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AGRARIAN CHANGE, AGROECOLOGICAL TRANSFORMATION AND THE COFFEE CRISIS IN COSTA RICA

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AGRARIAN CHANGE, AGROECOLOGICAL TRANSFORMATION AND THE COFFEE CRISIS IN COSTA RICA

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in

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by

Nicholas L. Babin

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ABSTRACT

AGRARIAN CHANGE, AGROECOLOGICAL TRANSFORMATION AND THE COFFEE CRISIS IN COSTA RICA

by

Nicholas L. Babin

Between 1999 and 2005 the deregulation of the international coffee commodity chain produced both a coffee crisis, characterized by the lowest prices ever for coffee farmers in producing countries, as well as a coffee boom within consuming countries as "the latte revolution" took shape. This research seeks to understand how social, economic and environmental change have unfolded in the producing country of Costa Rica following this coffee crisis. The impacts of two resistance strategies that peasant coffee farmers and their allies have deployed in the face of this crisis are tested: participation in Fair Trade marketing networks and the adoption of agroecological farming practices. Over six years of ethnographic community-based fieldwork, more than 70 agrobiodiversity inventories, archival research, semi-structured interviews, numerous farmer focus groups as well as a randomized survey of more than 100 farm-households were the main methodologies utilized to gather data for this research project.

I find that Fair Trade price premiums were inconsequential in providing support for smallholder resistance to the coffee crisis in Costa Rica. I find pivotal, the role played by Costa Rican governmental institutions in a successful agroecological transition that reduced external input costs. This is significant because the process took place amidst the backdrop of “roll-back neoliberalism” characterized by privatization and declining state involvement in the provision of services. With no market, not even a “fair” one, able or willing to provide the training and unique resources these smallholders needed, the state not only stepped in, but was successful according to the results of this study. With innumerable environmental, social and economic spillover effects of this transition process accruing at several scales, the results of this study argue for the creation or redirection of state-led institutions with the power and support to conduct agroecological research and training, especially in the de-technification transitional process to low-external input agriculture.

Dedication

I dedicate this dissertation to my mother Joyce Avignon-Hamilton. Without your loving kindness, support and encouragement none of this would have been possible. The curiosity and love of knowledge that motivated the questions posed in this research project are a result of the many museum visits, "historical" road trips and science projects that we carried out together. The thirst for justice and love of nature that inspired me to finish what at times felt to be an overwhelming task flows from connections made during the hikes, backpacking trips and heart-to-heart conversations I have enjoyed with you. Here's to many more.

Acknowledgments

First and foremost I wish to acknowledge the members of the Sustainable Group of coffee farmers from Agua Buena, Costa Rica, as well as all of the Agua Buena farm-families not in the group who agreed to collaborate in this research.

In Costa Rica I especially wish to thank the entire Jimenez-Herrera family; *w*ithout their wisdom and guidance this project simply would not have happened. Darryl Cole-Christiansen offered priceless advice upon my first visit to the community of Agua Buena which shaped the direction of this project. My research assistant Jose Zenon Gomez Guttierez is an amazing farmer, ethnobotanist, carpenter and preacher. Thank you Zenon! Jose Garcia, a Californian by birth, Mexican by blood, and "Tico" by association has been and always will be a friend and collaborator.

In Santa Cruz I have been incredibly blessed to count on many amazing individuals as teachers, mentors and friends. Roberta Jaffe, Executive Director of the Community Agroecology Network (CAN), saw enough in this scruffy undergraduate activist to provide the ongoing direction and motivation that has led to the completion of this dissertation project. My principal adviser, Dr. Stephen Gliessman, introduced me to the community of Agua Buena and has offered me intellectual support and personal guidance at every stage of the journey. My other dissertation advisors, Drs. Jeffrey Bury and Jonathon Fox, have both, in their own way, contributed substantially to my development as a scholar.

I feel truly blessed to count on so many colleagues and friends from my years at UCSC; John Lingman, Hillary Saunders, Troy Henri, Joey Smith, Ian Bailey, Annie Shattuck, Sara Emery, Tony LoPresti, Esther Rojas, Heather Putnam, Brian Dowd-Uribe, Amy Concilio and Sean Gillon are just a few of the many who made my time here fun and stimulating.

Drs. Ernesto Méndez and Christopher Bacon shared research methodologies and experiences that greatly helped shape this project. Raul Diaz designed the database utilized to store the data from this research. Generous financial support for this research was granted by the Pacific Rim Research Foundation, the Center for Tropical Research in the Environment, Agriculture and Development (CenTREAD), the Center for Agroecology and Sustainable Food Systems (CASFS), UC Santa Cruz's Graduate Division and the Environmental Studies Department at UC Santa Cruz.

Finally, I wish to thank Sarah Carvill for all of the love and support in this last year of the write-up. You are my hero!

