the dictatorship in the mid-1980's.⁵⁹ Making land their primary objective, they progressively organized a grass-roots movement. Rural peasants occupied unproductive land around the country, began cultivating it, and -- making use of a storied clause in the Brazilian constitution that allows for redistribution of land not being put to profitable use -- legally pursued title to the land with the help of the MST's cadre of lawyers, of a federal agency, and of organs of the Catholic Church.⁶⁰

To understand why this strategy was effective, one must understand the unique position of peasants in Brazil. Unlike places like Mexico and Peru, dispossessed peasants in Brazil were for the most part (with some important exceptions) not indigenous people or descendants of indigenous people robbed of their land in preceding centuries. They were descendants of willing and unwilling immigrants, with not even cultural primogeniture to call upon for the basis of their claim.⁶¹ Enlightenment ideals and a long-held view propounded by the Portuguese Crown, certain nobles and reformers, and repeatedly encapsulated in Brazilian laws and decrees, that unproductive land belongs to whoever strides out and cultivates it, was rather a basis for their claim. Here, the Catholic Church became an important ally of the dispossessed, and was in fact a co-founder of the MST, through the *Comissão Pastoral da Terra* ('Pastoral Land Commission').⁶² The

⁵⁹ Branford and Rocha 2002.

⁶⁰ Wright and Wolford 2003.

⁶¹ Martins 2002.

⁶² Wright and Wolford 2003.

result was a genuine grassroots movement of peasants, founded by a coalition of Marxists and Catholics, striving for the goal of land for productive use.

This strategy was so effective that it led to a massive redistribution of land throughout the country in the last 28 years. Over a million people have obtained title to land through the work of the MST.⁶³ Lest one think that land reform is settled with that, one must remember that Brazil still has a vast rural underclass. The MST represented a sea change in rural workers' strategy. Up until that time, rural labor unions, arguably the rural workers' most important champions, pushed almost exclusively for improvements in working conditions such as higher wages, contracts, task schedules, health insurance, and holidays.⁶⁴ As a matter of fact, land reform from above in Pernambuco, for example a government effort in the mid-nineteen eighties, failed precisely because of the rural unions' tepid response. Even late in the twentieth century, their primary aim was still the improvement of working conditions, not securing land for rural workers.⁶⁵

Organizing settlers in the area of the Amazon rainforest during a time in the early 1980's when the government had been aggressively pushing Amazon settling and development was an important part of the MST's initial growth.⁶⁶ Even in the last 17 years, the MST has contributed to the fact that land has been distributed to more landless families in the North of the country (the site of the Amazon) than in any other region of the country. (The Northeast has been the region with the second-largest number of landless families settled.)⁶⁷

⁶³ Wright and Wolford 2003.

⁶⁴ Rogers 2010.

⁶⁵ Pereira 1992.

⁶⁶ Wright and Wolford 2003.

⁶⁷ Movimento Sem Terra 2012.

This has exposed the MST to criticism from conservationists that the movement's activities have contributed to deforestation.⁶⁸ However, it is not in the modern age of Amazon conservation that rural settlers clearing land for small plots of private land were first accused of being improvident deforesters and nature-destroyers. Already in the 18th century in the Atlantic forest region, elite advocates of eminent domain criticized small-settlers who followed in the wake of logging and planted small plots, thereby making the deforestation permanent.⁶⁹ The harvested food from these eighteenth-century farms was destined for nearby sugar plantations. At the turn of the nineteenth century, Northeast sugar plantation owners looked around them and realized that the forests they prized to fuel their sugar mills were gone. They had been replaced by small farms feeding the towns.⁷⁰ These sugar plantation owners therefore became among the most ironic critics of local smallholders' environmental destruction. As they had been the prime deforesters to begin with, their environmental problem was one they had precipitated.

Environmental criticism of smallholder pioneers continues to this day. Particularly in the region of the Amazon has conservationist criticism of MST settlements been loudest.⁷¹ The conservationist argument is simple: The settlers are destroying rain forest. While they have plenty of data to back up their claim, their cry of alarm appears to arrive late when one considers the centuries of largeholder deforestation that preceded the latest wave of frontier settlement in Brazil. The conservationist-property rights argument first flared in the eighteenth century when the Crown sought to protect stands of forest for building of warships. Some largeholders bristled at a new edict to protect stands of old

⁶⁸ Aldrich *et al.* 2012.

⁶⁹ Dean 1995.

⁷⁰ Dean 1995.

⁷¹ Aldrich *et al.* 2012.

growth forest on private land, and blamed their wholesale destruction of these stands on the edict itself. Land owners tended to fell all their trees and sell them illegally to thumb their noses at the edict, avoid taxes, and prevent freeloading by invading loggers.⁷² And the property rights argument has emerged again today, in a different form. Some scholars argue that Amazon forests might be saved if forest stewardship on private property would be declared productive use under Brazilian law. Therefore, expropriation for deforestation and agricultural cultivation could be avoided. And property owners would have no reason to deforest their land “pre-emptively.”⁷³

Research has shown that MST settlements on the Amazon’s fringe have deforested their newly acquired properties.⁷⁴ However, the MST’s ecological role is more complex than this. Since the beginning of the movement, the MST has argued forcefully for ecologically sound agricultural practices and forms of settlement organization, and on some settlements, it has made this a reality.⁷⁵ In the sugar monoculture zone of Pernambuco and the Northeast generally, another ecological dynamic is afoot. A carefully constructed small diversified farm may represent an important ecological alternative to horizon-to-horizon sugar monoculture.⁷⁶ Some scholars have argued that the MST organizing principle and the dream of smallholder agriculture go against the ethos of the Pernambuco agricultural worker. Analyzing what went wrong with a failed Pernambuco MST settlement, Wendy Wolford argued that the political-economic ethos of the Pernambuco rural agricultural worker was anathema to founding an independent farm. The patronage of sugar plantation work was too far

⁷² Rogers 1995.

⁷³ Claudio *et al.* 2009.

⁷⁴ Joslin 2008.

⁷⁵ Wittman 2010.

⁷⁶ Movimento Sem Terra 2009. “Associação 21 de Novembro.”

ingrained in him. He would always expect and demand from a boss the deliverance of his well-being.⁷⁷ However, as Wolford's discussion continued, Wolford cited the ideas of Gramsci to develop her argument regarding the rural Pernambuco workers. Pernambuco MST settlements are not just another face of the MST. They are local workers with their own hopes, aspirations, and desires. Thus, a settlement built purely on MST ideals -- ideals espoused by intellectuals located in a metropolis thousands of miles away -- was not likely to last if the settlers themselves could not live within it. Settlers in the Pernambuco settlement she analyzed, driven by high sugar wages, did what settlers throughout the country do: They made their own choices. They have agency. They quit the settlement and dispersed to the sugar plantations.⁷⁸ So, while asserting that agricultural settlements go against the grain of Pernambuco rural workers' ethos, Wolford's finding of evidence of Pernambuco workers' agency suggests that, even in Pernambuco, settlers who find that their settlement offers them the best possible way of life, might choose to continue that life.

The above creates a perspective on the MST's contributions to and challenges in the Frei Gondim Settlement. Whether agents of deforestation, agro-ecological heroes, budding socialists, or small capitalists -- however one might see the AFG settlers -- the MST played an important part in formulating their role. Whether the MST will remain to be part of the solution remains to be seen.

⁷⁷ Wolford 2010.

⁷⁸ Wolford 2010.

3. Research questions

The foregoing literature review indicates that pre-colonial and modern agriculturalists in Brazil have had varying impacts on the forest around them, and on the people doing the actual agricultural work. The Frei Gondim Settlement stands as an effort to migrate agricultural workers from the camp that its founders saw as more destructive – embodied by the sugar plantations – to a camp that they hoped would be more creative, an agricultural and social paradigm that is still defining itself.

In order to explore this paradigm in the context of the culture and environment it rose out of, I posed the following questions for my fieldwork: What are the livelihoods of the families on the Frei Gondim agricultural settlement? And the subquestion growing out of this question is: Are those livelihoods ecologically and economically sustainable?

4. Site description

Figure 4.1: The location of Pernambuco in Brazil



Source: Wikimedia Commons

Figure 4.2: The state of Pernambuco



Source: <http://www.viagemdeferias.com/mapa/pernambuco/>
 The Frei Gondim Agricultural Settlement is located in the county of Gameleira.

The state of Pernambuco occupies 98,311 square kilometers, a little less than South Korea, and is divided into three main biomes: the forest zone along the coast, the ecologically diverse *agreste* in the middle of the state, and the dry chaparral of the *sertão* in the west.

Figure 4.3: Pernambuco broken down into biomes



Figura 1. Mapa do estado de Pernambuco com as cinco mesorregiões: Região Metropolitana (1), Zona da Mata (2), Agreste (3), Sertão (4) e Sertão do São Francisco (5)

Source: Possas *et al.* 2012

Pernambuco consists of three main biomes: the Atlantic Rainforest zone (1 and 2 on the map), the moderate-rainfall *agreste* (literally, ‘the wild’) (3), and the western chaparral (4 and 5). The authors of this map further differentiated these biomes, breaking off the urban sprawl around Recife (1) and the chaparral bordering the São Francisco River (5) from their mother biomes.

The entire region of the Northeast of Brazil follows this general pattern, of forest (and plantation monoculture zone) along the coast, a variable zone, and the dry chaparral zone, known in Portuguese as *sertão*. The Atlantic Forest biome in Pernambuco extends over 8,641 square kilometers and includes Recife, Pernambuco’s metropolis, with a population of about 1.5 million as of 2012.⁷⁹ The drama of the Frei Gondim agricultural settlement plays out in the forest zone, today the site of one of the world’s most extensive sugar monoculture regions.⁸⁰ The coastal zone of Pernambuco was among the first to be plumbed and settled by Europeans in the Western Hemisphere. Pernambuco was one of the original 15 captaincies into which the Portuguese Crown split its New World colony. The first sugar plantations appeared in the sixteenth century, and by the seventeenth

⁷⁹ Wikipedia (Portuguese) 2013: “Mesorregião da Mata Pernambucana.”

⁸⁰ Dean 1995.

century, Pernambuco's sugar plantations were the destination of most of the African slaves coming to Brazil, helping to make Brazil a country with one of the largest populations of African ancestry outside of Africa today.⁸¹ The sugar plantations supplied the colony with its primary export good in the Portuguese mercantile system, and after it became an independent country in 1822, sugar was still its most important export commodity.

Gilberto Freyre argued that the patriarchal society of the slave-holding sugar plantation was no less than the cradle of the Brazilian people, and that it created a miscegenated culture that set it apart from other peoples and nations.⁸²

In the tenderness, in the excessive mimicry, in the catholicism in which our sentiments revel, in the music, in the movements, in the speech, in the lullaby for the little child, in everything that is a sincere expression of life, almost all of us carry the mark of the black influence. Of the slave woman who cradled us. Who nursed us. Who fed us, herself softening the morsel in her hand. Of the old black woman who told us the first fables and ghost stories.⁸³

Freyre was one of the primary proponents of the 'racial democracy' theory of Brazilian culture. He described Brazil as an essentially miscegenated culture, in which people were color-blind, because practically everyone was mixed. This circumstance partly arose from the fact that Portuguese colonists rarely brought women with them to the New World, and frequently had children with indigenous and other non-white women, according to Freyre.⁸⁴

⁸¹ Telles 2004, Dean 1995.

⁸² Freyre 1963.

⁸³ Freyre 1963, 331.

⁸⁴ Freyre 1963.

Despite Freyre's egalitarian, somewhat idealistic vision of Brazilian history, there is strong evidence that colonial Brazilian society was strongly hierarchical.

Although from the beginning there were always other groups and other activities in Portuguese Brazil, sugar, the [plantation], and slavery played central roles in defining and shaping Brazilian society. They did so not only because sugar remained an important economic activity but also because the principles on which sugar society was grounded were widely shared, adaptive to new situations, and sanctioned by both church and state. Colonial Brazil was a slave society not simply in the obvious fact that its labor force was predominantly slave but rather in the juridical distinction between slave and free, in principles of hierarchy based on slavery and race, in the seigneurial attitudes of masters, and in the deference of social inferiors. Through the diffusion of these ideals, slavery created the basic facts of Brazilian life.⁸⁵

Slavery was not the only system that has contributed to Brazil's long-entrenched inegalitarian social structure. The habit of the Portuguese Crown of giving vast landholdings to its favorite vassals – a process known as the *latifúndio* system – has historically led to a lopsided distribution of wealth between a tiny class of large landholders and a vast underclass of the landless.⁸⁶ In Pernambuco, specifically, land reform has come slow, even while some progress has been made. In the 20th Century, the state, in fact, saw a regression of smallholdings versus largeholdings, in terms of the percentage of agricultural land in the entire state.⁸⁷ In 2006, a majority of the land in the state was still tied up in largeholdings, for a total of almost 2.9 million hectares. However, family farmers owned almost half the agricultural land in the state, with almost

⁸⁵ Schwartz 1985.

⁸⁶ Wright and Wolford, 2003.

⁸⁷ Silva 1985.

2.6 million hectares, accounting for more than 275,000 farms.⁸⁸ In 2006, Pernambuco and the Northeast generally was still an important sugarcane-producing region in Brazil. The Northeast was the country's second-most-important sugarcane-producing region measured in terms of the value of production, after the Southeast. Pernambuco's crop that year was worth over 800 million reais. However, the Northeast, Brazil's first and for a long time the pre-eminent sugarcane region in the country, over the course of the 20th Century gave way to the Southeast in sugar production, and overwhelmingly the state of São Paulo within that region. In 2006, São Paulo's crop was worth almost twice as much as that of the rest of the country combined, at over 11.7 billion reais. The Southeast's crop was worth almost 14 billion reais, compared to the Northeast's 3.6 billion reais.⁸⁹

These figures might suggest that the sun has set on the Northeast as a sugar producing region. However, it must be remembered that the region is still the country's second-most-productive. Also, the Southeast has by far the largest economy generally. So, the sugarcane industry as a fraction of the region's economy is comparable in the Southeast and the Northeast.⁹⁰

While the 16th through the 19th Centuries saw the injustices of chattel slavery and the progressive destruction of the Atlantic Rainforest in the coastal zone of Pernambuco, these human and environmental injustices segued smoothly into the abject poverty of landless workers in the region and the environmental destruction of the chemical-intensive monoculture practiced on the "Green Revolution"-style 20th Century plantations.⁹¹

⁸⁸ Instituto Brasileiro de Geografia e Estatística 2006.

⁸⁹ Instituto Brasileiro de Geografia e Estatística 2006.

⁹⁰ Instituto Brasileiro de Geografia e Estatística 2006.

⁹¹ Rogers 2010.

This set of circumstances would make Pernambuco's forest zone an ideal site for land reform. Indeed, the region was "the cradle of the Peasant Leagues [*as Ligas Camponesas*], a movement organized in the mid-1950's, whose principal demand was agrarian reform, and of which the MST considers itself heir."⁹²

However, the MST's form of land reform came relatively late to Pernambuco and the region generally. Most settlement activity in the first decade of the movement (roughly 1985 to 1995) were in the south of the country, the region of the movement's birth, and in the north, Brazil's frontier.⁹³ In Pernambuco, MST activists first established operations in the chaparral biome in the state, and worked their way east. Their first significant activity in the forest zone was the occupation of the Camaçari sugar mill, in the municipality of Rio Formoso, along Gameleira's southeast border, in 1992. While this occupation did not result in expropriation, it opened the door to other occupations in the region, and eventually, to a significant number of actual settlements.⁹⁴

Land reform activism in Pernambuco played catch-up with other parts of the country between 1995 and 1999, and by the end of the 1990's, the state had the largest number of land occupations and families occupying land in the country.⁹⁵ By 2012, the Northeast had turned into one of the country's hot spots of land reform. Pernambuco's settlements had helped make the Northeast the country's second-most-settled region, in terms of sheer number of agrarian reform settlements.⁹⁶

⁹² Sigaud *et al.* 2010, 270.

⁹³ Wright and Wolford, 2003.

⁹⁴ Sigaud *et al.* 2010, 267 *et passim*.

⁹⁵ Sigaud *et al.* 2010.

⁹⁶ Movimento Sem Terra 2012: "Número de famílias assentadas para fins de Reforma Agrária vem caindo."

Figure 4.4: Plaza in the town of Gameleira, with church in background



Source: <http://sosriodosbrasil.blogspot.com/2009/12/em-pernambuco-pistoleiros-armados.html>

Gameleira is a county in the Atlantic Rainforest sugar monoculture region of the state (see Figures 4.2 and 4.3). Its population in 2011 was recorded as 28,212, and its area comprises 257.716 square kilometers.⁹⁷ The town of Gameleira is the county seat.

Much of the land in the rural reaches of the municipality is owned by the Usina Estreliana, a vast sugar plantation and refinery operation whose seat is actually in the neighboring municipality of Riberão, to the east and north of Gameleira. The ironic circumstance of hunger in one of the world's premier agricultural areas is present in Gameleira as it is in other parts of the Northeast. A recent study found almost 90% of surveyed families suffered from the most severe gradient of food insecurity in the

⁹⁷ Wikipedia (Portuguese) 2013: "Gameleira (Pernambuco)"

municipality, and the children under five years of age that were the focus of the study were found to be significantly too short for their age, using World Health Organization standards.⁹⁸

About 11 kilometers due south of town, as the crow flies, is the center of the Frei Gondim Settlement. To connect Point A to Point B, one must drive through a maze of dirt roads leading one through the green desert of the Estreliana sugar plantation, valleys and hills covered with the sugarcane monocrop. Along the way, the bus crosses a crumbling one-lane bridge, *exactly* as wide as the bus. Nearby stand the pylons of a modern concrete bridge, silent sentinels to yet another well-meaning government project that went nowhere.⁹⁹ Arriving at the settlement, the first thing one notices is the return of vegetation aside from *Saccharum*.

⁹⁸ Oliveira *et al.* 2010.

⁹⁹ Amado 2012.

Figure 4.5: The view from a settler plot on the Frei Gondim Settlement



William Maxwell

The settler's *macaxeira* (*Manihot utilissima* Pohl) plants are in the foreground, biologically diverse and hilly neighboring parcels are visible in the background.

Figure 4.6: The Frei Gondim Settlement from space



Sources: Remote imagery: Google Earth 2007 datum. Settlement boundary: Settlement parceling map, FUNTEPE, 1994.

The settlement comprises 1,048 hectares, broken down into 194 parcels, on which a variety of crops are grown. The settlement center has the producer's association headquarters building (Friar Gondim's former homestead), a school, a medical clinic, two tiny stores/snack bars, and a smattering of homes.

The site is a former sugar plantation owned by a German friar by the name of Gondim (Frei Gondim = 'Friar Gondim'). After the friar's death, the property was sold to the neighboring Estreliana sugar plantation, but was under-utilized. The MST pushed for expropriation in order to offer an alternative to the surrounding landlessness and sugar monoculture, and a protracted occupation ensued. The *Associação 21 de Novembro*

(‘The 21 November Association’), the settlement’s producers’ association, was founded on 21 November, 1992. The government finalized the expropriation process and the families were issued their parcels in 1994. The settlement ultimately comprised 194 parcels.¹⁰⁰

¹⁰⁰ Amado 2012, Movimento Sem Terra 2009. “Associação 21 de Novembro.”

5. Methods

In order to turn our attention to the data collection and analytical methods I used during and after my fieldwork, it would be helpful here to restate the research questions I used to guide my fieldwork, as already stated in Chapter 3 above: What are the livelihoods of the families on the Frei Gondim agricultural settlement? Are those livelihoods ecologically and economically sustainable?

In order to answer these questions, I divided my fieldwork into three main parts: I interviewed farmers to learn about their agricultural methods, their products, their income, and other demographic factors. I worked with certain settlers to identify plants, including non-cultivated medicinal plants, on the settlement. I interviewed MST activists on and off the settlement to learn about the circumstances surrounding the settlement's foundation, and about the philosophy of the settlement's founders. I discuss each of these fieldwork parts below.

5.1. Focus on the farmers

My purpose was to evaluate the extent to which a way of life that includes ecologically sustainable methods and relatively simple tools can also be economically sustainable, and create a right livelihood for an entire family. In order to obtain an understanding of the agricultural operation and its economic and ecological roles on the Frei Gondim Settlement, I conducted semi-structured interviews with settlement farmers (see Appendix). I asked them what they considered their most important cash crops and household-use plants. Questions addressed alternative funding sources such as side jobs, home industries, and government assistance. I included demographic questions, such as

members of the household. I asked biographical questions, such as what they did before they joined the settlement, and about the livelihood of their parents. Additionally, I asked about the role the MST played in building and supporting the settlement, and the farmer's personal role in and attitude to the MST. I followed up with visits to the farmers' plots, where I asked farmers to give me a tour of the plot and give me detailed explanations of their agricultural practices.

While I originally and perhaps somewhat idealistically planned to find interview subjects on my own, I quickly learned this would be impracticable on this settlement. Settlers' homes were geographically isolated from each other, and a stranger coming to their homes unannounced and asking personal questions would not have been received well. Settlement leader Amado made most of the settler interviews possible. At producers' association meetings, on chance encounters on the street, or on other occasions, he would accost miscellaneous settlers and ask them whether they would allow me to interview them. He explained who I was, and what my purpose was on the settlement. It turned out that the settlers transferred the trust they had in Amado to me, and this allowed me to establish a relationship with them.

Anthropologist Lygia Sigaud, who wrote several works on the establishment of MST settlements in Pernambuco's sugar monoculture zone, found in a likewise manner that she needed an intermediary to make interviews with landless peasants possible.

Over years of research in the Pernambucan forest and specifically in Rio Formoso, I would always turn to the union organizers to reach the workers, seeking, to facilitate the first contacts, to be accompanied by a few of [the union activists.] Those times that I wanted to dispense with the introduction to give me more freedom of movement, the [union] organizers dissuaded me: the workers could become suspicious when accosted by a stranger, and [the

organizers] insisted on sending someone to go with me. ... The formula was magical, a kind of 'Open Sesame.' From that moment on, the conversation began to flow. The informants were disposed to listen to me and converse with me.¹⁰¹

Sigaud went on to point out that, particularly in Brazil, where so many rural political activists suffered persecution during the military dictatorship of 1964 to 1985, politically active landless peasants are especially cautious and loathe to talk to strangers about their political activism.

Before each interview, I explained to the informant that this interview was entirely voluntary and confidential. I assured the informant that they could discontinue the interview at any time. In this thesis, I have changed the names of all informants, according to the plan I drafted for the University of New Mexico Institutional Review Board.¹⁰² During the sessions, but always asking permission first, I took photographs of some of the farmers' plants and agricultural implements.

I subjected this research to qualitative analysis. For example, from my interviews, I identified two farmers who were strong proponents of planting sugarcane and two equally opposed detractors of sugarcane planting, and evaluated their statements and agricultural methods in order to learn something significant about sugarcane's equivocal role on a settlement founded in opposition to it. I took into account these farmers' ages and other demographic factors in order draw a schematic profile of the sugarcane opponent and sugarcane proponent on the settlement. I conducted similar qualitative analyses of the MST's role in contributing to economic development on the

¹⁰¹ Sigaud *et al.* 2010, 279-280.

¹⁰² An exception to this practice was information about people for whom my sole source of information was a published source, such as a book or newspaper article.

settlement, on farmers' environmental attitudes and practices, and on the level of cooperation on the settlement, all based on interview data and personal observations.

I provided some basic quantitative analysis of aggregated data for production of cash crops and household-use plants. I developed a points system for calculating the relative importance of crops in the settlers' minds, giving three points to the first crop they mentioned in response to Question 4 of the interview (See Appendix), giving two points to the second crop they mentioned, and giving one point to the third. If they only mentioned two crops, they would receive three and two points, respectively. If they mentioned but one crop, it would receive three. I presented the aggregated results in Table 6.1, listing the crops in descending order of importance.

Table 6.2 presents aggregated income data by crop, listing the crops in descending order of remunerative value to the settlers. Table 6.3 lists average income for each crop, in descending order of average income. Table 6.4 features the most important household-use plants on the settlement, developed according to the same points system that I used for Table 6.1. I tabulated the aggregated responses that informants gave to Question 6 in the Appendix, giving three points, two points, and one points to the first, second, and third plants they mentioned, respectively.

I asked farmers what the environmental effects of their agricultural methods were, compared to the methods employed on the neighboring sugarcane plantation. I asked some of them whether they used chemical additives. With some settlers, the discussion of agro-ecological methods continued as we toured their agricultural plot. The environmental portions of my interviews and my observations on plot visits resulted in a discussion of settler agricultural effects on the environment and environmental attitudes

in the Results and Discussion chapter of this work. I also attended a seminar on agro-ecological methods given by an agronomist. I provide details about this seminar in the Results and Discussion chapter. I submitted my ethnographic and ethnobotanical (See 5.2) data to the Netting Model for sustainable peasant agriculture to assess the sustainability of the Frei Gondim settlers' livelihood. More details on the model will be provided in Section 5.4.

5.2. Ethnobotany of plants, including native Atlantic Forest medicinal plants, on the settlement

In order to explore a non-agricultural, ecological dimension to the Frei Gondim settlers' livelihood, I conducted an ethnobotanical survey on the settlement. I interviewed seven settlers about their plants knowledge, including their medicinal plants knowledge, collected some of the plants they told me about, identified some of the plants I collected, and established their Atlantic Forest native or exotic status. I collected other plants around the settlement and gathered information about them from informants after collecting. This ethnobotanical study was part of a larger ethnographic study that I conducted at the Frei Gondim agricultural settlement, Gameleira, Pernambuco, Brazil, in June 2012. As part of this study, I conducted 19 ethnographic interviews, in which I interviewed farmers about their agricultural methods, their crops, and their income, as well as other demographic factors. Touring the farmers' gardens, orchards, and agricultural plots gave me the opportunity to remark about this or that plant growing among or near the cultivated plants, or growing elsewhere on the settlement. With some of the settlers, these conversations grew into more detailed discussions and interviews on medicinal plants growing around the settlement. I collected some of the plants that seven

of the settlers told me about, and collected others I found serendipitously around the settlement, for a total of 35 specimens. Some of the plants were found on the settlement's forest reserve, on roadsides, and in other areas as described above. My informants subsequently told me about medicinal uses of some of the plants that I found on my own.

Seventeen of the plants were fertile, generally considered a prerequisite for scientifically verifiable identification. I have identified 12 of these plants using scholarly databases such as those of the Missouri Botanical Garden and the United States Department of Agriculture; other information found on the Internet; and with the help of a Pernambuco ethnobotanist.¹⁰³ In each case, the popular name for the plant, as identified by the informant, was a valuable first step in identification. This usually led to a scientific name and plant images on the Internet with which I could compare the specimen. Dra. Laise de Holanda Cavalcanti, an ethnobotanist at the Federal University of Pernambuco, confirmed or corrected my identification of nine of the above-mentioned twelve specimens.

I determined the native or exotic status of the plants in the following manner. I identified native plants not necessarily as endemic plants or even as plants that evolutionarily originated in the Atlantic Forest. By native plants I used the more general definition of plants that were in the forest before the arrival of Europeans to Brazil, or for which there is no information that it was imported. I used three sources to determine the origin of the plants. De Almeida *et al.* (2012) and Pinto *et al.* (2006) are ethnobotanical articles that provide long detailed tables of medicinal plants local people know about, and

¹⁰³ Web sources include online database of the Missouri Botanical Garden (tropicos.org), the USDA Plants Database (<http://plants.usda.gov/java/>), botanicus.org, and *Flora brasiliensis* online (<http://florabrasiliensis.cria.org.br/>) (see also Von Martius *et al.* among the References below).

provide the authors' determination as to the plants' origins. Further, Maia *et al.* 2006 provides a detailed discussion of *Caladium bicolor* Vent., one of the plants I identified, and identifies it as a native Atlantic Forest plant. I also took a 2007-datum Google Earth aerial/satellite snapshot of the site in order to assess the extent of reforestation on the settlement.

5.3. The role of the Movimento Sem Terra

The MST has played a pivotal role in the last 20 years or so of land reform that has occurred in the culturally and politically conservative Northeast of Brazil. In order to understand the success and impact of AFG, it was imperative to understand the role the MST played in founding and supporting the settlement. I conducted semi-structured interviews with seven MST activists: at the MST headquarters in São Paulo; at the Pernambuco state headquarters in Caruaru; at the Normandia MST settlement just outside Caruaru; in the town of Gameleira; and on the Frei Gondim Settlement.

The nature of my questions to MST activists regarded the philosophy, activities, history, and goals of the MST, *vis à vis* AFG and land reform in Pernambuco and Brazil generally. The Northeast of Brazil, including the sugar zone, has been among the most challenging regions for the MST to mobilize. The movement has been successful in mobilizing landless rural workers in the south of the country, where the tradition of smallholder agriculture is strong and the level of political consciousness is high. The MST has similarly been successful in northern Brazil, the country's frontier, where more agrarian reform settlements have been founded than in any other part of the country. But the Northeast, where sugar monoculture and plantation agriculture are entrenched, has

been more challenging. This resulted in the movement's success in this region predictably coming later than in the south, where the movement was founded.¹⁰⁴

Challenges do not translate to failure, however. The Northeast today has seen the second-most settlements founded, of all of Brazil's regions. The Center-West is third. Interestingly, the country's South, the birthplace of the movement, has seen fewer overall settlement foundations than any other region of the country.¹⁰⁵

My line of inquiry was an attempt to ascertain the level of commitment of the MST to this region of the country. Similarly, in the past ten years or so, the MST has increasingly focused on more general political campaigns, such as opposing neoliberalism and deforestation. This has called into question in the minds of some observers the movement's continuing commitment to the settlements.¹⁰⁶ Therefore, my line of questioning also concerned the level of the MST's commitment to supporting established settlements. In a sense, while worthy, this type of activity may be said to lie outside the MST's original mandate. After all, they are the 'movement of the landless' (MST, *Movimento Sem Terra*, literally means landless movement in Portuguese).

The data gained from these interviews are in the form of MST activist narratives. In other words, I quote the MST activists at length in the Results and Discussion chapter of this thesis. Analysis is qualitative in nature. I used the contents of the interviews, as recorded in my notebooks, to understand the MST's own understanding of its role in shaping the Frei Gondim Settlement and of the settlement's successes and challenges generally. I balance MST activist narratives with the accounts of settlers regarding the MST, and information about the movement I found in the media and in scholarly sources.

¹⁰⁴ Movimento Sem Terra 2012.

¹⁰⁵ Movimento Sem Terra 2012.

¹⁰⁶ Welford 2010.

5.4. Analysis: Application of the Netting Model

In order to tie together all of the strings of collected data, I used one analytical instrument that I applied to them all. As discussed in the Literature Review above, the Netting Model states: “My contention is that smallholder intensive systems achieve high production, combine subsistence and market benefits, transform energy efficiently, and encourage practices of stewardship and conservation of resources.”¹⁰⁷ Using the Netting Model as a yardstick for the potential that a smallholder intensive system can reach, I assessed the Frei Gondim Settlement based on three of its four parts. I therefore assessed the extent to which the settlement...

1. Has achieved high production
2. Combines subsistence and market benefits
3. Encourages practices of stewardship and conservation of resources

To put it simply, Netting found that successful smallholder systems worldwide had the above characteristics. In order to determine whether the settlement was a successful smallholder system, I assessed the extent to which Frei Gondim had the above characteristics. Netting also contended that smallholder intensive systems transform energy efficiently. While this is an important part of Netting’s model, it lies outside the scope of my study, and was not considered.

¹⁰⁷ Netting 1993, 320.

6. Results and discussion

Data I collected on the Frei Gondim Settlement in June 2012, which I present below, will show that the Frei Gondim settlers have achieved some of the important goals the MST laid out for them. Today, 18 years after the settlement was founded, settlers grow a variety of at least 12 crops, and have moved away from sugar as a dominant crop. A group of 194 families, heretofore landless, has the dignity associated with having plots of land they can call their own. The ability to grow their own food has diminished the hunger problem.

However, the majority of the families interviewed on the settlement (10 out of 19) were still on public assistance. This public assistance was in the form of the *bolsa familiar* (family funds), which, depending on a number of demographic factors, could range between about 60 to 250 reais¹⁰⁸ a month for the family. Frei Gondim settlers did not always use the most ecologically sustainable methods in their agriculture. Agricultural methods varied widely from household to household in their ecological and economic sustainability. Infrastructure improvements on the settlement were rudimentary. And examples of cooperation on the settlement for production and various aspects of social reproduction, especially formal organizational structures, were rare.

This snapshot of the settlement – including progress and challenges for the settlers -- based on my field work, brings me to the thesis of this essay: The Frei Gondim settlement is a genuine alternative to the sugar monoculture and landlessness around it,

¹⁰⁸ The *real* (pronounced hey-all), Brazil's currency since the mid-1990's, was worth about 50 U.S. cents in June 2012.

but the isolation of the settlement, combined with a mode of production in which cooperation is limited, has restricted its economic and ecological sustainability.

The foundation of an agrarian reform settlement, based on the process that has been hammered out for many of the more than million landless who have received land in Brazil in the last 28 years, is a curious cultural phenomenon. People come together on a roadside in order to target a particular piece of land for expropriation. It may be a piece of farm land long fallow, or a former industrial property. The assembling people may have lived in the area for generations; or they might have arrived in the area that day, from the next county or state, or from clear across the nation. They will huddle in makeshift shelters as their spokespeople petition the government for the land.¹⁰⁹

The more aggressive among them may occupy the land in question. This may lead to a period of living in tents on the land for months or years, even while cultivating it, as their legal case makes its way through the court(s). More often than not, they are expelled from the land before making any legal progress. The land in question often does not become the occupiers' permanent home. Sometimes, the government announces that that particular tract of land will not be available, but there is a possibility in such-and-such *município* or such-and-such state. Then, in the new location, the camping and waiting begins again.

Thus, some of the founding settlers who still reside on their plots at Frei Gondim had been long-time campers¹¹⁰ at another piece of land in the state, which they had been pushing for expropriation. When they heard the MST had successfully brought about

¹⁰⁹ Wright and Wolford 2003, Sigaud *et al.* 2010.

¹¹⁰ *acampados*

expropriation at the Frei Gondim farm in 1994, they came to claim a plot. Even many of the settlers who had originally occupied the farm were from outside the município.

Therefore, many of the settlers at Frei Gondim, and on most agrarian reform settlements in Brazil, may be from another *município* or even region in the state, or from some entirely different part of the country. This means that the multigenerational social networks that play an important role in classic smallholders' and householders' success in traditional peasant societies¹¹¹ do not exist for many agrarian reform settlers, and will be years and decades, if not centuries, in the making. In the absence of these social networks, a coherent organization for the settlers -- in order to direct such crucial settlement aspects as production, training, infrastructure, health, education, etc. -- is all the more important. In other words, cooperation among the settlers is all the more important in a new community founded largely without ties to the community surrounding it.