Chapter 1.
Peasants, Crisis and Resistance: Overview, Background and Conceptual Framework

Introduction: research motivations

The persistence of peasant forms of household production in many countries of the developing world parallels chronic agrarian crises of food, labor and land characterized by food riots, rural displacement and rising income inequalities (Bello 2009 Holt-Jimenez, et al 2009). Researchers and activists have pointed out key vulnerabilities in the conventional paradigm of neoliberal agricultural development, calling into question the project's worth as a model for the millions of resource poor farm-households in the global south. This has dovetailed efforts by transnational agrarian social movements of rural workers and farmers, as well as food-system advocates, informed consumers and progressive non-governmental organizations, in the revival, adaptation and creation of new models of agricultural development which challenge the conventional, historical relations between capital, nature and agriculture (McMichael 2004). Increasingly, sustainable agriculture and access to alternative, value-added food networks like Fair Trade have been promoted as measures that can reduce producer vulnerability to increasingly common shocks like natural disasters and price crises (Holt-Gimenez 2002; Bacon 2005; Mendez, Bacon et al. 2006).

International development institutions have begun to assess the merits of these alternative models of agricultural development as the evidence of conventional agriculture's failings mounts. A 2008 report sponsored by the World Bank, the Global Environment Facility (GEF) as well the United Nations[1], "The International Assessment of Agricultural Knowledge, Science and Technology for Development" (IAASTD), contains a frank account of the accomplishments as well as shortcomings of conventional agricultural development and advises continued and increased support for the research and development of sustainable food systems (IAASTD 2009). Smallholder agriculture was flagged as a crucial sector in need of financial and logistical support, especially in the building of resiliency to crisis through on-farm diversification, adoption of sustainable agricultural practices and participation in value-added alternative markets. While a body of research evaluating farm-household experiences with these types of programs does exist, the number of programs and agricultural systems evaluated to date is extremely low compared to the great diversity of peasant agricultural systems and the sheer magnitude of both alternative marketing initiatives and potential sustainable agricultural practices.

The evaluation of the impacts of sustainable agriculture and alternative markets on reducing vulnerability to the "coffee crisis" in Costa Rica (Chapters 4-6) fills this

[1] Five UN agencies took part in the assessment; the Food and Agriculture Organization (FAO), the UN Development Program (UNDP), the UN Environment Programme (UNEP), the UN Educational, Scientific and Cultural Organization (UNESCO) and the World Health Organization (WHO).

dissertation's applied research goal of assessing the impacts of recent strategies of resistance by peasants and their allies. Unpacking the historical and material mechanisms and logics behind these recent responses to the coffee crisis (Chapters 2-4) also contributes to this dissertation's theoretical task of better understanding the grounds for peasant persistence in the face of agrarian crises. This dissertation's case study aims to deepen our understanding of why and when classical theories of agrarian transition fail, how they might then be analytically reconfigured, as well as suggests the inclusion of moral economic and agroecological dynamics into macro-level historical-materialist accounts of agrarian change.

Overview: dissertation organization

Over six years of ethnographic community-based fieldwork, more than 70 agrobiodiversity inventories, archival research, semi-structured interviews, numerous farmer focus groups as well as a randomized survey of more than 100 farm-households were the main methodologies utilized to gather data for this research project. I attended 4 general assembly and 7 monthly board of director meetings at the CoopePueblos Cooperative. I also attended the annual general assembly of CooCafe, the second level exporter of Costa Rican Fair Trade certified coffee. The day-to-day routines of rural work and idle chat became the sites where I was able to gather Agua Buena resident perceptions and knowledges surrounding agriculture, class, the environment and landscape change. The following is the organizational structure for the remainder of this thesis, along with the main research question (s) or hypothesis evaluated within each chapter, and the principal findings.

Chapter 2: The Agrarian Question in Costa Rica: 1800-1980

<u>How did the agrarian transition to capitalism unfold within Costa Rica and what factors and dynamics have contributed to the contemporary persistence of the coffee producing peasantry?</u> In chapter two, the history of agrarian class relations within the Costa Rican coffee sector between 1800 and 1979 are outlined and the role of coffee production in priming the development of capitalist relations in society is explored. This chapter also uncovers the historical foundations for the contemporary persistence of the Costa Rican coffee producing peasantry that is at the heart of the community case study found in Chapters 4-6. The pro-smallholder politics of the post-revolution Costa Rican state, combined with the unique and historically contingent relations that have developed between landed agrarian and industrial capitalist classes and the peasantry, have led to an agrarian class structure which lacks a substantial landed capitalist coffee producing class. Instead agrarian capital has relegated itself to the processing and input spheres. This suggests that when evaluating the agrarian question in Costa Rica that "instead of looking at capital as a dynamic force at work in a static setting we should acknowledge that the dynamism of the setting has been a conditioning factor in the development of capitalism" (Goodman and Redclift 1981; p, 213).

Chapter 3: Structural Adjustment, Neoliberalism and the Persistence of the Costa Rican Peasantry: 1980-2009

What have been the macro-structural factors, as well as farm-household and institutional strategies, that have contributed to the contemporary persistence of the coffee producing peasantry in Costa Rica in the face of the coffee crisis? Chapter 3 historically contextualizes the neoliberal turn and the dispossession and political and economic subordination of the Costa Rican basic grain producing peasantry in the 1980's; product of structural adjustments and the ascendency of a non-traditional export (NTE) model of agricultural development. I contrast this with the current persistence of the Costa Rican coffee sector peasantry through the millennial coffee crisis, and find that this persistence is partially due to what I argue has been an uneven, incomplete and job poor process of recent industrialization shaped and exploited by international finance capital, and so incapable of providing a viable livelihood alternative.