However, cooperation among the settlers has been extremely limited. Aside from the producers' association and a women's association, few formal institutions have been founded on the settlement. Despite the MST's encouragement to embrace a collective or cooperative mode of production, no formal co-operatives have been formed and settlers have retained a household mode of production. While I visited the settlement, producers' association meetings were sparsely attended. With this lack of cohesiveness on the settlement, settlers had a *bona fide* barrier to pressing the MST, the government, and INCRA for benefits in the form of infrastructure, agricultural training and supplies, etc.

In light of this, some preliminary observations on the Frei Gondim Settlement are pertinent. On many settlements, the MST has successfully instituted a cooperative or

¹¹¹ Netting 1993, Garcia 1983.

collective mode of production.¹¹² However, perhaps more than the average MST settlement, AFG settlers largely follow a household-based mode of production, with examples of co-operation evident but largely not enshrined in any formal institutions. This leads to tension between an individualistic mode of production and a mode of land tenure that is more complicated than the outright ownership of the plot of land by the family. Frei Gondim is a settlement of independent families whose plots are owned by the federal government and held in perpetuity for the families of the plot inhabitants;¹¹³ a settlement founded by a direct action land reform organization; but also a group of families on separate plots who produce and market more or less independently.

The failure of institutions to congeal on the settlement was according to one informant the result of the attrition of original, idealistic settlers; and the subsequent arrival of new settlers who were interested in family farming and a country way of life, but did not necessarily share the MST's ideals.¹¹⁴ This social process was corroborated by at least one other informant interview, a family that moved to the settlement from Recife recently, but did not necessarily approve of land occupations.

The agrarian reform form of land tenure -- in which farmers are allowed to cultivate their plots indefinitely, and pass the plots on to their children, but do not actually own the plots, and may not sell them -- merits its own discussion. The federal government owns the land under a settlement. This means that settlers will not sell plots, and the historically occurring dynamic of land concentration in the hands of the rich, particularly prevalent in Pernambuco, is avoided. On the other hand, settlers looking to move to an urban area or relocate to another rural area face an obstacle to comfortable

¹¹² De Figeroa 2012. Miranda 2012.

¹¹³ The system is similar to the Mexican *ejido* system.

¹¹⁴ Amado 2012.

relocation. They cannot sell their land in order to invest in a new life in a new place, a benefit conferred to peasants who own their land.

The Results and Discussion section of my essay is organized as an assessment of the extent to which the Frei Gondim Settlement fits the Netting model for sustainable peasant agriculture: the extent to which it achieves high production, combines subsistence and market benefits, and encourages practices of stewardship and conservation of resources. Despite the fact that it is part of Netting's model, I will not assess the extent to which AFG settlers transform energy efficiently. That was outside the purview of my study.

6.1 Production

6.1.1 The limits imposed by isolation and lack of cooperation

The MST has organized a cooperative mode of production on many of its settlements, and one movement leader said that this is the mode that the movement favors. "The MST's idea is collective production,"¹¹⁵ said Jorge de Figueroa, a member of the Pernambuco state production sector of the MST. However, AFG demonstrates a largely household-based mode of production, with most families growing, harvesting, and selling on their own.

The MST has largely refrained from forcing settlers to adopt one mode of production or another, even while it has offered technical assistance in organizing cooperatives.¹¹⁶ Mário Miranda, who works in the national Production Sector of the movement in São Paulo, still has ties to his settlement in the state of Rio Grande do Sul,

¹¹⁵ "A ideia do MST é a produção coletiva." All translations in the footnotes are by the author.

¹¹⁶ Wright and Wolford 2003.

which is an organic agro-ecological collective that produces and sells rice, milk, and fish; and produces fruits and vegetables, and has a bakery, for internal consumption.¹¹⁷

Miranda conceded that not all MST settlements have adopted the cooperative model. He said cooperation on a settlement does not have to take the form of a legally constituted cooperative: “It’s more important for settlers to have a cooperative attitude than a legal cooperative.”¹¹⁸

De Figueroa is a settler in the Normandia MST settlement just outside of Caruaru, Pernambuco. He was an MST organizer in Gameleira from 2000 to 2004, and is very well acquainted with production on AFG. De Figueroa explained that production on AFG is geographically organized on the family level: “Every family has its little plot.”¹¹⁹ De Figueroa said cooperation on the settlement comes in the form of working together to transport and market the fruits the families produce. I saw evidence of this on the Frei Gondim Settlement. Luiz Alfonso de Andrade was a particularly successful soursop farmer, with many more than his originally parceled hectares in production on and off the settlement. He had good commercial ties in Recife, and neighbors sold their soursop to him to sell off-site. His own brother, Guilherme, was an AFG soursop grower who sold to him.¹²⁰ This was essentially a supply-chain form of cooperation, in which, through transport and sale, a product makes its way from producer to middleman on its way to the consumer.

According to de Figueroa, the MST leader interviewed on the Normandia settlement, the MST is not going to force AFG to adopt a co-operative model of

¹¹⁷ Miranda 2012.

¹¹⁸ Miranda 2012.

¹¹⁹ “Toda familia tem seu pequeno lote.”

¹²⁰ Cavalcanti 2012. My information about Luiz comes from an interview with Guilherme.

production. “The motivation has to be coming from the settlers.”¹²¹ De Figueroa explained that the settlers do have an overarching organization, as mandated by federal laws and INCRA’s rules for forming land reform settlements: “In reality, they are a production association, not a cooperative,” he said. The name of the association is *Associação 21 de Novembro*, and commemorates the date of its foundation, 21 November 1992.¹²² De Figueroa said that the settlement land belongs to the federal government, and the settlers have usufruct title,¹²³ which grants them and their descendants the right to live and work on their plots in perpetuity, as long as they continuously inhabit them. “But this is truly a Brazilian innovation, that the Brazilian government owns the land, and the production is by the settlers,” de Almeida said. “This is production not for profit, but for the sake of the settlers.”¹²⁴

Miranda, the São Paulo production sector member, explained that geography, i.e. the spatial configuration of settler homes and plots, can have a significant effect on the amount of cooperation that exists on a settlement. He said that the traditional government strategy for setting up settlements, as interpreted by INCRA, discouraged cooperation among settlers. “The government settlement model isolates the families. Families are placed on plots; they live too far away from each other to interact much.”¹²⁵

Julio Azevedo works in the MST’s Pernambuco state headquarters in Caruaru, but he is a representative to the organization’s national production sector, and specializes on

¹²¹ De Figueroa 2012.

¹²² Amado 2012. It is noteworthy that the association was founded more than a year-and-a-half before the settlement was founded, which was 30 June 1994. This suggests that it may have played a role in organizing the settlers even before the land had been expropriated for them, and that it may have played a role in the expropriation process.

¹²³ “título de usufructo”

¹²⁴ De Figueroa 2012. As a matter of fact, this form of land tenure exists in at least one other country. The government of Mexico owns land and grants usufruct rights to household-level coffee planters in the state of Nayarit, for example (the *ejido* system). See Maxwell 2002.

¹²⁵ Miranda 2012.

the housing front.¹²⁶ He has experience evaluating the living situations of settlers on MST settlements nationwide from the point of view of sociability and productivity. He said that breaking up property on new settlements into lots and spreading housing across the settlement is no longer allowed by INCRA because of the consequent isolation of settlers from each other and because of the cost of providing utilities across great distances.¹²⁷

According to Azevedo, the MST's new settlements follow the *agrovila* (literal translation: agri-town) model of development, whereby the settlers all live together in a concentrated town near the center of the settlement – each family to a house with a yard with family-use plants and fowl – and travel to their fields distributed throughout the rest of the property. This settlement organization, it is thought, alleviates settler isolation and makes cooperation more expedient. Normandia was organized along this model.¹²⁸

The need to analyze the relationship between the MST and the Frei Gondim Settlement *after* the settlement's foundation is not a foregone conclusion. Miranda said that the MST's relationship with established settlements was a matter of debate in the early days of the movement, and that it was far from a foregone conclusion that the MST would have any kind of continuing relationship once the landless were no longer landless. After all, the movement's name – the short name is 'Landless Movement' in English – implies that its constituency consists of the people who have no land tenure. According to Miranda, the prevailing view among movement organizers in the 1980's that grew out of the debate was that the landless would be ill-served if they were deposited on their land with the material resources and level of training they possessed, which in many

¹²⁶ “frente de habitação”

¹²⁷ Azevedo 2012.

¹²⁸ Azevedo 2012.

cases was almost none. “The needs of the settlement do not end with getting land,” Miranda said. “The struggle continues.”¹²⁹ The movement therefore committed to helping chart production on established settlements over the long term.

Walmaro Paz, a spokesman for INCRA, reflected the same sentiment in an interview conducted in the same year. “It is essential to understand that agrarian reform is not just placing the family on land. We must think about infrastructure on the disappropriated land, about production capacity, about distance to consumer markets, and many things,” he told *Brasil de Fato* reporter Aline Scarso in 2012.¹³⁰ Today, while the movement is nominally the movement of the landless, there are currently 214 settlements in Pernambuco that the movement has founded.¹³¹ In documents by and about the movement, the production sector is often among the first sectors, if not the first, that the author cites as a representative sector of the movement. “The Production Sector is as important as other Sectors in the MST,” Miranda said.¹³² Other MST sectors include Health, Gender, Communications, Education, Culture, Youth, Finance, Human Rights, and International Relations. They form the backbone of the movement’s activities.¹³³ Miranda said that the heart of the Production Sector’s task was providing technical assistance and help in procuring training, funding, and materiel for the settlements from the government. The MST also provides technical teams to help a settlement in its process of advancing agro-ecological production.

¹²⁹ Miranda 2012. “A luta continua.”

¹³⁰ Movimento Sem Terra 2012. “[...]é preciso entender que reforma agrária não é só colocar a família na terra. Tem que pensar na infraestrutura da área desapropriada, na capacidade de produção, na localização em relação aos mercados consumidores, é muita coisa [...]” *Brasil de Fato* is a weekly newspaper founded by the MST, Via Campesina, and pro-land reform Catholic organizations during the World Social Forum in Porto Alegre, Brazil, in 2003. Due to the fact that Paz was already quoted in a journalistic article, his real name has been used.

¹³¹ De Figueroa 2012.

¹³² Miranda 2012.

¹³³ Movimento Sem Terra 2009.

Sofia Silva Martins, founder and head of the Women Farmers' Association of Frei Gondim,¹³⁴ was also one of the settlement's founding settlers. She described the role of the Movimento Sem Terra in 1994, after the Frei Gondim land had been won, in the following manner: "The role of the MST was to provide supplies to the newly settled settlers – with food, medicine – and settle us in."¹³⁵ Martins said that the role of the movement has shifted as the settlement has entered a new phase of its existence. "The main role of the MST is to win land for us, but now they work with INCRA and FUNTEPE to better living and working conditions for us. The MST never left the settlement. We have really strong coverage from the MST here."¹³⁶

There is evidence to the contrary, that in fact MST functionaries spent practically no time on the settlement in any capacity in the period immediately previous to my interview with Martins, and that the current relationship between Frei Gondim and the movement was tenuous at best. However, the above statement by Martins indicates that there was an expectation, even among settlers – especially among those who have had significant exposure to the MST – that the MST would continue to guide development on the settlement.

6.1.2 Crops data

One of the characteristics of smallholder intensive systems that Netting lauded was their ability to achieve high production with the use of often very low technology

¹³⁴ "Associação de Mulheres Agricultoras de Frei Gondim"

¹³⁵ Martins 2012.

¹³⁶ "O MST nunca se ausentou do assentamento. A gente tem a cobertura muito forte aqui do MST."

and chemical inputs. Netting pointed out that many smallholders around the world and through history have done this partly by planting a diversity of crops.¹³⁷

Garcia wrote that one of the Pernambuco smallholder's great strengths, and what sets him apart from the monoculture plantation, is the flexibility of uses of the crops that he plants: They can directly feed the family, or be sold for cash, unlike the coffee, sugar, and cotton grown on monoculture plantations. However, Garcia pointed out that the smallholder generally reserves part of the field for a pure cash crop, because the cash crop is the only one that is guaranteed to fetch cash, even if only a little cash. Cane can always be sold to the local sugar refinery, even if it is for very little. However, in a local area where almost all the smallholders plant *macaxeira*¹³⁸ for personal consumption, this crop will not necessarily sell at market. Garcia wrote:

If on the smallholder's field the plants that alternatively can be directly eaten or sold predominate, and if among these, manioc [best] incarnates this characteristic, one will always find plants that are only being cultivated with their sale in mind, the *cash crops*, or *lavouras comerciais*.¹³⁹

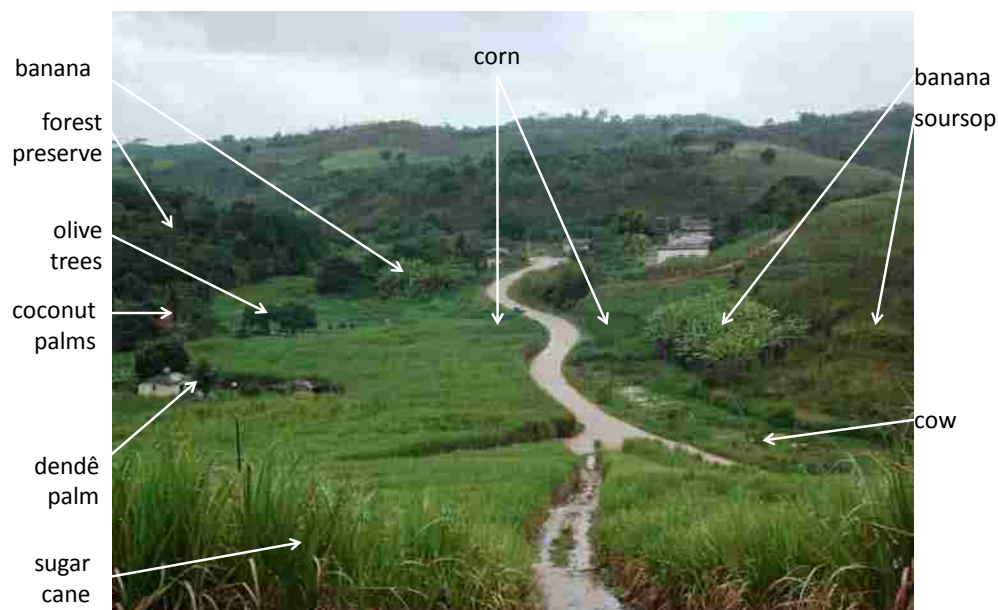
The data below show that the Frei Gondim settlers satisfy an instance of the high production part of the Netting Model by diversifying production. They are demonstrating an alternative mode of production to that of the sugar monoculture plantations that surround it.

¹³⁷ Netting 1993, 3.

¹³⁸ *Manihot utilissima* Pohl, a starchy root and a Pernambuco staple.

¹³⁹ Garcia 1983, 134.

Figure 6.1: A diversity of agricultural products



William Maxwell

This photograph, taken from a hill overlooking the center of the settlement, illustrates the diversity of crops (and animals) to be found on the Frei Gondim settlement. This one small area on the settlement features six different species of plants that provide edible fruits, in addition to sugarcane and the cow. A piece of non-marketed vegetation is also labeled: A part of the settlement's forest preserve reaches all the way to the center of the settlement. The main settlement buildings, including the producers' association headquarters, the school, the health clinic, and some homes, are also visible near the center of the frame.

Interviews with 19 informants on the Frei Gondim agricultural settlement revealed that settlers significantly diversified production since planting exclusively sugarcane 18 years earlier. Various informants named 12 different crops as being among the three most important crops that they planted.

Table 6.1: The most important crops on the settlement, based on informant reports

Rank	Crop Linnaean name	Crop common name	Points
1	<i>Annona muricata</i> L.	Soursop	34
2	<i>Saccharum</i> spp. L.	Sugarcane	19
3	<i>Manihot utilissima</i> Pohl	<i>Macaxeira</i>	13
4	<i>Musa</i> spp. L.	Banana	8
4	<i>Cocos nucifera</i> L.	Coconut	8
6	<i>Passiflora edulis</i> Sims	Passion fruit	4
7	<i>Dioscorea</i> spp. L.	Yam	3
8	<i>Manihot esculenta</i> Crantz	Manioc	2
9	<i>Psidium cattleianum</i> Sabine	Cattley guava	1
9	<i>Ananas comosus</i> (L.) Merr.	Pineapple	1
9	<i>Zea mays</i> L.	Corn	1
9	<i>Coriandrum sativum</i> L.	Cilantro	1
n=19			

Macaxeira is a starchy root, and it is one of Pernambuco's staples, along with *cuscui*, which is made from corn meal. *Macaxeira* and what the Frei Gondim settlers call manioc (*mandioca*) are, as the above table shows, different species of the same genus, *Manihot*. While both species belong to the manioc genus, throughout this thesis, I distinguish between these two species as differentiated in Table 6.1 based on the settlers'

distinction, between what they call *macaxeira* and *mandioca*. Another way of distinguishing the two species is that *macaxeira* is sweet manioc, while *mandioca* is bitter manioc, which must be processed before it can be eaten because it contains a cyanide compound in its unprocessed state.

Figure 6.2: Soursop on the Frei Gondim settlement



William Maxwell

De Braganza compares his organic soursop (smaller) to his conventional soursop, which he says has a harder, thicker rind, and is not as sweet.