Together, the analyses of historical contingencies and contemporary vulnerabilities within global capitalism as well as the Costa Rican coffee sector that are undertaken in Chapters 2 and 3 of this dissertation identify land-use change out of coffee and peasant proletarianzation as particularly robust proxy measures of resistance to the hazards that characterized the coffee crisis. These two impacts form the basis of Chapter 4's investigation. Chapter 2 concludes by identifying the key resistance strategies employed by Costa Rican smallholders in the face of the coffee crisis which are evaluated in Chapter's 5 and 6; alternative marketing and external input reduction/ agroecological transformation.

Chapter 4: The Coffee Crisis, Peasant Resistance and Class Differentiation in Agua Buena, Costa Rica between 2000 and 2009

1. How did processes of Costa Rican coffee sector land-use change advance between the years of 2000 and 2009 and how did experiences differ between the Sustainable Group (SG) and the Control Group (CG) from Agua Buena, Costa Rica?

2. How did processes of Costa Rican coffee sector class differentiation advance between the years of 2000 and 2009 and how did experiences differ between the SG and CG? Chapter 4 forms the first of three community-scaled, comparative case study chapters while at the same time also representing a conclusion to the previous two macro-scale chapters focused on agrarian change and class differentiation in the Costa Rican coffee sector since 1800. It forms the intellectual, conceptual and organizational hub of this dissertation, due to the transitional role it plays in bridging the multiple methodological and analytical approaches of the project.

This chapter documents the effects of the coffee crisis on the district of Agua Buena and finds that the impacts have been many and varied; they include increased unemployment, out- migration and poverty, as well as dramatic landscape level environmental changes as the region as a whole has transitioned to the dominance of extensive pasture agroecosystems. Chapter 4 reveals that within a randomly selected Control Group (CG) of eighty one out of an approximate total 1702 year 2000 farm-households (INEC 2000) located within the district of Agua Buena, Costa Rica, fully 27 (35%) had sold or abandoned their farms and migrated out of the district by 2009. Among the 54 farm-households that remained, only 24% of the total farm-area that was dedicated to coffee in the year 2000 persisted through the year 2009, while extensive pasture systems increased in area by over 250% during the same time period. This has had significant repercussions on the ability of agriculture to provide a livelihood for smallholder farm-families because while coffee generates around 130 labor-days per hectare in Costa Rica, cattle farms require only six (Evans as cited in Luetchford 2008; 198).

This drastic change in land-use also translated to substantial changes in the class configuration of the CG sample as while 72% of the CG farm-households were considered peasant commodity producers[2] in the year 2000; by 2009 this had decreased 27% to 45% of all households. This was accompanied by a 23% gain in the semi-proletariat commodity producer class[3], which rose from encompassing just

[2] In Chapter 4 I define peasant commodity production as that form of household production where family labor predominates and is dedicated to unremunerated on-farm production of coffee and subsistence crops, while wage labor is seldom hired or sold.

[3] In Chapter 4 I define the semi-proletariat commodity producer class as that form of household production that relies mainly on off-farm wages for household reproduction but unremunerated family labor is also dedicated to on-farm production that focuses on subsistence crops and to a lesser extent coffee.

an estimated 15% of the total farm-household population of Agua Buena in the year 2000 to accounting for fully 38% of the farm-households in the district by 2009.

In contrast, within the Sustainable Group (SG) of fifty randomly selected farm-households out of sixty-one total members of the group in the year 2001, none had sold or abandoned their farms between 2000 and 2009. In addition, fully 82% of the total farm-area that was dedicated to coffee in the year 2000 SG sample persisted through to the year 2009, while the proportion of farm-households considered peasant commodity producers only decreased 12%, from 68% to 56% of the total fifty SG farm-households sampled.

The persistence in coffee and resistance to class differentiation of the SG documented in Chapter 4 led to the formulation of two hypotheses (detailed below) utilized in the subsequent two chapters to explain the drastically different experiences of land-use and agrarian change experienced by the SG and CG.

Chapter 5: Fair Trade and Beyond? Alternative Marketing, Accountability and Debt

Chapter 5 tests the first hypothesis generated in Chapter 4, that <u>higher farm-gate prices resulting from the SG's connection to Fair Trade and direct markets explain their persistence in coffee.</u> The investigation finds that the SG's participation in Fair Trade and direct-trading networks only minimally increased farm-gate price earnings and so can only slightly account for the SG's persistence in coffee and resistance to class differentiation that was documented in Chapter 4. This failure of alternative markets to increase farm-gate prices is found to be due to a lack of transparency and accountability[4] (Fox 2007) between the larger Fair Trade governance structure, the management of CoopePueblos, their smallholder membership and CAN.

In the last harvest year studied, 2008/2009, the CoopePueblos farm-gate price return was more than $0.15 a pound less than the national average coffee production costs per pound. One way to reduce this shortfall, as well as to explain the SG's persistence in coffee, is the agroecological transformation of production, especially when this transformation is accompanied by a reduced need for formerly purchased external inputs, as well as a heightened ability to provide necessary subsistence for the farm-households managing them. This becomes the focus of Chapter 6's investigation.

Chapter 6: Self-provisioning and Functional Diversification following the Coffee Crisis

Chapter 6 tests the second hypothesis generated in chapter 4, that <u>the agrobiological and structural diversification of SG coffee agroecosystems led to the emergence of structures and functions that maintained production while heavily reducing or</u>

[4] In essence the relations between the second level Fair Trade export cooperative (CooCafe) and CoopePueblos, considered as "opaquely" instead of "clearly" transparent and with "soft", instead of "hard" accountability (Fox 2007), were reproduced in the relations between CoopePueblos, it's membership and CAN. More on this in the epilogue.

eliminating costly external inputs and providing crucial subsistence food. In this chapter the coffee agroecosystems of Agua Buena are evaluated for their level of resistance and resilience to the economic and environmental pressures pushing the abandonment of coffee agriculture. Chapter 6 confirms that the above hypothesized mechanisms do in fact offer the best explanation for the comparative persistence of the SG's peasant family-farmers through the years of coffee crisis.

The combination of low levels in all forms of diversity and the heavy application of chemical fertilizers, herbicides and fungicides in the CG created a highly dependent system with structures and functions comparable to that of industrial agriculture. This high input system was especially vulnerable to a price "disruption" and when coffee prices dropped to depths never before experienced, many farmers simply pulled the agro-chemical plug and abandoned the system. This was the systems "threshold" point, the elimination of highly un-sustainable off-farm inputs. The abandoned systems had very little resistance and no resilience, and soon fell apart, losing their highly subsidized "stability" and succumbing to disease and eventual transformation. This has resulted in a significant reduction in the class of farm-households that make a living primarily from on-farm agriculture, as well as dramatic landscape level environmental changes, as erosion, flooding and biodiversity loss have accompanied this regional transition to extensive pasture agroecosystems. Mirroring the ecological conditions of the farm, household livelihoods lacked resilience and resistance, which is to say they were vulnerable (Eakin and Luers

2006). This was due to heavy reliance on one export crop and high levels of purchased inputs. This led to increasing poverty and massive out-migration.

However, the SG provides an example of how to foster resistance and resilience to economic crisis and social-economic change. And while the simple production squeeze may explain the CG experience, it cannot explain how the SG farm-households preserved 80% of their coffee, increased subsistence production, and worked even more on their farms between the years of 2000 and 2009. The persistence of the SG is due to a “subsistence logic” which explains why these peasant households persisted through restructuring events in the greater political economy. In certain circumstances, like during commodity price crises that drastically reduce the terms of trade for poor peasant producers, the self exploitation of family labor and the deployment of labor intensive “sustainable” agricultural techniques provide an explanation for peasant persistence.

Background: the coffee crisis

In July of 1989 one of the oldest and most successful worldwide commodity trading accords, the International Coffee Agreement (ICA), collapsed. In 1902 Brazil became the first country to sign onto the ICA and by 1962 almost all producing and consuming countries had joined. The ICA set a target price and managed supplies with a country by country export quota system to keep the international market within a reasonable “price band” deemed necessary considering the significant impact of coffee production on the national balance of payments and rural stability in many countries of the "developing" world (Ponte 2002). While coffee promotion boards located in these producer countries enjoyed considerable influence in the marketing of global coffee production under the ICA era, post-ICA they lost most of their regulatory power to trading houses, many of them housed in consuming countries under private ownership. This ensured that a substantial piece of the coffee pie that once remained in producing countries now flowed to roasting and consuming countries, chief among them the U.S. (Daviron and Ponte 2005).

Transnational roasters and traders wasted no time in taking advantage of the new terms left in the regulatory vacuum. Newly allowed intra-firm coordination led to increased mergers and fostered the creation of new economies of scale which lowered costs and promised to bump up profits through the expansion into new markets and, as described below, the acquisition of new supplies of cheap coffee beans. By 2005 the global coffee supply chain consolidated to the point where two companies, Nestle and Phillip Morris, controlled the roasting and retailing of a full 50% of all worldwide coffees. This oligopoly in the roasting sector has also contributed to the loss of total revenues going to coffee producers versus other actors in the chain, which has shrunk from 20% to 10% in the last 20 years. (Daviron and Ponte 2005).