Also significant is that soursop has replaced sugarcane as the most important crop on the settlement. Soursop, a vitamin-rich, nutritious tree fruit originally from the Caribbean¹⁴⁰, bests sugarcane in all three measures of crop importance I employed (See Tables 6.1, 6.2, and 6.3). This indicates that Movimento Sem Terra propaganda, in the

¹⁴⁰ Lorenzi and Matos 2008.

form of the 2009 article on the movement's Web site¹⁴¹, is borne out by evidence on the ground, as far as soursop is concerned. Settlers have indeed embraced soursop as a viable crop.

Table 6.2: Informants' gross reported income by crop

Rank	Crop Linnaean Name	Crop	Income ¹⁴²
1	<i>Annona muricata</i> L.	Soursop	62,578
2	<i>Saccharum</i> spp. L.	Sugarcane	35,851
3	<i>Manihot utilissima</i> Pohl	Macaxeira	25,530
4	<i>Dioscorea</i> spp. L.	Yam	9,450
5	<i>Musa</i> spp. L.	Banana	8,650
6	<i>Passiflora edulis</i> Sims	Passion fruit	5,000
7	<i>Psidium cattleianum</i> Sabine	Cattley guava	1,500
8	<i>Ananas comosus</i> (L.) Merr.	Pineapple	1,300
8	<i>Cocos nucifera</i> L.	Coconut	1,300
10	<i>Manihot esculenta</i> Crantz	Manioc	1,000
n=19			

Table 6.2 lists only 10 crops, as opposed to 12 crops in Table 6.1, because informants did not give income figures for corn and cilantro. The figures in Table 6.2 reflect the total of all income reported for each crop by all 19 informants. In this table also, soursop has a substantial lead over sugarcane. Informants reported earning almost twice as much income from soursop as from sugarcane.

¹⁴¹ Movimento Sem Terra 2009. "Associação 21 de Novembro."

¹⁴² In June 2012 *reais*. The *real* (plural *reais*) is the Brazilian currency. In June 2012, 1 *real* equaled about 50 U.S. cents.

Table 6.3: Average income

Rank	Crop Linnaean Name	Crop	Income ¹⁴³
1	<i>Dioscorea</i> spp. L.	Yam	9,450
2	<i>Annona muricata</i> L.	Soursop	6,953
3	<i>Manihot utilissima</i> Pohl	Macaxeira	6,382
4	<i>Saccharum</i> spp. L.	Sugarcane	5,975
5	<i>Passiflora edulis</i> Sims	Passion fruit	5,000
6	<i>Musa</i> spp. L.	Banana	2,883
7	<i>Psidium cattleianum</i> Sabine	Cattley guava	1,500
8	<i>Ananas comosus</i> (L.) Merr.	Pineapple	1,300
9	<i>Manihot esculenta</i> Crantz	Manioc	1,000
10	<i>Cocos nucifera</i> L.	Coconut	650
n=19			

Table 6.3 is based on the average income reported by informants who provided specific income figures for each particular crop. Again, soursop plays a prominent role as an income-winning crop, two ranks above sugarcane. Here, yam, in first place, appears to garner a significantly higher average income per farmer than soursop. However, it must be kept in mind that the average yam income figure is based on the income data from only one informant, while the average income data from the other top crops, namely soursop, *macaxeira*, and sugarcane, are based on income data provided by an average of more than six informants each. As this increases the margin of error on the yam figure, it can be deduced that soursop has the highest average income among the crops for which there was information from numerous informants, and for which there are comparatively reliable data.

¹⁴³ In June 2012 *reais*. The *real* (plural *reais*) is the Brazilian currency. In June 2012, 1 *real* equaled about 50 U.S. cents.

6.1.3 *The manioc flour mill*

Frei Gondim settlers have boosted production, thus satisfying the “achieve high production” part of the Netting Model, by cooperating to produce manioc flour. Garcia showed that inter-family cooperation at the manioc flour mill is a longstanding tradition in Pernambuco.¹⁴⁴

The most organized form of cooperation in the realm of agricultural production I found on the settlement was the *casa de farinha*, the manioc flour mill. Manioc, a root in the spurge family (Euphorbiaceae), is Brazil’s staple starch.¹⁴⁵ It is a plant native to Brazil, and archeological evidence suggests that it has been under cultivation for thousands of years. New arrivals on the continent learned its cultivation from indigenous people after 1500.¹⁴⁶

¹⁴⁴ Garcia 1983.

¹⁴⁵ In this paper, I distinguish between “manioc” (*Manihot esculenta* Crantz) and *macaxeira* (*Manihot utilissima* Pohl), even though they are both species of manioc. I do this to parallel the local parlance. Pernambucans distinguish between *mandioca* and *macaxeira*, meaning the two species of the genus *Manihot* just mentioned.

¹⁴⁶ Simpson and Ogorzaly 2001.

Figure 6.3: Manioc



Köhler's Medizinal-Pflanzen; <http://onfoodandwine.wordpress.com/2008/04/07/manioc-chipsfries-otherwise/>

Manioc (*Manihot esculenta* Crantz), a root, is Brazil's staple starch.

Farofa, or manioc flour, is an important ingredient in *feijoada*, Brazil's national dish. Bitter manioc, the most widely cultivated variety, is poisonous because of the presence of cyanic acid. Therefore, people do not ingest whole roots of manioc. The milling process allows the leaching out of the poisonous chemical.¹⁴⁷ The ensuing high-carbohydrate flour can then be added to beans, meat, vegetables, or whatever other dish of the day.

Settler Felipe Ribeiro Fernandes owned the manioc mill I visited on the Frei Gondim Settlement, which he had set up near his house. It had a thatch roof without walls, with the equipment underneath. A diesel generator provided power. Settlers sat in a circle under the roof, peeling manioc roots.

¹⁴⁷ Simpson and Ogorzaly 2001.

Figure 6.4: Step 1 is peeling the manioc



William Maxwell

At Fernandes's manioc flour mill on the Frei Gondim Settlement, on every *farofa* milling day, it is only one producer's manioc that is turned into flour. The other manioc growers are his or her helpers. They know that, one day, their turn will come. Participants in this cooperative arrangement, including children, peel manioc roots in this picture.

Others fed the peeled roots into a grinder, which is what the generator was supplying power to, and which was the only diesel-powered part of the process.

Figure 6.5: Grinding



William Maxwell

Felipe Ribeiro Fernandes, the manioc flour mill owner, looks on as a producer feeds the peeled roots into the grinder.

The ensuing paste was then ladled into large porous plastic bags, which looked like they might have previously held seed. The bags were piled on top of each other in the press, and one of the settlers with the most muscle power, typically a young man, vised the stack of bags with the aid of a turnstile.¹⁴⁸

¹⁴⁸ Garcia 1983. Garcia wrote that this was a longstanding *casa de farinha* tradition, that this labor-intensive task, almost always performed by muscle power, was left to the most physically fit males present.

Figure 6.6: Pressing out the poisonous juice



William Maxwell

The leader of the youth association on the settlement presses the poisonous juices out of the manioc paste, on its way to becoming manioc flour.

The poisonous juice, squeezed out of the manioc paste, ran down a short pipe into a bucket just outside the mill. Once dry, the ensuing powder was spread over large flat cooking surfaces, disk-shaped wood-fired ovens, to roast.

Figure 6.7: Roasting the flour



William Maxwell

Pulverized manioc is roasted on these wood-fired ovens to make flour.

Women were typically in charge of the final task of sifting the flour using various permeabilities of sifters, depending on the grade of flour desired.

Figure 6.8: Women sift the flour



William Maxwell

The size of the apertures in the sifter determines the grade of flour.

On the day that I visited the mill, only one settler's manioc was being processed into flour. The people helping him – and there were at least a dozen people there, in addition to children – were other manioc producers, who were helping in the knowledge that their turn would come. On the day that their manioc crop was ready to be processed, the same producers would assemble to mill that settler's flour. The mill owner, himself, received a small payment for the use of his mill.

This was the most organized form of cooperation not rooted in cash-based labor relations that I saw on the settlement. Garcia wrote that for manioc flour milling – a process too labor-intensive for most nuclear families to do by themselves – a long tradition existed in Pernambuco for the whole community to take part. Garcia explained

what happened when a Pernambuco family needed help milling their manioc: “In that case, a relative or neighbor will be asked for *help*, and they will perform certain tasks, and will be owed *help* when requested,” Garcia wrote (emphasis in the original.)¹⁴⁹ This succinctly describes the labor relations under which manioc flour is produced on the Frei Gondim settlement.

As Tables 6.1 to 6.3 indicate, manioc (*Manihot esculenta* Crantz) is only the eighth to the tenth most important crop on the settlement, depending on the rubric used. Manioc production on the settlement has suffered because the roots do not grow well when inundated in Pernambuco’s frequent winter rains. Rains have also contributed to a spreading manioc blight. Of six *casas de farinha* that the settlement has had, only two are currently active.¹⁵⁰ *Macaxeira* (*Manihot utilissima* Pohl), on the other hand, is the settlement’s third-most important crop by all counts as reflected in the tables. In Pernambuco, *macaxeira* is much more of a staple than manioc. Despite manioc’s relative production difficulties on the settlement, the manioc flour mill is still a significant form of cooperation between householders.

6.1.4 The agrarian reform market

One misconception held about the Movimento Sem Terra is that their vision for settlers is that they be subsistence farmers. The MST has in fact devoted considerable energy to developing micro-economic and macro-economic markets for agrarian reform settlers to sell their produce.¹⁵¹

¹⁴⁹ Garcia 1983, 133.

¹⁵⁰ Amado 2012.

¹⁵¹ Miranda 2012.

Since most householders sell at least part of their crop, market development is an important factor facilitating their agricultural production. Proceeds from sales generate the goods and services needed for the next crop and for social reproduction.¹⁵² The MST made significant progress in facilitating production on the settlement, thus helping to satisfy the “achieve high production” part of the Netting Model, by founding an agrarian reform market in Gameleira for settlements in the area.¹⁵³ The market occupies a side street that feeds into a larger street that holds the town’s main Saturday market. Settlers from all over the county, and even outside the county, bring their produce to the market to sell to town dwellers and to other ruralites. It was a bustling place on the Saturday I visited, and it looked about as busy with customers as did the main market. The participants in the manioc flour mill I visited on the Frei Gondim Settlement had a stall in the agrarian reform market. The MST thus helped articulate the commercialization process to supplement the mode of production on the Frei Gondim Settlement.

¹⁵² Netting 1993, 288; Garcia 1983.

¹⁵³ It is known by *feira da reforma agraria* by sellers and customers alike.

Figure 6.9: Manioc flour mill participants at the agrarian reform market



William Maxwell

The MST has been part of the success of one of the few organized forms of interfamily agricultural cooperation on the Frei Gondim Settlement. The movement founded an agrarian reform market in town, giving the participants in one of the settlement's manioc flour mills a place to sell their product. Mill owner Felipe Ribeiro Fernandes (also pictured in Figure 7.4), with beard, is at left. The leader of the youth association on the settlement (pictured in Figure 7.5) wears the MST vendor's coat in this picture, rear. The sellers were selling both manioc and *macaxeira* flour on this day, as well as flat bread (*beijú*) made from manioc flour, red peppers (in bottles), oranges, and eggplants.

Settlers from all over the state came to sell their produce at this market. Of the sellers I talked to, many were from Frei Gondim Settlement, but three were from other agrarian reform settlements in the county, and three were from settlements elsewhere in the state. One squat, scrappy old man in a red Movimento Sem Terra vendor's coat selling his bananas at the market hailed from Sítio de Meio Settlement, in the county of Ingazeira, 250 kilometers northwest of Gameleira, in the *sertão*, or chaparral, biome in western Pernambuco. Another vendor was from the *agreste* region, about 40 kilometers west, a transition zone between the rainforest and the drier chaparral.

Aside from the crops already mentioned, people offered jackfruit, oranges, cilantro, lettuce, onions, green peppers, tomatoes, carrots, potatoes, cucumbers, chayote (*Sechium edule* (Jacq.) Sw., a fruit in the gourd family), *maxixe* (*Cucumis anguria* L., in the gourd family, a cucumber-like fruit,) red beets, *jiló* (*Solanum gilo* Raddi, an eggplant-like or tomato-like fruit in the nightshade family (Solanaceae)), *coví* (greens prized as a side dish to *feijoada*, comparable to collard greens), manioc and *macaxeira* roots, *acerola* (*Malphigia emarginata* DC, a cherry-like fruit), coconuts, and a chicken, which the seller had already sold, for 20 reais.¹⁵⁴

¹⁵⁴ Lorenzi and Matos 2008, tropicos.org, embrapa.br.

Figure 6.10: President of Frei Gondim women’s association sells wares



William Maxwell

Sophia Silva Martins, founder and head of the Association of Women Farmers of Frei Gondim,¹⁵⁵ and past president of the settlement’s producers association, sits with her wares at the market. On this day, Martins offered coconuts (both succulent and dry), soursop, and *macaxeira*, for sale.

The trip to the market was for many Frei Gondim Settlement families the most significant event in the week. Settlers spent a considerable amount of energy traveling to and from the market, preparing their goods, securing their stalls, and selling. A fleet of VW buses, along with the settlement’s own all-purpose school bus, started their journey from the settlement to town before dawn every Saturday morning. The market allowed settlers the opportunity to turn surplus food, which they did not need for their own consumption, into cash, and then into other products purchased for the family, including foods they do not grow themselves, clothing, tools, and various household wares.

¹⁵⁵ *Associação de Mulheres Agricultoras de Frei Gondim.*

Settlers' active participation in the municipal market demonstrated that the settlement in this instance also meets the "combine subsistence and market benefits" part of Netting's model. Garcia showed that the versatility of the smallholder's crops sets the smallholder way of life apart from cash crop monoculture, in Pernambuco embodied by the sugarcane, coffee, and cotton plantations. These cash crop enterprises offered no recourse to owners or workers in case their monoculture failed, or the market for their product went bust, and instances of hunger were common in these situations in Pernambuco history, particularly among the workers.¹⁵⁶ Garcia below highlighted manioc, because unlike other crops, it ripens year round, and provides subsistence and cash benefits to householders during those lean times of year when no other crop is ready for harvest. Garcia also pointed out, however, that it was rare for smallholders to desist from growing cash crops altogether.

If on the smallholder's field the plants that alternatively can be directly eaten or sold predominate, and if among these, manioc [best] incarnates this characteristic, one will always find plants that are only being cultivated with their sale in mind, the *cash crops*, or *lavouras comerciais*.¹⁵⁷

6.1.5 Luiz Alfonso de Andrade

The reciprocity-based cooperation of the manioc flour mill was not the only form of cooperation evident on the settlement. As any primer on capitalism will tell you, once market forces are applied, differentiation of wealth between producers begins to happen.¹⁵⁸ Some of the more successful producers on the Frei Gondim Settlement became the bosses and customers of their neighbors. Therefore, some of the settlers

¹⁵⁶ Rogers 2010.

¹⁵⁷ Garcia 134.

¹⁵⁸ Cournot 1897, 150.

began to interact with their neighbors in a way that was not different from age-old economic relations between farmers, as seen in Netting and Garcia.¹⁵⁹ Smallholders entered into cash-based economic relations with those who could afford to pay. This practice represents an important driver for economic development on the settlement, and contributed to making the Frei Gondim Settlement the second-most-important soursop producer in the state.¹⁶⁰

A closer look at the cooperation between Luiz Alfonso de Andrade and his neighbors is worthwhile.¹⁶¹ Like all founding settlers, de Andrade started with one four-hectare parcel at Frei Gondim. By 2012, de Andrade controlled much more land, on and off the settlement.¹⁶² De Andrade was an important Frei Gondim soursop producer. He also bought soursop from his neighbors, which he sold for consumption in Recife. According to his brother Guilherme, as of June 2012, Luiz was selling tens of thousands of kilograms of soursop a month. Given that Luiz and Guilherme harvested soursop six months out of the year, Luiz's annual income from soursop sales would have been substantial. Numerous settlers reported selling soursop to him, including Guilherme.

Luiz's enterprise was large enough to warrant the hiring of workmen. Settler Moisés Breno Marchi's son, who was my guide to Luiz's property in my unsuccessful attempt to interview him, worked for him on a seasonal basis, clearing land on the settlement for soursop plantings and keeping orchards clear of undergrowth. He was one

¹⁵⁹ Netting 1993, Garcia 1983. Netting goes into this in detail. Local differentiation of wealth happens without the formation of permanent over- and under-classes (page 2). Garcia talks about smallholders working for cash to supplement their agricultural income, thereby facilitating and not taking away from their smallholder way of life (page 71).

¹⁶⁰ Secretary of Health for the município of Gameleira, Associação 21 de Novembro Assentamento Frei Gondim producers' association meeting, 17 June 2012.

¹⁶¹ Despite repeated attempts to make contact with him, including going to his house, I was not able to speak with him personally. I derived my information about him from his brother Guilherme.

¹⁶² Despite the fact that settlers were not allowed to sell parcels, parcel transfers and accumulation were occurring. For example, settlers took over the parcels of family members who moved away.

of two sons of Marchi who worked for Luiz Alfonso de Andrade. Given the size of Luiz's land, it is likely that Luiz had employees besides Marchi's sons.