The loss of quotas and sectoral consolidation, combined with overproduction, soon resulted in a prolonged price drop as the International Coffee Organization (ICO) five-year indicator price averaged US$0.77 per pound between 1990 and 1994, compared to an average of $1.34 per pound for the five years prior to the ICA's demise (Daviron and Ponte 2005). After a short epoch of stabilization due to a freeze in Brazil[5], prices soon fell to their lowest real amounts in over one hundred years, further complicated by a rabid boost in speculative trading on the coffee futures market (Ponte 2002). The average ICO composite prices fell to $0.56 in 2000 and to an all time low of $0.42/ pound in 2001. The year 2000 would be the first of five "coffee crisis" years, a development disaster that included hunger, homelessness, school drop-outs and increased immigration through Mexico from Central and South America, as well as rural-urban migration (Varangis, Siegel et al. 2003; Lewis and Runsten 2006; Mendez, Bacon et al. 2006). With coffee providing a livelihood to over 100 million people worldwide, a development disaster unfolded as coffee farmer livelihoods and landscapes soon became some of the biggest and most widespread victims of the neoliberal political and economic project (Bacon 2005).

[5] It is common for Costa Rican coffee farmers to comment that "When Brazil sneezes, everyone gets sick", which expresses both the reverence and powerlessness they feel before the sheer market power wielded by Brazilian production; and the impact of this on global coffee commodity prices.

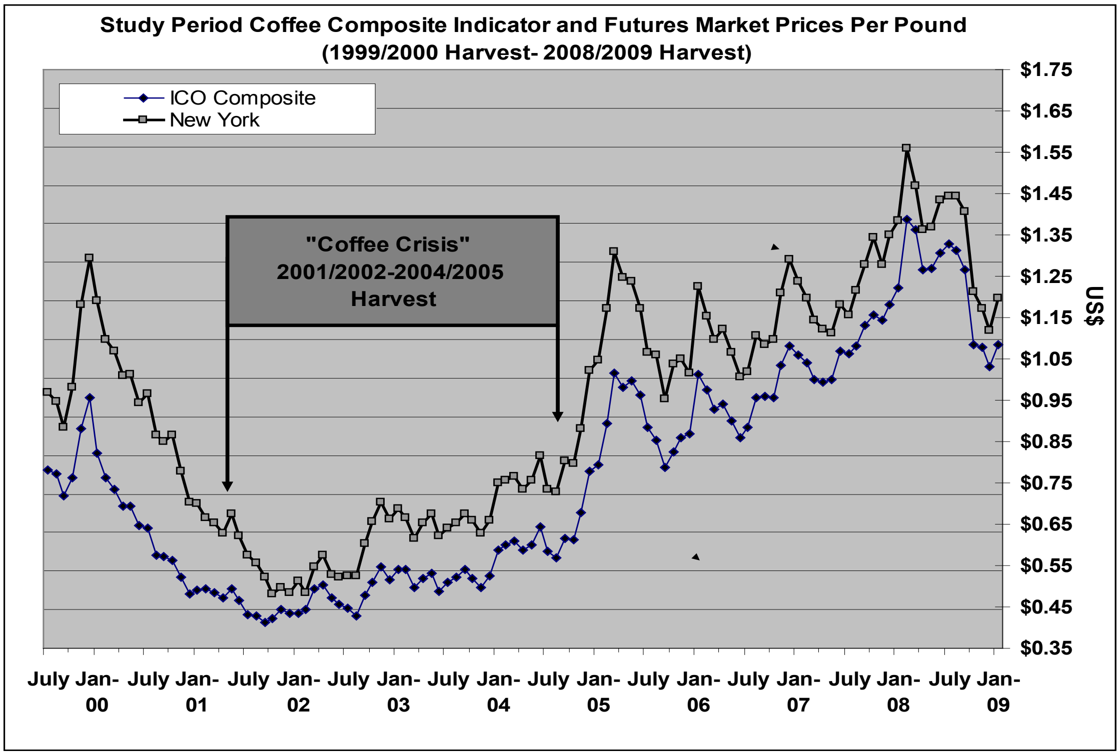

Figure 1.1. ICO composite and NY commodity board coffee prices, 1999-2009. Source: (ICO 2011)

Region	2000-2009 % Change	% Arabica Variety 2009	% Robusta Variety 2009
South America	30%	82.20%	17.80%
India and Southeast Asia	34%	12.75%	87.25%
Central/ Mesoamerica and the Caribbean	-23%	99.20%	0.80%
Africa	-20%	49.40%	50.60%

Table 1.1. Regional coffee production change by variety, 2000-2009. Source: (ICO 2011)

Coffee overproduction

In the wake of unfettered global competition brought on by market deregulation and a comparative advantage of cheap costs of production, Vietnam and Brazil, already the two biggest producing countries in the world, quickly and aggressively increased their production. This coincided with consuming country coffee roasters' increasing willingness to substitute the inferior but higher yielding Robusta variety of coffee grown in these two countries for the higher quality Arabica variety traditionally grown in Central America, Mexico and the Caribbean. The Robusta varieties have other advantages as well, with lower altitude tolerance for growth while being highly amenable to mechanical harvesting. This resulted in the region of Central America, Mexico and the Caribbean suffering the biggest drop in production between 2000 and 2009 when compared to the other three principal worldwide coffee growing regions (see Table 1.1). A closer look at the Central American sub-region of Costa Rica, Nicaragua, El Salvador, Honduras and Guatemala provides a more fine-scale view of the dynamics and impacts of the coffee crisis.

Central American experiences of the coffee crisis

Coffee exports accounted for 11% of Central Americas export revenues in 1999, the year prior to the crisis. They dropped more than 40% between 2000 and 2001, after just the first year of the crisis (Varangis, Siegel et al. 2003). This has frustrated government attempts to manage the national balance of payments as well as generate tax revenue, with significant repercussions on states social-service provision. The crisis also increased both total national debt load as well as the incidence of past-due loans within the coffee sector in each country, hampering the ability of credit markets to serve other sectors of each nation's economy.

The economic and social structure of coffee production in Central America is the prism through which the impacts of this revenue collapse pass and are either magnified or mediated. As you can see in table 1.2, coffee is grown by a large number of smallholding farmers in Central America. Average farm-sizes in 2001 ranged from a high of just under seven hectares per farm in El Salvador, to a low of under two hectares in Costa Rica[6] (Varangis, Siegel et al. 2003). Coffee farms with yearly yields less than 100 quintals made up 80% or more of the farms in the coffee sector of each nation. However, these small-producers' contribution to total national coffee production was sizeable only in both Costa Rica (38%) and Honduras (45%), also the two countries with the largest coffee sector in terms of the number of producers. This signifies that in the remaining Central American countries a relatively small group of large-scale operations has dominated national production.

Employment and the coffee crisis in Central America

In the year 2000, coffee employed more than a quarter of the rural population in the Central American countries of Costa Rica, Nicaragua, El Salvador, Honduras and Guatemala. However, between 2000 and 2002 190,000 permanent coffee jobs were lost in this region, representing a 55% decline, with more than 50% of the remaining permanent labor force now working less than half-time in coffee. In addition 350,000

[6] However, it can be deceptive to judge processes of agrarian class formation and differentiation by farm-size alone, as is commonly done in the neoclassical tradition of economics. Analysts focusing primarily on traditional and easily obtained indicators like average farm size miss the fine scale labor dynamics that Marxian agrarian political economy has revealed as central to any and all types of class analysis; whether agrarian or industrial. In contrast to the traditional approach, the dynamics of farm-household participation in labor markets (as either a buyer and/or seller of labor) forms the basis of the concepts and analytics behind this research's community case-study presented in Chapter 4-6.

seasonal coffee jobs disappeared, representing a 21% decline between 2000 and 2002 (Varangis, Siegel et al. 2003). This collapse in both farm-owner and wage- laborer earnings has had significant impacts on overall economic activity in each nation, especially in the rural regions most dependent on coffee. Documented consequences include hunger, homelessness, school drop-outs and increased international out-migration, as well as within-country rural-urban migration (Varangis, Siegel et al. 2003; Lewis and Runsten 2006; Mendez, Bacon et al. 2006).

Country	# producers	Average Farm Size he)	% Farms Producing Under 100 qq	% Production on Farms under 100 qq
Honduras	90,000	2.9	92	45
Costa Rica	73,707	1.6	90	38
Guatemala	62,649	4.3	80	20
Nicaragua	30,400	3.2	90	14
El Salvador	23,597	6.9	81	10

Table 1.2. Central American coffee producer typology, 2002. Source: (Varangis, Siegel et al. 2003). qq = quintal = 220.46 pounds.

Costa Rica, the coffee crisis and the "agrarian question"

The 1984 census classified 14% of the Costa Rican population as self-employed in agriculture which dropped to 7% by the 2000 census (INEC 1985; INEC 2000). With a relatively small peasant sector that is especially vulnerable to commodity and input price volatility, the Costa Rican peasantry has been steadily disintegrating as the neoliberal transition of the national economy has taken place[7] (Modrego 2006). As

[7] Similarly, a nine-country comparison of Latin American rural-household economic activity found that in the year 2000, 10% of rural Costa Rican households were self-employed in agriculture; the lowest proportion by far found in the study. Other countries such as Nicaragua (34%), Honduras

Costa Rica earned the dubious honor of being the hardest hit major coffee producing nation in Latin America by the coffee crisis in terms of proportion of total production lost between 1999 and 2008, the common assumption has been that depeasantization processes have been accelerated by the deregulation of the coffee supply chain[8](ICO 2011). However these processes, characterized by the movement from the primary to secondary sectors of employment, have not been extensively evaluated in the context of Central America and the coffee crisis; with the political economic analytic of the "agrarian question" having been conspicuously absent from the body of coffee crisis scholarship. The agrarian question is a historical-materialist analytical framework utilized in the political economy literature "to grasp the place of farming and agriculture in emergent and mature capitalist societies" (Akram-Lodhi and Kay 2010; p.179). It is utilized in Chapter's 2 and 3 in order to contextualize historical shifts in the relationship between coffee agriculture and development in Costa Rica that have contributed to the persistence of the coffee producing peasantry. This two chapter case study reveals the role of political-economic and historical-geographical heterogeneity in producing diverse sets of social relations between capital, the state and agrarian classes that have in turn prevented a "simple reproduction squeeze" [9]and

(41%) and Guatemala (34%) all had self-employed agriculturalist sectors more than three times the proportion of Costa Rica's (Modrego 2006).