It is evident that Luiz provided an important avenue for social and physical reproduction for Marchi's sons, especially given Marchi's limited ability to provide sufficient income for the entire extended family. Marchi's corn and white rice crops had failed, and Marchi complained about having received insufficient support from the government to buy enough supplies to make his operation productive. In an interview, Marchi discussed the challenges he and his family faced to reap a living from the earth, "to thrive, work, and live."¹⁶³

It is evident that Luiz was not able to completely lift his neighbor's family out of poverty. His employment of the two young men was beneficial to them, but the benefits to the rest of that extensive extended family were limited. The articulation of a cash-based mode of production among Luiz and his neighbors therefore represented an important form of cooperation on the settlement, but also simultaneously demonstrated that this form of cooperation was not enough to lift the settlement out of poverty. Forms of economic development that provide a value-added benefit to all settlers, even if they do not lead to collective production, represent an essential non-cash based form of cooperation whose absence has restricted the settlement's economic sustainability.

6.1.6 Institutional challenges to production

While the MST took steps to enhance production and market articulation for the settlement, one alleged development involving an MST subsidiary apparently had the opposite effect. During my two-week stay on AFG, I was perplexed by the MST's lack

¹⁶³ Marchi 2012. His exact words: "Crescer, trabalhar, viver."

of involvement in the settlement, given that it had taken credit for a larger part of its success.¹⁶⁴ No offsite MST activists, agronomists, or other personnel appeared to be active on the settlement. During the two weeks I was there, current off-site MST activists only came to visit twice, and both times it was only to attend producers' association meetings. The MST did not appear to have a current role in settler training or any hands-on role in economic development on the settlement.

According to information I received from Frei Gondim settlers, in 2004, employees of a company affiliated with the MST embezzled government agricultural development funds that were destined for the settlers. Allegedly, they worked out a kick-back scheme with agricultural supply merchants in order to enrich themselves. Of 15,000 *reais* in agricultural development funds that were destined for each settler, many Frei Gondim settlers received no money or only partial payments. The settlers were promised cows, but according to settler reports, only some of the promised cows arrived, and the ones that did arrive were sickly.

An off-site MST activist corroborated this story, but added that some settlers also benefitted from schemes to receive cash from the agricultural supply merchants instead of the goods that agricultural development funds were supposed to be used for. This same MST activist said that, once the malfeasance came to light, the responsible employees of the MST subsidiary were fired. Requests for comments on the allegations with Pernambuco state-level MST officials have gone unanswered. If these allegations are true, they have potential to impact an analysis of the MST's role in contributing to economic and ecological sustainability on the Frei Gondim Settlement. However, I did

¹⁶⁴ Movimento Sem Terra 2009. "Associação 21 de Novembro."

not have the opportunity to conduct a thorough investigation regarding this matter. Suffice it to say that, if true, these circumstances may help explain the MST's all-but absence from the settlement, and may have impeded economic development and ecological practices on the settlement.

6.1.7 Conclusion to discussion of production

Given the limits imposed on producers by lot size and mode of land tenure on the Frei Gondim Settlement, and individual settlers' social and economic isolation due to their removal from the social networks of their place of origin, the cash-based form of cooperation as evidenced in Luiz Alfonso de Andrade's hiring of his neighbors and buying produce from them, is necessarily limited in the potential it offers for *all* Frei Gondim settlers, or even a substantial fraction, to achieve household-based economic sustainability. Therefore, a community-based – not cash-based -- form of cooperation, is what is lacking to progress substantially to economic sustainability on Frei Gondim. I will provide an example below.

The settlement has made halting steps in the direction of community-based cooperation. An effort has been made to shift some of the processing of produce to the settlement itself. But as of June 2012, the only result of that effort was an empty building. The soursop pulping facility, a small, new boxy concrete structure adjacent to the producers' headquarters building (Frei Gondim's old homestead), is a signifier for the community's need. It is the embodiment of the community's incomplete journey to economic sustainability.

Currently, Frei Gondim producers sell soursop "meat" (the puddingy edible part of the fruit) for off-site processing. The ability to pulp soursop on site would be an

important source of added value for the product. It would mean that the community could sell directly to the Recife school system. The government is the largest potential customer for agrarian reform settlements.¹⁶⁵ A function like the soursop pulping facility,¹⁶⁶ through which the efforts of all or most of the settlement's soursop producers could flow, would be a nexus for the settlement's production. It would not transform the settlement into a collective, but it would produce opportunities for cooperation. The facility might have its own organization associated with it, including possibly cadres for maintenance, operation of the equipment, and bookkeeping. Alternatively, more informal but still cohesion-building processes might develop, as they have historically with the manioc flour mills. These processes could include work parties for soursop pulping, cleaning, or maintenance.

6.2 Subsistence and market benefits

6.2.1 Introduction

Netting argued that peasants have been unfairly maligned as subsistence farmers, who play no role in the market, by Karl Marx, among others. Netting asserted that there is practically no such thing as a subsistence farmer, if defined as a farmer who grows plants exclusively for family use and trades nothing with anyone else.¹⁶⁷ With very few exceptions, all farmers trade part of their production for goods they cannot obtain otherwise. Most farmers engage in economic activity in order to procure those goods

¹⁶⁵ Miranda 2012.

¹⁶⁶ *a agro-indústria*, in the parlance of settlement leaders. Tellingly, they confound the name of the building with the name for the mode of production that it connotes. This building would indeed represent a form of agro-industry largely lacking on this somewhat fragmented settlement.

¹⁶⁷ Netting 1993, 15.

they do not obtain or manufacture themselves. Therefore, one may divide the smallholder's plantings into a number of classes: Those plants whose only use and purpose is for cash sale, those plants which have the dual purpose of cash sale and home use, and those plants that are only for family consumption.¹⁶⁸ Only the smallholder-householder with a diversity of plantings -- as opposed to the cash-crop plantation farmer who plants only sugar, coffee, and cotton -- has the advantage of versatility in some of his crops, in that his family can eat them and he can sell them.

6.2.2 Personal-use cultivated plants

Table 6.4 shows that informants mentioned 13 plants that they plant for home consumption. Comparison with Table 6.1 will show that, in accordance with Netting's model and true to Garcia's discussion,¹⁶⁹ many subsistence crops are also cash crops for Frei Gondim farmers. To facilitate comparison, the right-hand column in Table 6.4 indicates the crop importance rankings from Table 6.1.

¹⁶⁸ Garcia 1983.

¹⁶⁹ Netting 1993, Garcia 1983.

Table 6.4: Personal-use cultivated plants

Rank of importance for personal use	Plant Linnaean name	Plant common name	Points	Crop importance ranking from Table 6.1
1	<i>Manihot utilissima</i> Pohl	<i>Macaxeira</i>	30	3
2	<i>Musa</i> spp. L.	banana	10	4
2	<i>Annona muricata</i> L.	soursop	10	1
4	<i>Coriandrum sativum</i> L.	cilantro	7	9
4	<i>Solanum tuberosum</i> L.	potato	7	NA
6	<i>Phaseolus vulgaris</i> L.	beans	6	NA
7	<i>Zea mays</i> L.	corn	5	9
8	NA	<i>pauza</i> ¹⁷²	3	NA
9	<i>Ipomoea batatas</i> (L.) Lam.	sweet potato	2	NA
10	<i>Cocos nucifera</i> L.	coconut	1	4
10	<i>Lactuca sativa</i> L.	lettuce	1	NA
10	<i>Manihot esculenta</i> Crantz	manioc	1	8
10	<i>Dioscorea</i> spp. L.	yam	1	7
n=19				

Macaxeira is the most important plant on the settlement to feed the producers' families themselves. It is also the third-most important cash crop, providing support for the claim that *macaxeira* is Pernambuco's staple. It is a rich source of carbohydrates.¹⁷⁴ The table comparison further shows that it is evident that sugarcane is a quintessential cash crop. It is the settlement's second-most-important cash crop, but no one mentioned it as a food crop. Households consume a tiny fraction of what they produce of this substance. Perhaps more importantly, the plant that settlers harvest is not close to the form in which the product is consumed. AFG settlers do not refine their own sugar. A

¹⁷² *Pauza* was described to me as a food crop. More exact definition unknown.

¹⁷⁴ De Oliveira 2013.

relatively simple and inexpensive machine will press the juice out of the stalks of cane, an energy-providing substance. I did not see any such machine on the settlement. It was relatively common on the beaches and streets of Rio de Janeiro and Salvador da Bahia. Suffice it to say that AFG settlers do not consume any of their own crop.

AFG settlers consider soursop an important source of both revenue and food. Residents of northern temperate latitudes tend to think of tropical tree fruits as things that come from “banana republics” grown exclusively on plantations for export to temperate climates. The data from tables 6.1 and 6.4 tell a different story. On AFG, bananas and soursop are two tree fruits that are important for the dinner table as well as the *local*, not *export*, market. Banana and soursop the subsistence crops end up on AFG dinner tables. Bananas and soursop the cash crops end up on the dinner tables of other people in Gameleira, via the agrarian reform market in town. (See Figures 6.10 and 6.11)

Figure 6.11: AFG producers arrive at agrarian reform market with bananas on the minibus



William Maxwell

Bananas are an important food crop and cash crop for Frei Gondim settlers. Producers unload bananas and other crops at the agrarian reform market in Gameleira on 16 June 2012.

AFG settlers both consume and sell their cilantro, and the fact that it is tied for fourth place in Table 6.4 underscores its importance as a food plant. The fact that it is relatively easy to grow even in urban gardens and windowsill planters may explain its relatively low standing as a commercial crop (Table 6.1).

Figure 6.12: Cilantro at the agrarian reform market



William Maxwell

This settler from the Primo Roso Settlement, also in Gameleira, is offering cilantro for sale.

Women have for centuries worked the sugarcane fields, going back to the days of slavery, so it was no surprise that I saw women collaborating on the settlers' cane fields as well. But aside from the cane fields, women were generally absent from settler plots during my visit to AFG in June 2012. The agricultural plots are traditionally considered "man's work" in Pernambuco.¹⁷⁵ Women have historically sold small animals (such as poultry) under their care at market to supplement personal and household income. I found evidence that women may be doing the same with plants they are growing in household gardens; see Figure 6.12. Women's relative scarcity on the fields notwithstanding, a cursory survey of the gender ratio of sellers at the agrarian reform market indicates that women are substantially involved in the marketing of the produce. Close to half of the sellers were women.

Potatoes are also tied for fourth place in importance as subsistence crop on the settlement. However, no one mentioned it as a cash crop. This may reflect local tastes. *Macaxeira* and corn, in the form of *cuscui*, corn meal boiled or fried and served fluffy, as if it were rice, are Pernambuco's staple starches. The potato does not play as important a role on Pernambuco's dinner tables. Frei Gondim settlers may just have a local liking for the tuber.

6.2.3 Sugarcane

According to an article about Frei Gondim on the MST web site, the point behind founding the settlement was to provide farmers an authentic alternative to the sugar monoculture of the region.¹⁷⁶ In the parlance of MST activists on and off the settlement,

¹⁷⁵ Garcia 1983.

¹⁷⁶ Movimento Sem Terra 2009: "*Associação 21 de novembro.*"

there are no redeeming aspects to sugarcane production. However, there is a variety of attitudes toward sugarcane on the settlement. While objections may be made to sugarcane cultivation in the ecological, social, economic, and political realms, even as it is practiced on this settlement, I argue that continuing sugar production on Frei Gondim represents an important part of the settlers' success in satisfying the "combine subsistence and market benefits" part of Netting's model. Tables 6.1 through 6.3 show that sugar remains one of the top crops on the settlement in terms of economic importance. For a sizeable proportion of the 19 settlers I interviewed regarding their production, the proceeds from selling their cane represented a significant part of their family income. Eight, or almost half, of the informants reported growing cane for sale. Five of these farmers listed cane as their most important crop, economically. Given the vigor with which the MST web site and the MST activists connected to the settlement criticized sugarcane as an agricultural and economic option, I would find it hard to believe that there was any AFG settler left unaware of the dominant discourse coming from the MST that this settlement was about diversification of plantings and getting away from sugar. This may have led to the underreporting of cane as a cash crop for settlers. One settler did not mention sugarcane at all among his important crops. Later, when I asked him whether he grew any cane, it turned out that it was his most economically important crop.

In the course of my ethnographic interviews with settlers, four specifically voiced their opinions regarding the cultivation of cane, with two settlers strongly opposed to the practice, and two settlers voicing firm confidence in it. Both cane opponents cited the connection between cane and hunger. It is one of the abiding ironies of the region, that one of the world's most productive agricultural regions should have a significant hunger

problem. However, considering that most of the land under cultivation is covered with crops that are only suitable for export, gives some perspective on this state of affairs. Rogers shows in detail that cane workers themselves suffered from malnutrition whose levels rose and fell based on prevailing wages.¹⁷⁷ This problem arose with the very foundation of the plantation economy, as underfed slaves plied the soil beginning in the 16th Century.

The MST founded the Frei Gondim settlement in 1994 with the specific intent that settlers would plant crops that would command a good price on local markets and were not beholden to world commodities prices; and that the settlers could eat themselves if other sources of revenue ran dry.¹⁷⁸ This is applicable to soursop, a tree fruit and AFG's top crop, but it is not true for the state's top plantation crops: sugarcane, coffee, and cotton. Given the history of many of the settlers of having been cane workers, and the economic and cultural dominance – even psychological dominance – of cane in the region, it is perhaps not surprising that the settlers initially planted nothing but cane.¹⁷⁹ MST agronomists and activists devoted considerable time in order to wean AFG settlers from cane, launching the soursop project, and securing seeds for a variety of other crops, including other tree crops. As discussed above, 18 years later, soursop has replaced cane as the settlement's top crop, and settlers have considerably diversified, with 19 of the settlement's 194 settlers listing 12 crops that they grow for sale or for personal consumption and sale, and listing 13 pure subsistence crops. However, they have not stopped growing and selling cane.

¹⁷⁷ Rogers 2010.

¹⁷⁸ Movimento Sem Terra 2009: “*Associação 21 de novembro.*”

¹⁷⁹ *Ibid.*

Ignacio Ferdinand de Braganza is one of the top soursop producers that I interviewed. He was a cane worker before he joined the encampment on the Frei Gondim farm in the early 1990's in order to agitate for land of his own. Working cane was in his blood. His parents "worked day and night doing cane." When he received his land, he had had enough. On a rare sunny day in June 2012 (June, winter in Pernambuco, is in the middle of the rainy season), he gestured at the orchards around him on his property. "This was all cane. I turned it all into fruit."¹⁸⁰ De Braganza, who is vice president of the *Associação 21 de novembro*, the producers' association, grows organic and conventional varieties of soursop, and manages a sophisticated organic soursop orchard, with goats fertilizing the soil and a neem tree providing oil that he sprays on the soursop trees to ward off pests. His case against cane is twofold: economic and ecological. "Cane is only good for the plantation. I knew I was just going to go hungry. You know, there is a lot of hunger with cane. I changed to soursop and bought two new cars," he said.¹⁸¹ De Braganza here is leveling his polemic not only against the working and living conditions of the landless cane worker. He also argues that the independent cane cultivator – the smallholder and householder – suffers from similar economic insecurity.

There is plenty of evidence in the record that slumps in world sugar prices have had devastating effects on small producers who were relying heavily on that particular crop.¹⁸² The 2001 Walter Salles film *Behind the Sun*¹⁸³ shows to what extent impoverished small sugar producers were beholden to middlemen in town, who offered a

¹⁸⁰ De Braganza 2012.

¹⁸¹ De Braganza 2012.

¹⁸² Rogers 2010, Garcia 1983.

¹⁸³ Salles 2001.

pittance for bricks of raw sugar based on the meager return the smallholders' small production would fetch on the world market.

Additionally, de Braganza objects to the environmental effects of the way cane is cultivated on plantations. He said that, on the sugar plantation, "It is all poison. Poison goes in the row that is cut, poison is used until the cane is tall."¹⁸⁴ Of all the farmers I interviewed on the settlement, de Braganza was the most dedicated to using agro-ecological methods. He said that he learned the method and the philosophy from a Pernambuco government agronomist who advised settlers. De Braganza stated his intention to eventually eliminate all chemical use from his production, "because chemicals are bad for your health, as [the agronomist] says."¹⁸⁵

Guilherme Alfonso de Andrade was the number two producer of soursop I talked to on the settlement, based on self-reported figures.¹⁸⁶ He echoed a familiar refrain when he said "Planting cane means starvation."¹⁸⁷ De Andrade also pointed out the economic insecurity of those smallholders who rely too heavily on cane. "Planting cane just doesn't work out." De Andrade charged that the government does not help the small producer when inundating rain ruins the cane crop.

The testimony of the two cane-planting proponents provides rational background to the decisions by a substantial number of AFG settlers to combine subsistence and market benefits by producing cane in order to contribute to their social reproduction. The two cane planting proponents whom I interviewed used precisely the fact that the crop

¹⁸⁴ De Braganza 2012. The word that I translated as poison is the Portuguese *veneno*, which local farmers use as a generic term for herbicides and pesticides.

¹⁸⁵ De Braganza 2012.

¹⁸⁶ De Andrade 2012. His brother, Luiz Alfonso de Andrade, may have been a greater soursop producer. However, my data for Luiz's production is based on figures Guilherme gave me. Therefore, I left that data out of the production tables. I calculated AFG production figures based only on information I received directly from the producers.

¹⁸⁷ "Plantar cana é morrer de fome."

has a world market as an argument for it. According to their reasoning, there is always someone on the planet who has a sweet tooth. There will always be a price for sugar. The other crops the settlers plant have smaller available markets.

Samuel Costa is 73 years old. He was one of the original occupiers of the Frei Gondim farm, and was a founding settler. His entire plot is planted in cane. “I put all my trust in God, cane, and cattle,” he told me. Costa indicated that the logistical challenges of selling products for markets that are not as well developed as sugarcane were daunting for him. “Everyone has his talents. Selling is not one of mine,” he said. Given his age, cultivating four hectares of cane is challenging, and he said he hires neighbors to help when he can. His testimony and that of his fellow sugar proponent suggested that there may be a generational logic to their point of view. The view that sugar cultivation is the age-old standby may be more ingrained in the older generation, who have lived most of their lives under the reign of sugar, and were only exposed to anti-sugar rhetoric relatively late in their lives. In this discussion, the average age of the two cane proponents was 18 years more advanced than the average age of the two cane detractors. The ages of the cane proponents ranged from the late fifties to the early 70’s, while the ages of the opponents were in the 40’s and early 50’s.

Costa appears to come from a generation that looks to the past as a more economically stable time. He also bemoaned the replacement of the *cruzeiro* currency with the *real*, claiming the *cruzeiro* was a stronger currency. President Fernando Henrique de Cardoso made the replacement in the mid-1990’s, putting an end to decades of devastating inflation. The value of Brazil’s currency has been in a recognizable relation to the dollar ever since. It has been a cornerstone of Brazil’s economic recovery,

and of the country's rapid economic growth in recent decades. However, the accuracy of Costa's statement is not relevant here. The attitude, seeing the previous time as a gilded age, is relevant.

Costa effectively uses cane to supplement his household sustenance, which also includes a government pension and the crops he pulls from his own garden. His garden was well-appointed, with a large variety of fruits and vegetables.

Figure 6.13: Settler Samuel Costa effectively combines subsistence and market benefits



William Maxwell

Samuel Costa posed with a six-kilogram *macaxeira* plant that a neighbor pulled out of his (Costa's) garden for him. Cane adds cash to his budget, while his garden, filled with food plants, provides much of the food.

Costa also had four cows, which he kept at a pasture about halfway on the walk between his house at the settlement's center and his vegetable garden. It was unclear what the cows added to his annual budget. They may have been a source of reserves, a commodity that could be turned into cash in case of emergency.

For Moisés Breno Marchi, sugar is effective insurance against crop losses. His corn was killed by a drought, and "I planted this white rice, and it's dead. The sugar is thriving," he told me on a tour of his land. His conclusion: "Sugar is the best bet, it always brings in money." The difference in average age between the cane proponents on the one hand and the cane detractors on the other was the size of a generation. The opponents both belonged to the same generation as that of the producer association president, another vocal cane opponent. These comparatively younger farmers may have found the transition to alternative crops easier than the older farmers. Also, the sugar opponents were founding settlers, who were dedicated MST members from the beginning. As the MST's institutional logic was in opposing sugar monoculture, it is not surprising that these particular settlers opposed sugar as well. Costa was also among those who occupied the Frei Gondim Farm at the very beginning of the expropriation process. However, Costa never joined the MST. "I don't like to get involved in political or money things," he told me.

None of the four producers I have discussed above are good examples of cash crop diversification on the settlement. They did not sell any crops besides sugar or soursop, the particular cash crops they were advocating. However, the two cane proponents help to give insight into the thought process that has led to a sizeable number

of producers on the settlement to continue to cultivate cane along with other crops, in order to combine subsistence and market benefits.

6.3 Practices of stewardship and conservation of resources

6.3.1 Introduction

Netting showed in detail in *Smallholders, Householders* that smallholders, when confronted with a long-term situation of growing population and relative land scarcity, and are forced into agricultural intensification over the long term, will resort to strategies that “encourage practices of stewardship and conservation of resources,” as the final part of the Netting Model reads. Drawing on case studies around the world, Netting showed that farmers used methods like erosion control barriers, application of organic fertilizers, fine-tuning irrigation systems to make them more efficient, and crop rotation, among others, to preserve the fertility of the land and maintain the health of their immediate environment.¹⁸⁸

In this section, I will assess the extent to which Frei Gondim farmers have adopted similar methods: to what extent their practices conform to the final part of the Netting Model. I will begin with a general discussion of Frei Gondim farmers’ attitudes and methods, and will introduce an agronomy education program that has led to a significant development in Frei Gondim agriculture – specifically horticulture. I will continue with two case studies of producers with contrasting attitudes to ecological stewardship, and I will conclude with a study of local ecological knowledge on the

¹⁸⁸ Netting 1994, 3.

settlement, a necessary precursor to any practices of stewardship and conservation of resources.

6.3.2 Attitudes and methods

It is true that the precursors to the Frei Gondim Settlement, the conditions that brought it about, were paradigmatic for the Netting Model. The Northeast is one of Brazil's most densely populated areas. Simultaneously, a number of factors contributed to the fact that land availability for smallholders in Pernambuco was always very limited. To encourage settlement in Brazil, the policy of the Portuguese Crown was to deed vast tracts of New World land to its favorite vassals.¹⁸⁹ After Brazilian independence, oligarchic policies favored the keeping of the status quo, while discouraging land reform. Many of the *latifúndios*, or large estates, remained intact. In the Northeast, the aggressive pursuit of an agricultural policy that tied up a large part of the rural land in coffee, sugar, and cotton plantations, made land for smallholders even harder to come by. In the 19th and 20th Centuries, land availability for smallholders waxed and waned with the vagaries of world sugar prices and plantation economies.¹⁹⁰ In the mid-20th Century, the conversion of much former plantation land into cattle ranches made smallholder land an even more endangered species.

These two factors – growing population density and land scarcity – should set up an ideal environment for smallholder intensive systems that match Netting's model. In this thesis, I have explored the extent to which the Frei Gondim Settlement does match

¹⁸⁹ Dean 1995, Wright and Wolford 2003.

¹⁹⁰ Garcia 1983.

that model. In this section, I turn to the final part of the model, relating to practices of stewardship and conservation of resources.

As the settlement has only been in existence for 18 years, and many of the farmers on the settlement never before had land of their own, I would argue that, in general, the settlement farmers have not had enough time to develop distinctive practices of stewardship and conservation of resources that are typical to their own specific micro-environment. In this regard, it is important to keep in mind that many of the cultural groups Netting studied have had hundreds or thousands of years to perfect their resource-conserving methods. By contrast, the Frei Gondim Settlement is a population that came together 18 years ago.

However, an agricultural training program has contributed to encouraging stewardship and conservation of resources. Settlement leader Carlos Mano Amado lobbied in Brasília for agricultural training, and AFG received it in the form of KIT-PAIS.¹⁹¹ An organization called ASSOCENE (*Associação de Orientação às Cooperativas do Nordeste*, Association for Orientation to the Cooperatives of the Northeast) has implemented what it calls PAIS (*Produção Agroecológica Integrada e Sustentável*, Integrated and Sustainable Agro-ecological Production) technology in 740 places around the Northeast of Brazil.¹⁹² Agronomists visit agrarian reform settlements and conduct workshops on building your own KIT-PAIS vegetable garden for household use. Many households I visited on the Frei Gondim Settlement had a KIT-PAIS garden. Concentric rings of plantings surround a central chicken coop. Manure from the chickens organically fertilizes the vegetables; some of the produce goes to feed the chickens. The

¹⁹¹ Amado 2012.

¹⁹² ASSOCENE 2013.

circular shape of the garden, concentrating the geometry of the rows, facilitates irrigation. Crops that are planted include lettuce, okra, cilantro, and various other garden vegetables for household use.

Figure 6.14: KIT-PAIS garden



William Maxwell

Frei Gondim settler Antonio Garcia Neves discusses his cultivation method for the okra plants in the KIT-PAIS garden outside his home.

KIT-PAIS agronomists who provide the training, supplies, and startup seed – as well as the chickens – emphasize organic methods in their training, stressing the health advantages of non-chemically grown vegetables.¹⁹³ The training and the gardens have added a significant layer of agricultural knowledge that emphasizes stewardship and conservation of resources on the settlement. The gardens also appear to have a

¹⁹³ I attended a seminar for producers conducted by a KIT-PAIS agricultural technician on the Frei Gondim settlement on 27 June 2012.

significant effect on environmental attitudes on the settlement. Environmental attitudes appear to have been framed in the manner in which I asked questions regarding effects on the environment. With few exceptions, settlers did not appear to grasp the concept that agricultural methods have an effect on the environment. Asked whether there is a difference between their agricultural methods and those of the neighboring plantation, many gave an answer that did not have anything to do with the environment. There were some notable exceptions: Particularly those in the leadership of the producers' association, who conceivably had better access to agronomy education, could speak knowledgeably about agro-ecology.

However, even many of the settlers who did not voice environmental savvy as far as agriculture was concerned showed themselves to be agro-ecologists in their own vegetable gardens. And they voiced their appreciation for the salubrious effects of growing their own organic vegetables. Antonio Garcia Neves, shown in Figure 6.13, displayed a certain indifference to the environmental effects of using chemicals in an interview, but he threw himself into building an outstanding KIT-PAIS garden nevertheless.

Figure 6.15: Appropriate technology in the KIT-PAIS garden



William Maxwell

Neves demonstrates his practice of shielding young lettuce plants from sun scorching with a palm leaf.

Settler Moisés Breno Marchi said that he is not worried about chemical use by the neighboring sugar plantation, but he sees the merits of the KIT-PAIS garden an agronomist showed him how to build on his property. “This will be good for us,” Marchi said. “It will be an organic garden. There will be no poison. Just the force of the earth.”

6.3.3 Antonio Garcia Neves

Neves, 31, was one of the most hard-working and productive of any of the farmers I met on the settlement, based on the production figures he provided, and considering that he performs virtually all agricultural work alone. He lives with his wife

on a plot that is kilometers removed from the center of the settlement, and about as far away as one could get on the settlement from the road to town. This former bakery assistant and plantation worker learned to farm from his neighbors. “When I came here, I did not know what passion fruit was. I did not know what sugarcane was,” he said. He has built a thriving farm around his house that includes sugarcane and a variety of tree and vine fruits. He was one of the few settlers I interviewed who earned enough from his production to afford to buy a car. His top crops were sugarcane, passion fruit, and cattley guava.

From the vigorous state of his KIT-PAIS garden, it appeared that he saw the benefits of organic vegetables for his family. However, that attitude did not extend to his for-sale production. When asked what the differences in the environmental effects of his production compared to that of the surrounding sugar plantation was, Neves answered that he concentrates on fruit production and therefore has need for fewer workmen than the plantation. Asked whether he uses chemicals in his production, he answered: “No, not at all. I just use herbicide to clear the soil, chemical fertilizer for my cane and soursop, and chemical pesticide on my soursop trees.”¹⁹⁴

The spatial arrangement of his property also exhibits a combination of ecological savvy and insouciance.

¹⁹⁴ Neves 2012.

Figure 6.16: Neves's farm



William Maxwell

Sugarcane field on steep hillside to left, orchard outside frame to right, catchment pond behind banana trees frame center, family home behind pond and road.

On the one hand, he constructed a catchment pond for household drinking water at a fortuitous location, just downstream of a salubrious wetland (frame center left in Figure 6.16) that filtered the rain water from the little valley that extended for four hectares off frame left and formed his farm. On the other hand, the season's copious rain water also percolated through the soil on the steep sugarcane field frame left, and the runoff from that chemically intensive cane field – he uses herbicides and chemical fertilizers – as well as the runoff from the chemically intensive fruit orchard outside frame right, would also run into the household drinking water pond.

6.3.4 Ignacio Ferdinand de Braganza

As I discussed de Braganza's environmental attitudes elsewhere (please see Subsection 6.2.3), I will restrict myself to his methods here, which I believe strongly show that there are farmers on this settlement whose intensive systems encourage practices of stewardship and conservation of resources.

De Braganza took full advantage of the ecosystem services of his parcel, all the while maintaining the ecological integrity of those landscape-features that provided the services. The forest on his parcel filtered rainwater before it entered the ponds that provide water for his family and hold fish for family consumption and sale. The forest also provided shade and wind protection for *açaí*¹⁹⁵ saplings in a natural nursery very different from greenhouse nurseries. De Braganza allowed the saplings to sprout directly from the forest soil.

De Braganza took advantage of a variety of pre-existing trees that created a rich humus that he spread under the soursop trees to fertilize them. And he fortified the steep hillsides on his parcel with dense plantings of orchard trees and lush grass to minimize erosion. The top of his parcel was near the peak of a hill in front of his house, at 183 meters the highest elevation I reached while staying at the settlement. At this location exposed to the elements more than the rest of his parcel, De Braganza planted sun-loving beans to enrich the soil. It was evident that this farmer was keenly aware of the environmental advantages of every corner of his parcel.

De Braganza is one of the top soursop producers on the settlement, based on the figures he supplied. He has separate organic and conventional soursop orchards. In the

¹⁹⁵ *Euterpe oleracea* Mart., a palm fruit native to Central and South America, has seen a recent surge in worldwide demand. High in carbohydrates and vitamins, the fruit is important in the diets of indigenous people in the Amazon, and can now be found in drinks and confections the world over. See Lewis 2008.

organic orchard, he lets goats fertilize the soil with manure, and a neem tree provides the oil that he sprays on the soursop tree to ward off pests.

Figure 6.17: De Braganza sees no use in cane



William Maxwell

De Braganza in front of his organic soursop orchard. “This was all cane,” he said. “I turned it all into fruit.”

De Braganza said that, while the organic soursop is smaller, the rind of the conventional fruit is thicker and tougher, and the conventional fruit is not as sweet. Remarkably, he said, the organic fruit does not fetch a higher price at the market, which may help explain the scarcity of organic cash crop production on the settlement. There is apparently no strong local market incentive.

Figure 6.18: Beans enrich the soil



William Maxwell

De Braganza planted nitrogen-fixing beans (foreground) near his soursop trees (background) at the top of his property. Nitrogen is a necessary nutrient for all plants, but there are few natural sources for nitrogen in the soil. Beans,

with their *Rhizobium* bacterial root nodules, are among the few.¹⁹⁶ The beans therefore enrich the soil to the benefit of the nearby soursop trees.

A government agronomist apparently got Braganza thinking agro-ecologically. De Braganza planted beans, whose root bacteria fix nitrogen and enrich the soil, in order to contribute to the health of his soursop trees.

¹⁹⁶ Simpson and Ogorzaly 2001, 136.

Figure 6.19: The açai nursery



William Maxwell De Braganza created an açai nursery in the forest on his parcel, where they are shielded from scorching, wind, and inundation, and where tree-derived humus hummus has enriched the soil. Nothing this farmer has done is happenstance; he is keenly aware of the ecological advantages of all the micro-environments on his parcel. Braganza tends to his açai nursery.

To start a new crop, Braganza creates a nursery in a forested area of his property. His agricultural production is naturally woven into the forest around him.

Figure 6.20: The family's drinking water



William Maxwell

A necklace of four ponds, in the forest near the family home, provides drinking water and habitat for fish. The forest helps keep the ponds clean and cool. De Braganza and neighbor Moisés Breno Marchi are partially obscured by a long compound leaf frame left.

Even the family's drinking water comes from the forest. Abundant riparian vegetation around the family's drinking water pond filters rain water and creates a clean water supply for the nearby home. De Braganza stocks fish in other, nearby ponds.

De Braganza plans to phase out all chemical use in his agriculture.

Demonstrating the effect that the agro-ecology advisor had on his thinking, Braganza told me: “Chemicals are bad for you, as the [government agronomist] says.”

6.3.5 Local ecological knowledge

As discussed in Chapter 5, I conducted an ethnobotanical survey of plants settlers recognized in their environment in order to assess their local ecological knowledge, which I judged to be a necessary precursor to “encourage practices of stewardship and conservation of resources,” the final part of the Netting Model. Informants told me about medicinal uses of some of these plants. An important part of my assessment was determining the origin of the plants settlers identified.

Please refer to Table 6.5 for the 12 plants I identified, and for their origin determination. Origin here is narrowly defined as native Atlantic Rainforest plant or not. Identification of the 12 plants and research into their origin revealed that seven of them are native Atlantic Rainforest plants.

Table 6.5: Plants of the Frei Gondim settlement

Latin name	Local name	English name	Uses	Origin
<i>Borreria verticillata</i> (L.) G. Mey	Vassoura de botão	Shrubby false- buttonweed	Tea from root for inflammations	Exotic
<i>Passiflora edulis</i> Sims	Maracujá	Passion fruit	Culinary uses	Native
<i>Annona muricata</i> L.	Graviola	Soursop	Culinary uses	Exotic
<i>Brachiaria brizantha</i> Stapf	braquiarão	Pasture grass	Cow feed	Exotic
<i>Heliconia psittacorum</i> L.f.	Língua de cutia	Parrot's beak	Unknown	Native
<i>Annona montana</i> Macfad.	Aticum	mountain soursop	Leaf tea for fever and spiritual ills	Native
<i>Lippia alba</i> (Mill.) N.E. Br. ex Britton & P. Wilson	Cideira	Bushy matgrass	Leaf tea for stomach ache	Native
<i>Ocimum</i> <i>campechianum</i> Mill.	Favaca	least basil	Seeds in eye for eye infections	Native
<i>Mangifera indica</i>	Manga	Mango	Culinary uses	Exotic
<i>Senna occidentalis</i> Link	Jirioba	Coffee senna	Add beans to coffee for constipation	Exotic
<i>Eugenia uniflora</i> L.	Pitanga	Surinam cherry	Leaf tea for intestinal disorders	Native
<i>Caladium bicolor</i> Vent.	Tiorão	Elephant's ear	Spadix for cattle skin parasites	Native
n=7	Origin Results: 7 Native, 5 Exotic			

The fact that seven out of the 12 plants I have identified are native Atlantic Rainforest plants is significant. The forest still has a strong foothold on this settlement, with one-fifth of the 1,048 hectares protected as a forest reserve, as required by law.