[8] Heavy losses due to low farm-gate prices and high input costs caused coffee volumes to decline 34% between 1999 and 2008 as Costa Rica dropped to the 14th place national producer in the world (ICO 2011).

[9] The "simple production squeeze" of peasant households engaging in commodity production is caused by simultaneous increasing costs of production and decreasing returns to labor (Watts 1983). This is brought on by the exhaustion of land due to declining fertility, causing peasants to labor more with fewer results. Add to this the modernization of inputs promoted by the state, and households become

the full capitalist penetration of agriculture. This empirical case study of a persistent historical peasantry thus identifies generalizeable social phenomena and structural factors that condition peasant persistence.

Costa Rican peasant resistance strategies to the coffee crisis

Costa Rican coffee scholar Mario Samper recently identified the most common responses of Costa Rican smallholder coffee producers following 1989's deregulation (Samper 2010). They are:

1. Value-added marketing using environmental or social-justice certification.
2. Reduction of wage labor hiring.
3. Adoption of low-external input farming systems.
4. Pruning back of coffee and planting annual crops for household consumption.
5. Inter-planting of additional shade trees, especially fruit trees.
6. Farm-level diversification partially out of coffee.
7. Increased combination of on and off-farm work.
8. Temporary migration for wages.

All of the responses outlined above indicate the flexibility of peasant production units. While the complex interplay between the subsistence and commercial

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increasingly commodititized. Finally, with declining terms of trade between the commodity sold and the commodities purchased by the household, the result is reduced consumption (hunger), intensified production (degradation) or both, eventually leading to the differentiation of the peasantry into an agrarian proletariat. The simple production squeeze and commoditization act as dynamic pressures whereby the over-reliance on one cash-crop or purchased inputs produces the vulnerabilities most sensitive to the hazards of the coffee crisis.

orientation of family-farmed coffee production has been acknowledged (Bacon, Mendez et al. 2008), its formative role, along with that of low-external input sustainable agricultural practices, in buffering price-volatility resulting from supply-chain restructuring is poorly understood (but see Westphal 2008). This dissertation and Chapter 6 in particular aim to improve our understanding of these factors and relationships.

Research on the relationship between neoliberal restructuring of the coffee market and agrarian change must recognize that in many national coffee sectors, including Costa Rica's, smallholder peasant production still dominates. Family farmers grow over 70% of the worldwide production of coffee (Petchers and Harris 2008). However, they often lack direct access to credit and markets and are highly dependent on coffee as their principle source of income, making them especially vulnerable to the price volatility This suggests that access to alternative markets like Fair Trade that promise stable prices and favorable terms for credit could be an important peasant resistance strategy (Bacon, Méndez et al. 2008). While Fair Trade certification has received increasing scrutiny as a resistance to the coffee crisis, more case studies, such as the one offered in Chapter 5 of this dissertation, are needed to understand when and why alternative markets succeed or fail at bolstering peasant livelihoods.

Research approach

In <u>Europe and the People Without History</u> (1982) author Eric Wolf takes mainstream social science epistemology to task; the historians, economists and sociologists are regarded as often employing a static approach full of false categories that serve to carve out disciplines rather than illuminate. He calls for a dynamic approach that considers history not as a "spring" but as a temporally and spatially changeable set of relationships where the world is viewed as a totality, a manifold. He proposes that while it is important for analysts to identify general processes of capitalist development, this must be accompanied by an analysis of the effects of these processes on "micro-populations" (Wolf 1982).

Marc Edelman's 1988 study of Costa Rican peasant grain producer resistance following neoliberal structural adjustment demonstrates how social scientists can and should link different scales of analysis when examining local reactions to broader nation-state and global political economic processes (Edelman 1990). Edelman calls special attention to how local political cultures and historical agrarian identities mediate on the ground responses to global economic restructuring phenomena. Although as an anthropologist his primary focus is on local-level subjects, his appeal for connecting "higher" and "lower" levels of analysis is a powerful argument for interdisciplinary, multi-scalar scholarship.

This dissertation's research design reflects the limitations of funding and timing which precluded potentially rich, cross-country comparison[10]. However, my commitment remains to a multi-scalar research strategy. Hence, the overall research is designed as an embedded single case study with multiple levels of analysis. The higher level of analysis in the study is the country of Costa Rica (Chapters 2-4) and the lower level is the district of Agua Buena, Costa Rica (Chapters 4-6). A quasi-experimental, case controlled design research design was utilized in Chapters 4-6 (Campbell and Stanley 1963). The experimental "treatment" in this "natural experiment" was farm-household participation in alternative markets and the conversion process to sustainable coffee agroforestry. The coffee price crisis of 2001-2004, combined with the peak-oil agricultural input price crises from 2004-2007 provided a "natural experiment" to compare the livelihood and landscape impacts of these interventions. Thus this embedded comparative case study design is concerned with assessing and comparing class differentiation and agroecosystem transformation between two Agua Buena cases, a Sustainable Group and a Control Group, that are embedded within the larger case study of agrarian change in Costa Rica.