Also, a number of settler plots are reverting to forest. An aerial survey of the settlement using a 2007-datum Google Earth aerial/satellite image shows that on some plots, the rough texture of forest is beginning to emerge, compared to the smooth texture of the monoculture of the sugarcane plantation that surrounds it. According to Brazilian law, a plot that lies fallow for a number of years becomes a mandatory permanent forest plot.¹⁹⁷ The forest is returning on a number of these plots. (Please see Figure 6.21.)

¹⁹⁷ Amado 2012.

Figure 6.21: Settlement land use compared to surrounding sugarcane plantation



Sources: Remote imagery: Google Earth 2007 datum. Settlement boundary: Settlement parceling map, FUNTEPE, 1994. Labeled features: William Maxwell personal observations.

This remote imagery shows a contrast between the land texture of the settlement parcels with that of the monoculture surrounding it. The rough texture of vegetation, including trees, throughout the settlement contrasts starkly with the smooth, in parts vegetation-free surface of the sugarcane plantation. Along segments of the settlement boundary, the legal boundary line is visible from space. One can see where settlers have preserved their forest, compared with the agricultural field just outside the boundary line.

Table 6.5 shows that the settlers have significant local ecological knowledge. Not only can they identify numerous plants in their natural surroundings, they know how these plants have been used by people. This shows that they have the meaningful relationship with their natural environment that is requisite for the “practices of stewardship and conservation of resources” that agricultural anthropologist Robert Netting links with sustainable smallholder agriculture.¹⁹⁸

Settlement leader Carlos Mano Amado pointed out that he and his neighbors do not have the same level of wild plants knowledge that local people used to have. This, he explained, is due to the fact that people do not make the same use of the forest they did before. Today, local people are as apt to travel to a local drug store to find drugs to treat minor ills as they are to turn to their homegarden pharmacy or the local forest. William Balée, in his ethnobotany of the Ka’apor people of Maranhão,¹⁹⁹ points out that, in any thorough study of a human-plant complex, it is not enough to describe the names that local people give to plants. It is important to show where that plant knowledge comes from, and how much has been lost.

A historical-ecological perspective can be used to reconstruct aboriginal relationships between culture and environment as well as the historical events that have, by and by, transformed these relationships.²⁰⁰

Amado and his neighbors are former sugar monoculture plantation workers. Many of their parents and grandparents held the same positions. As such, they had very limited traffic with local natural plants during the course of their daily lives. Considering this

¹⁹⁸ Netting 1993

¹⁹⁹ Balée 1994.

²⁰⁰ Balée 1994, 208.

fact, it is impressive and significant how much native plants knowledge still exists on the settlement. There may be enough knowledge left to enliven a more active future relationship with local medicinal plants, in the case of a major resurgence of the forest on the settlement. The fact is that nearly everyone I asked about local medicinal plants began pointing out such plants when we took a tour of their plot.

Local ecological knowledge does not imply an intellectual or scholarly understanding of the subject matter. As a matter of fact, more than a third of my interviewees were illiterate. Results were often dependent on how I asked a question. Use of terms during the ethnographic interview elicited fewer results than asking pointed questions on plot tours. Settler Moisés Breno Marchi provided more leads to local medicinal plants than any other informant on the settlement. However, when I asked him during the interview, “What local medicinal plants do you know?”, he avowed that he knew none. During the plot tour, I asked him about this and that herb that I saw growing on the ground, which were clearly not part of his deliberately planted garden or agricultural fields. He began alluding to medicinal uses for some of them, and before long, he was volunteering information about various plants he spotted here and there growing on his property. That afternoon’s tour led to the collection of 16 plants, along with detailed information about the uses of each of them. What Marchi had apparently not understood was the wording of my original question.

A surprisingly large proportion of the settlers’ medicinal plants knowledge repertoire included plants that had not been deliberately planted. Some of the plants in my collection are from the settlement’s forest reserve. Three informants (Amado, Marchi, and Francisco Lima de Navarre) accompanied me on this hike, identifying plants

for which they knew some traditional use. As stated above, the medicinal plants on Marchi's property were not located in a space obviously delineated for a garden purpose. That is not to say that they were not deliberately planted. However, I believe that it is more likely that this extended family (several houses around Marchi's house belonged to his grown sons and their families) with significant local plants knowledge used plants they had received from nearby forest or neighbors' property and tossed them outside their houses when they were done with them. Seeds from these relocated, discarded plants could have germinated and grown in their new locations. It was these progeny of these plants' seeds that we may well have seen on our plot tour.

Apart from the popular crop plants I collected (for example passion fruit; see Table 6.5), the locations of the other plants in my collection suggested that they had not been deliberately planted by any of the settlers. The first plant in my collection, *capim santo* (lemongrass; it is not in Table 6.5 because I did not acquire this plant in its flowering state), grew in a small clump on the side of the road less than 25 meters from the informant's house. It looked like it had perhaps been dropped there after having been weeded from someone's field. Or perhaps someone picked it, intent on using it, dropped it, and forgot about it. While the roots of a good part of the clump lay above ground, some enterprising members of the clump had laid root and stayed alive.

The plant that was the most likely to have been planted, given its proximity to someone's house, was a foul-smelling plant that Marchi called *mã di gravo*. He said it was historically used to induce abortions, and that it was highly toxic. It grew within 5 meters of a settler's front porch. However, given that it was growing in a jumble of other weeds, it is well possible that it had not been deliberately planted.

I discovered some of the collected plants on solo outings. *Caladium bicolor* (see Table 6.5) was a striking plant I spotted on a hill overlooking the center of the settlement.

Figure 6.22: *Caladium bicolor* Vent.



William Maxwell

Found on a hillside overlooking the center of the settlement.

It was in a small population. It was growing in an area of sugar monoculture on a steep hillside, and it was one of the very few plant species besides *Saccharum* growing in this area. The pink coloration of its major veins caught my eye. Each plant consisted of three peltate leaves, in addition to a stalk that held what I would later learn was the inflorescence, the spadix, within a protective pouch called a spathe. The plant is closely related to a type of ornamental plant popular in the United States, known as elephant's ear. I would not learn until that evening, when I was pressing the plant at Amado's house, that the plant has a popular use. A friend of Amado, noticing the plant that I was

pressing, pointed out that it is used to kill cattle skin parasites. The discovery of *Heliconia psittacorum* L.F. has a similar story.

Figure 6.23: *Heliconia psittacorum* L.f.



William Maxwell

Found on a hillside overlooking the center of the settlement.

The plant, known locally as *língua de cutia* and known in English as parrot's beak, grew on roadsides and in fields, never looking like it had been planted deliberately. The plant has a striking orange and red flower, with hard colorful bracts subtending

colorful sepals and giving the entire flower the shape of a mouth, hence the name. *Cutia* is the Portuguese term for the small Brazilian mammal known in English as the agouti (genus *Dasyprocta*).

Amado said he had seen it around, but knew nothing else about it. He did not believe it had been planted, and later research did indeed reveal it is a native Atlantic Rainforest plant. Amado picked one of these plants from a small population on the roadside in order to give to his wife to plant in their garden, for ornamental purposes. This is probably how a number of native plants spread around the settlement. I am still researching the plant's possible medicinal uses.

Table 6.5 reveals the diversity of medicinal uses settlers are familiar with. Not all of the plants are used exclusively for physical ailments. *Annona montana*, previously mentioned as having been in use by indigenous people when Europeans arrived in the region, is also said to cure spiritual ills. Five of the plants have culinary uses, one specifically for cows. *Senna occidentalis* is said to be a helpful coffee substitute for constipation. Some plants are used to cure animal afflictions. *Caladium bicolor*, as discussed above, is said to eliminate cattle skin parasites.

An ethnobotanical study on the Frei Gondim agricultural settlement, Pernambuco, Brazil, revealed that settlers have significant local ecological knowledge of native Atlantic Forest medicinal plants growing in their environment. This paper's findings were based on information provided by settlers on 12 plants collected on the settlement and subsequently identified. I determined seven of the plants to be native Atlantic Rainforest plants.

There is room for further study on the settlement. Informants spoke at length about what various plants are known to have been used for. In my short time on the settlement, I was not able to gauge to what extent the local people are still using these plants for these purposes. Amado described *Annona montana*, for example, as a plant used by the local indigenous people for the purposes described in Table 6.5 even before their first contact with Europeans. Whether local people still make *Annona montana* teas to cure fever and spiritual ills, I do not know. A detailed picture of the medicinal plants' current uses on the settlement will have to await the results of a further study.

7. Conclusion

The questions that launched my fieldwork were: What are the livelihoods of the families on the Frei Gondim agricultural settlement? And the subquestion growing out of this question was, Are those livelihoods ecologically and economically sustainable? I used Netting's Model of peasant agriculture worldwide to measure the economical and ecological sustainability of the Frei Gondim settlers. Netting's Model reads: "My contention is that smallholder intensive systems achieve high production, combine subsistence and market benefits, transform energy efficiently, and encourage practices of stewardship and conservation of resources."²⁰¹ I tested three parts of the model ("transform energy efficiently" was outside the purview of my study) by analyzing data I collected during my fieldwork. My thesis, stated succinctly, is: The Frei Gondim settlement is a genuine alternative to the sugar monoculture and landlessness around it, but the isolation of the settlement, combined with a mode of production in which cooperation is limited, has restricted its economic and ecological sustainability.

Evidence that the Frei Gondim settlers achieved high production included their crop diversification, the fact that they had become the number-two soursop producer in the state, and the fact that they were active participants in the agrarian reform market in town. There were two manioc flour mills on the settlement. I found that settlers grew a significant amount of personal-use plants, including in special organic gardens built with the help of a non-governmental organization of agronomists. They did this even while continuing cash crops including sugarcane, which spoke to the "combine subsistence and market benefits" part of Netting's Model. Some of the settlers' ecological savvy, in

²⁰¹ Netting 1993, 320.

conversations and in agricultural practices, and the level of the settlers' local ecological knowledge, as tested in an ethnobotanical study of native Atlantic Forest medicinal plants on the settlement, showed that these settlers' livelihoods encourage practices of stewardship and conservation of resources.

Perhaps the greatest achievement of this settlement is entirely intangible. This is in effect the freedom and dignity that comes to a farmer who owns his own home and has undisputed control of his plot and of his life. Sofia Silva Martins, the leader of the settlements' womens' association, summed it up, describing the joy when the hopeful families received their parcels: "We knew that we had a place here," she said. Brazilian anthropologist Lygia Sigaud described the satisfaction of the landless-turned-landowners whose struggle for land she chronicled in Pernambuco in the following manner:

We also observe that they appreciated their new condition of 'parcel-holders.' The possibility of having a piece of earth that they perceived as better pleased them; the ownership of a house effectively theirs and not dependent on the relationship with the boss, as was the case on the plantations; and, above all, the freedom of being in control of their own time, freed from the boss's impositions, were the most valued dimensions.²⁰²

However, I also observed ways in which some of the settlers fell short of the settlement's goals, evidencing a lack of knowledge about agro-ecological methods, and indicating that they are not yet entirely economically self-sufficient, with partial reliance of some settlers on government assistance. My main argument in this essay has been that, to the extent that the settlement has fallen short of its goals, this has been due to the fact that an agrarian reform settlement such as this, socially isolated as it is because of the

²⁰² Sigaud *et al.* 2010, 316.

presence of settlers streaming in from different regions, must develop coherent strategies for cooperation among settlers. However, I found very few instances of formal institutions of cooperation among settlers. The mode of production was on the household level. While there were some economic and non-cash-based interaction between settlers in order to produce and market goods, the settlement still had a long way to go to meet its potential to achieve economic and ecological success by working together.

Not all of the settlers' problems are self-imposed. I discussed an alleged embezzlement scheme, allegedly perpetrated by an MST subsidiary, that allegedly robbed settlers of money, agricultural supplies, and the opportunity to own quality cattle. Another frequent target of settler ire were the local and national governments. Settlers blamed the local government for failing to make good on promises to provide quality housing on the settlement and to link the town and the settlement with a safe bridge over a local river.²⁰³ And on the national level, the MST has expressed increasing frustration over the years at the slowing pace of agrarian reform in Brazil. This circumstance is especially ironic considering that the ruling party, the *Partido dos Trabalhadores* ('Workers' Party'), and the MST rose hand-in-hand out of the ashes of the military dictatorship in the mid-1980's.²⁰⁴

²⁰³ Amado 2012.

²⁰⁴ Wright and Wolford 2003.

Figure 7.1: MST frustration with slow pace of reform



Source: Editorial cartoon by Carlos Latuff, *Brasil de Fato* web site, 2 February 2013.
<http://www.brasildefato.com.br/>.

The February 2013 cartoon on the web site of a newspaper co-founded by the MST hints at the movement's fatigue over what it sees as the current government's slowing pace of land reform. Brazilian President Dilma Rousseff's secretary tells the MST settler, left: "I'm very sorry, the president's appointment book is full." Right, the businessman is telling Rousseff: "I'm going to see if I can open up a space in my appointment book for you, Dilma."

According to a recent article, the administration of Brazilian President Dilma Rousseff in its first year in office in 2011 oversaw the lowest number of landless families settled in new settlements since 1995.²⁰⁵ While this figure is disquieting, Rousseff, through a spokesman, indicated that her administration's emphasis will be on providing economic development on and support to existing settlements, in order to enact genuine

²⁰⁵ Movimento Sem Terra 2012.

agrarian reform where families have already been settled. One Frei Gondim settler remarked that, 18 years after the settlement was founded, freedom for him and his neighbors is just another word for nothing left to lose. The government gave them land and little else, he claimed. New houses, equipment, and technical training have been scarce. “Agrarian reform? This is not agrarian reform at all!”²⁰⁶ he remarked. The next few years will prove whether government officials will be equal to the task of making good on their promises.

I believe that the Netting Model, the way I have defined it in this thesis based on the writings of Robert Netting, can be useful to future researchers who want to assess the level of success of a smallholder intensive system, or who want simply to determine whether a particular operation they are studying *is* a smallholder intensive system.

My final words in this thesis will be a short, informal list of suggestions for improving life on the Frei Gondim Settlement. In this thesis, I have linked quality of life intimately with productivity by using the concept of livelihood, which reaches into both realms. Therefore, I will focus on improving agricultural productivity on the settlement as an engine of life-betterment.

The most important thing settlers can do to improve their livelihoods is to take a more active part in producers’ association meetings. When I first arrived, a spare crowd of settlers sat listlessly at the meetings while being harangued by the president, who apparently grew increasingly frustrated at not receiving a response from them. By the end of my short stay on the settlement, settlers were taking a more active role, asking questions about their rights, and asking for help in resolving disputes with their

²⁰⁶ “Reforma agrária? Este é reforma agrária nenhum!”

neighbors. At the same time, a farm workers' union representative had come to census the settlers' rolls and make sure everyone was a member in good standing, and settlers and their representatives were working furiously to bring their memberships in order. Whether this new activity was prompted by my presence or by other factors, I will never know, but it was a good sign. In short, settlers will not improve their lives until they learn to demand significant support from their representatives, the MST, and the government.

The entities mentioned, in addition to NGO's and local universities and technical schools, must provide significant support to the settlement in terms of agricultural methods training and assistance in developing markets. As discussed in detail above, the completion of the soursop pulping facility with actual equipment and training would provide an important source of value-added to the settlers, as well as an opportunity for cooperation among settlers.

I recommend that the producers' association form a committee to identify and implement other opportunities for cooperation. For example, the coconut producers could pool their production and offer a batched crop to a Recife distributor. Coconut is a popular street food in Recife. Market development is a complex and ambitious activity, and the this committee will not reach its potential without help from an organization like the MST. The potential is enormous. Some of the locally grown fruits are delicious and nutritious, but less well-known in North America and Europe. Surinam cherry (*Eugenia uniflora* L.) is a small red tree fruit that tastes great and is high in vitamins A and C.²⁰⁷ The right market developer could create a boom in the Northern Hemisphere and enhance

²⁰⁷ SelfNutritionData 2013.

the Frei Gondim settlers' production and income. But the vision for this settlement, and of the MST, is of local market development, and there is also a universe of possibilities for developing local markets for various crops on the Frei Gondim Settlement.

Finally, but certainly not least importantly, there is enormous potential for developing local ecological knowledge on the settlement. People know what some of the local plants have been used for medicinally. Developing that knowledge and making traditional use of some of those plants has the potential for enhancing household health and income, and tightening the householders' bond with nature. A co-operative project with ethnobotanists at a local university, in which ethnobotanists and settlers work together to rediscover these traditional methods, would benefit both parties.

8. References

- Albuquerque, UP, LHC Andrade, and J Caballero. 2005. Structure and floristics of home gardens in Northeastern Brazil. *Journal of Arid Environments* 62 (3):491-506.
- Albuquerque, UP, Monteiro, JM, Ramos, MA, Araujo, EdL, Amorim, ELC, and Paulino, U 2011. Dynamics of medicinal plants knowledge and commerce in an urban ecosystem (Pernambuco, Northeast Brazil). *Environmental Monitoring and Assessment* 178: 179-202.
- Aldrich, Stephen, Robert Walker, Cynthia Simmons, Marcellus Caldas, and Stephen Perz. 2012. Contentious Land Change in the Amazon's Arc of Deforestation. *Annals of the Association of American Geographers* 102 (1):103-128.
- De Almeida, Cecília de Fátima Castelo Branco Rangel, Marcelo Alves Ramos, Rafael Ricardo Vasconcelos Silva, Joabe Gomes de Melo, Maria Franco Trindade Medeiros, Thiago Antonio de Sousa Araújo, Alyson Luiz Santos de Almeida, Elba Lúcia Cavalcanti de Amorim, Rômulo Romeu da Nóbrega Alves, and Ulysses Paulino de Albuquerque. 2012. "Intracultural Variation in the Knowledge of Medicinal Plants in an Urban-Rural Community in the Atlantic Forest from Northeastern Brazil." *Evidence-Based Complementary and Alternative Medicine* 2012. doi:10.1155/2012/679373.
- Amado, Carlos Mano. 2012. William Maxwell 19 June 2012 interview, Frei Gondim Settlement.
- De Andrade, Guilherme Alfonso. 2012. William Maxwell 26 June 2012 interview, Frei Gondim Settlement.
- Andrade, LHC, and Alberto Jorge da Rocha Silva. 2006. "Cultural Significance of Plants in Communities Located in the Coastal Forest Zone of the State." *Human Ecology*, Vol. 34, No. 3.
- ASSOCENE. 2013. *Associação de Orientação às Cooperativas do Nordeste*. http://www.assocene.org.br/st/index.php?option=com_content&view=article&id=194&Itemid=235
- Azevedo, Julio. 11 June 2012. Interview conducted by William Maxwell. MST Pernambuco state headquarters, Caruaru.
- Balée, William L. 1994. *Footprints of the forest : Ka'apor ethnobotany-- the historical ecology of plant utilization by an Amazonian people*. New York: Columbia University Press.

- Begossi, A., N. Hanazaki, and J. Y. Tamashiro. 2002. Medicinal plants in the Atlantic Forest (Brazil): Knowledge, use, and conservation. *Human Ecology* 30 (3):281-299.
- De Braganza, Ignacio Ferdinand. 2012. William Maxwell interview, Frei Gondim Settlement, 21 June 2012.
- Branford, Sue, and Jan Rocha. 2002. *Cutting the wire : the story of the landless movement in Brazil* London : Latin America Bureau, 2002.
- Brasileiro, Robson Soares. 2009. "Possibilidade do uso de alguns conceitos de tipos funcionais de plantas na agroecologia: O caso do Assentamento Chico Mendes -- Pombos -- PE." *Para Onde!?* (revista electronica) (5):181-197.
- Brookfield, H.C. 2000. *Exploring Agrodiversity*. New York: Columbia University Press.
- Campling, Liam, Havice, Elizabeth, and McCall Howard, Penny. 2012. "The Political Economy and Ecology of Capture Fisheries: Market Dynamics, Resource Access and Relations of Exploitation and Resistance." *Journal of Agrarian Change* Vol. 12, Nos. 2 and 3: 177-203.
- Cavalcanti, Guilherme. 26 June, 2012. William Maxwell interview on Assentamento Frei Gondim.
- Claudio, Araujo, Bonjean Catherine Araujo, Combes Jean-Louis, Motel Pascale Combes, and J. Reis Eustaquio. 2009. Analysis: Property rights and deforestation in the Brazilian Amazon. *Ecological Economics* 68:2461-2468.
- Clements, Frederic E. 1936. "Nature and Structure of the Climax." *The Journal of Ecology*. 24: 252-84.
- Cournot, Augustin. 1897 [1838]. *Researches into the mathematical principles of the theory of wealth*. New York: MacMillan.
- Dean, Warren. 1995. *With broadax and firebrand: the destruction of the Brazilian Atlantic forest*. Berkeley: University of California Press.
- Duvall, Chris. 2007. "Human settlement and baobab distribution in south-western Mali." *Journal of Biogeography* 34, 1947-1961.
- De Figueroa, Jorge. 2012. William Maxwell interview, Assentamento Normandia, vic. Caruaru, Pernambuco. 10 June, 2012.
- Freyre, Gilberto 1963 [1933]. *Casa-grande e senzala*. [English: *The Masters and the Slaves*] Brasília: Editora Universidade da Brasília.

- Freyre, Gilberto 1975. *A presença do açúcar na formação brasileira*. Rio de Janeiro: Coleção Canavieira.
- Garcia Junior, Afrânio Raul. 1983. *Terra de trabalho*. Rio de Janeiro: Editora Paz e Terra.
- Greenpeace. 2009. *Developing Sustainable and Equitable Pole and Line Fisheries for Skipjack*. Amsterdam: Greenpeace.
- Gutberlet, J. 1999. "Rural development and social exclusion: a case study of sustainability and distributive issues in Brazil." *Australian Geographer* 30 (2):221-237.
- Hamilton, A., E. Havice and L. Campling. 2011. "UK Market Moves Toward Pole and Line and Against FAD-caught Canned Tuna." *FFA Fisheries Trade News*, 4 (1-2): 7-8.
- Instituto Brasileiro de Geografia e Estatística. 2006. *Censo Agropecuário 2006* ('2006 Agricultural Census').
<http://www.ibge.gov.br/home/estatistica/economia/agropecuaria/censoagro/default.shtm>
- Joslin, Audrey Janann. 2008. Negotiation between conservation and development objectives in agrarian reform settlements in the south of Para, Brazil. Master's thesis: Michigan State University.
- Latuff, Carlos. 2013. Editorial cartoon. *Brasil de Fato*.
<http://www.brasildefato.com.br/>. 2 February 2013.
- Lewis, Jennifer A. 2008. The power of knowledge: information transfer and açai intensification in the peri-urban interface of Belem, Brazil. *Agroforestry Systems* 74 (3):293-302.
- Lockie 2004. "Collective Agency, Non-Human Causality and Environmental Social Movements: A Case Study of the Australian 'Landcare Movement.'" *Journal of Sociology* 40: 41.
- Lorenzi, Harri, and F.J. Abreu Matos. 2008. *Plantas medicinais no Brasil: Nativas e exóticas*. São Paulo: Instituto Plantarum.
- MacArthur, R. H. and Wilson, E. O. 1967. *The Theory of Island Biogeography*. Princeton, N.J.: Princeton University Press.
- Maia, A.C.D., and C. Schlindwein. 2006. "*Caladium bicolor* (Araceae) and *Cyclocephala celata* (Coleoptera, Dynastinae): A Well-Established Pollination

- System in the Northern Atlantic Rainforest of Pernambuco, Brazil.” *Plant Biology* 8: 529-534.
- Marchi, Moisés Breno. 2012. William Maxwell interview, Frei Gondim Settlement, 14 June 2012.
- Martin, Gary. 1995. *Ethobotany: A Methods Manual*. London: Chapman & Hall.
- Martinez-Alier, J. 1995. “In Praise of Smallholders.” *The Journal of Peasant Studies*. Vol. 23, No. 1: 140-148.
- Martins, S.S. 2012. William Maxwell interview, Frei Gondim Settlement. 18 June 2012.
- Martins, J. D. 2002. “Representing the peasantry? Struggles for/about land in Brazil.” *Journal of Peasant Studies* 29 (3-4):300-+.
- Von Martius, C.F.P., Eichler, A.W.E., Urban, I. 2005 [1840-1906]. <http://florabrasiliensis.cria.org.br/index>. This is an online-version of a 15-volume Brazilian flora published between 1840 and 1906, which contains 22,767 species and comprises 10,367 pages. Munich, Leipzig, and Oldenbourg: Numerous publishers.
- Maxwell, William C. 2002. “Coffee growing rooted in time-honored process.” Feature on the Malinal coffee plantation, *município* of Xalisco, Nayarit, Mexico. *The Taos News*. May 2-8, 2002.
- Miranda, Mário. 2012. William Maxwell 5 June 2012 interview with national Production Sector member Mário Miranda, São Paulo MST Headquarters. As per IRB guidelines, all informant names have been changed to protect confidentiality.
- Missouri Botanical Garden. 2012 and 2013. <http://www.tropicos.org>.
- Missouri Botanical Garden Library. 2012 and 2013. <http://www.botanicus.org/>.
- Monteiro, JM, Marcelo Alves Ramos, Elcida de Lima Araújo, Elba Lúcia Cavalcanti Amorim, and Ulysses Paulino Albuquerque. 2011. “Dynamics of medicinal plants knowledge and commerce in an urban ecosystem (Pernambuco, Northeast Brazil).” *Environmental Monitoring and Assessment* 178: 179-202.
- Movimento Sem Terra. 2012. “Número de famílias assentadas para fins de Reforma Agrária vem caindo.” <http://www.mst.org.br/node/13232>. Rerun of 10 April 2012 *Brasil de Fato* article by Aline Scarso. (*Brasil de Fato* article: “E a reforma agrária, Presidente Dilma?” <http://www.brasildefato.com.br/content/e-reforma-agr%C3%A1ria-presidenta-dilma>). 20 April 2012.
- Movimento Sem Terra. 2009. “Associação 21 de Novembro.” On web page: “Experiências atuais de cooperativas - REGIÃO NORDESTE,” “Nossa Produção”

- Section, MST Brazil web site. <http://www.mst.org.br/node/8615>. 17 November 2009.
- Movimento Sem Terra. 2009. "Organização." <http://www.mst.org.br/taxonomy/term/330>. 10 July 2009.
- Neil, C., & Tykkyläinen, M. 1998. *Local Economic Development : A Geographical Comparison of Rural Community Restructuring*. University Press.
- Netting, R. McC. and M.P. Stone. 1996. "Agro-diversity on a farming frontier: Kofyar smallholders on the Benue plains of central Nigeria." *Africa* Vol 66, No. 1: 52-70.
- Netting, Robert McC. 1993: *Smallholders, Householders: Farm Families and the Ecology of Intensive, Sustainable Agriculture*. Stanford: Stanford University Press.
- Netting, R. McC. 1977. «Maya subsistence: mythologies, analogies, possibilities.» In Culbert, T P (ed.), *The Origins of Maya Civilization*. Albuquerque: University of New Mexico Press, Albuquerque, 299-333.
- Neumann, Roderick P. 1998. *Imposing wilderness : struggles over livelihood and nature preservation in Africa / Roderick P. Neumann, California studies in critical human geography: 4*. Berkeley : University of California Press.
- Neves, Antonio Garcia. 2012. William Maxwell interview, Frei Gondim Settlement, 21 June 2012.
- De Oliveira, Eliane Contreras e Cida. 2013. "Mandioca superpoderosa (anti-stress e antibarriga!)." <http://boaforma.abril.com.br/dieta/aliados-da-dieta/mandioca-stress-barriga-520543.shtml>. Last accessed 15 March 2013.
- Oliveira, Juliana Souza, De Lira, P.I.C., Maia, S.R., Sequeira, L.A. de S., de Amorim, R.C..A, and Batista Filho, M. 2010. "Insegurança alimentar e estado nutricional de crianças de Gameleira, zona da mata do Nordeste brasileiro." *Revista Brasileira de Saude Materno Infantil*. Vol. 10, No. 2, pp. 237-245.
- Otsuki, K. 2011. "Sustainable partnerships for a green economy: A case study of public procurement for home-grown school feeding." *Natural Resources Forum* 35 (3):213-222.
- Perfecto, I., Vandermeer, J.H., Wright, A.L. 2009. *Nature's Matrix: Linking Agriculture, Conservation and Food Sovereignty*. London and Sterling, VA: Earthscan.
- Pereira, A. W. 1992. Agrarian-Reform and the Rural Workers Unions of the Pernambuco Sugar Zone, Brazil 1985-1988. *Journal of Developing Areas* 26 (2):169-192.

- Pinto, Erika de Paulo Pedro, M.C. de M., A. Furlan. 2006. "Conhecimento popular sobre plantas medicinais em comunidades rurais de mata atlântica – Itacaré, BA, Brasil." *Acta Botânica Brasilica* 20(4): 751-762.
- Possas, M.C., Marcus M. Correa; Geber B. de A. Moura; Fabrício M. O. Lopes; Anildo M. Caldas; Robertson V. de P. Fontes Júnior. 2012. "Zoneamento agroclimático para a cultura do pinhão-manso no estado de Pernambuco." *Revista Brasileira de Engenharia Agrícola e Ambiental*. Vol. 16, No. 9.
- Pyburn, K. Anne. 1998. "Smallholders in the Maya Lowlands: Homage to a Garden Variety Ethnographer." *Human Ecology* Vol. 26, No. 2: 267-286.
- Robbins, Paul. 2007. *Lawn people: How grasses, weeds, and chemicals make us who we are*. Philadelphia: Temple University Press.
- Robbins, Paul. 2004. *Political ecology: A critical introduction*. Malden, MA: Blackwell Press.
- Rogers, Thomas D. 2010. *The deepest wounds : a labor and environmental history of sugar in Northeast Brazil*. Chapel Hill: University of North Carolina Press.
- Salles, Walter 2001. *Behind the Sun* (original: *Abril despedaçado*). (Film). Director Walter Salles. José Dumont, Rodrigo Santoro. Bac Films et al. (USA: Miramax.)
- Schwartz, Stuart. 1985. *Sugar Plantations in the Formation of Brazilian Society: Bahia, 1550-1835*. Cambridge: Cambridge University Press.
- SelfNutritionData. 2013. <http://nutritiondata.self.com/facts/fruits-and-fruit-juices/2029/2>. Accessed 5 April 2013.
- Sigaud, Lygia, Hernandez, Marcelo, and Rosa, Marcelo C. 2010. *Ocupações e acampamentos: Sociogênese das mobilizações por reforma agrária no Brasil*. Rio de Janeiro: Garamond.
- Silva, Ednaldo da. 1985. *Peasant production, labor reserve, and the food economy of northeast Brazil*. Thesis (Ph D), University of California, Berkeley, 1985.
- Silvano, R. A. M., S. Udvardy, M. Ceroni, and J. Farley. 2005. "An ecological integrity assessment of a Brazilian Atlantic Forest watershed based on surveys of stream health and local farmers' perceptions: implications for management." *Ecological Economics* 53 (3):369-385.
- Simpson, B.B., Ogorzaly, M.C. 2001. *Economic Botany: Plants in our World*. Boston: McGraw-Hill.

- Slinger, V. A. V. 2000. Peri-urban agroforestry in the Brazilian Amazon. *Geographical Review* 90 (2):177-190.
- Stein, Stanley J. 1985. *Vassouras : a Brazilian coffee county, 1850-1900*. Princeton, N.J.: Princeton University Press.
- Stone, G.D. 1998. "Keeping the Home Fires Burning: The Changed Nature of Householding in the Kofyar Homeland." *Human Ecology*. Vol. 26, No. 2.: 239-265.
- Teixeira, Francisco M.P. 2012. *História Pernambuco*. São Paulo: Editora Ática.
- Telles, Edward E. 2004. *Race in Another America: The Significance of Skin Color in Brazil*. Princeton: Princeton University Press.
- USDA Plants Database. 2012 and 2013. <http://plants.usda.gov/java/>.
- Wikipedia (Portuguese). 2013: "Gameleira (Pernambuco)." http://pt.wikipedia.org/wiki/Gameleira_%28Pernambuco%29
- Wikipedia (Portuguese). 2013. "Mesorregião da Mata Pernambucana." http://pt.wikipedia.org/wiki/Mesorregi%C3%A3o_da_Mata_Pernambucana. Accessed 16 March 2013.
- Wittman, Hannah. 2010. Agrarian Reform and the Environment: Fostering Ecological Citizenship in Mato Grosso, Brazil. *Canadian Journal of Development Studies* 29 (3-4):281-298.
- Wolford, Wendy. 2010. *This Land is Ours Now : Social Mobilization and the Meanings of Land in Brazil* Durham, N.C.: Duke University Press.
- Wright, Angus Lindsay, and Wendy Wolford. 2003. *To Inherit the Earth : The Landless Movement and the Struggle for a New Brazil*. Oakland: Food First Books.
- Zimmerer, Karl S. 1996. *Changing Fortunes: Biodiversity and Peasant Livelihood in the Peruvian Andes*. Berkeley: University of California Press.

Appendix: Ethnographic interview questions

Questions I posed to 20 farmers on the Frei Gondim Settlement follow.

1. What is your name?
2. What is your age?
3. What is your parcel number?²⁰⁸
4. What are the three most important crops you grow for sale?
5. What was the total harvest (weight) and income from each crop in the last 12 months?
6. What are the three most important plants you grow for household use?
7. What are other sources of income that you have?
8. Does your family collect any form of government assistance?
9. If so, what kind, and how much?
10. What family members live in this house? (E.g. Myself, my wife, two sons, a daughter-in-law, and two grandchildren)

I conducted more extensive interviews with 13 of the above farmers. In addition to the above questions, I asked them:

1. What are the environmental effects of your agricultural practices, compared to those of the neighboring sugar plantation?
2. How long have you been on the settlement?
3. What brought you to the settlement?
4. What kind of work did you do before arriving on the settlement?
5. What kind of work did your parents do?
6. Did they own their own land?
7. Are you a member of the MST?
8. What is your opinion of the MST?

Since I conducted semi-structured interviews, I asked various informants follow-up questions, based on the nature of the answers I received to the above questions.

²⁰⁸ When the settlement was founded in 1994, it was split into 194 lots for the settlement families. Settlers make use of their parcel numbers in dealings with officers in the producers' association. The parcel number also becomes part of the settler's mailing address.