At both levels the research employs qualitative and quantitative methods to provide a robust and valid rejoinder to the research questions and hypotheses posed. Costa Rica

[10] There are necessary tradeoffs between rich, local interpretations and broader, more comparative and robust accounts within the same project, not to mention limits on funding and the intellectual capacity to juggle multiple scales and moving concepts and still produce a coherent and valuable set of results.

was chosen for this research because it is has a large petty-commodity coffee producing class as well as an industrialized and modernized urban sector that allows for many different outcomes as per differentiation, dispossession or persistence. An interesting story of state intervention in agriculture and fairly evenly distributed land within the coffee sector, Costa Rica was the first Latin American country to default on its loans in the early 1980's and underwent several structural adjustment programs.

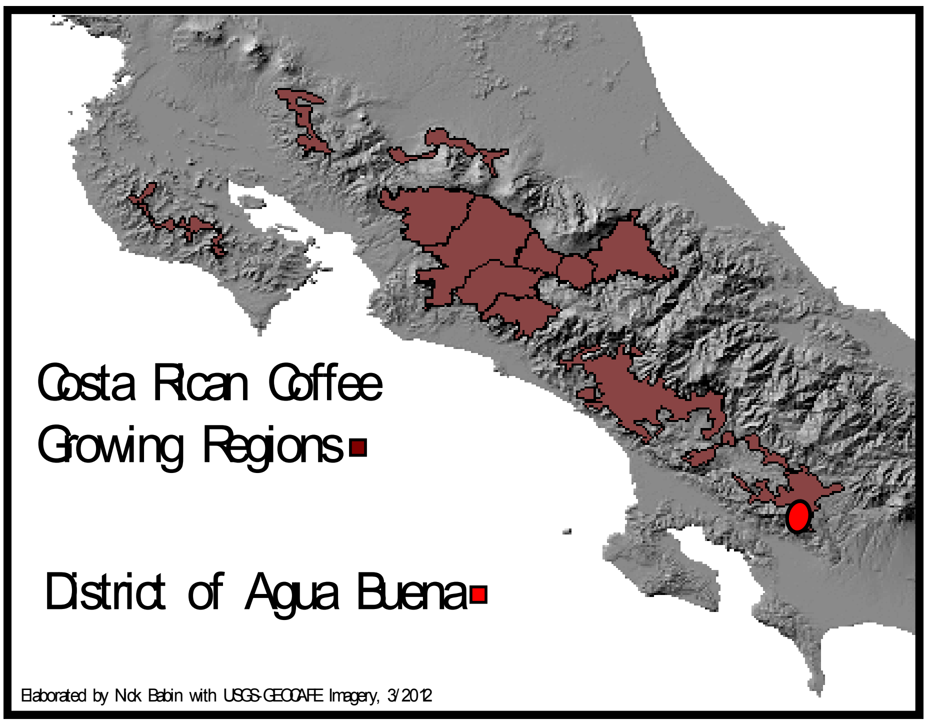

Figure 1.2. Digital relief map of Costa Rica with coffee regions and Agua Buena district highlighted. Source: Elaborated from (USGS 2012).

Settlement of Agua Buena, Costa Rica

Agua Buena, Costa Rica was chosen for the lower level site in this study because prior to the coffee crisis, it was a district highly dependent on coffee production. It is also an ideal site to study agrarian transitions following neoliberal deregulation because of the wide ranging social, economic and agroecological changes that the district has experienced in the last ten years and the existence of a rural economy organized at the farm-household. Most importantly, it is also home to a producer cooperative and farmer association that have articulated the resistance strategies of alternative markets and agroecological transformation that are the focus of this research.

The district of Agua Buena encompasses 6,118 hectares on the border with Panama (Manger 1992). It is the southernmost and smallest of the four districts that make up the county of Coto Brus within the province of Puntarenas[11]. To the south of the highland valley of Agua Buena a limestone escarpment dubbed the Fila de Cal marks the districts southern political boundary, beyond which the land drops abruptly in altitude from the 1000 meter average height of the Agua Buena highlands to the Pacific lowlands at near sea level. This topography has important impacts upon the high amount of rainfall, an average of 3600 mm of rain/year, and the life-zone classification, pre-montane rainforest, of Agua Buena (Daily, Ehrlich et al. 2001; Holdridge 1947).

[11] Coto Brus forms a large valley 100 kilometers long, 20-25 kilometers wide and runs approximately east-west. Its northern border is marked by the Talamanca Mountains, reaching altitudes of more than 3000 meters. The valley floor has an average elevation of 600 meters before rising again to the south, reaching heights of 1500 meters at its southern terminus in Agua Buena. The other three districts in Coto Brus; Limoncito, Saballito and San Vito, have some lands along the southern slopes but the majority of their territory lies in the valley floor and up to the Talamancas. In contrast, Agua Buena is located only in the highlands or altiplano above the slopes along the valleys southern rim, where a small valley straddles the Cordillera Costera.

Coto Brus is one of the seven major recognized coffee producing zones in Costa Rica. Prior to settlement by non-indigenous peoples, the area consisted of dense, neo-tropical, high-altitude rainforest with a high diversity of plant life due to the varying topography and fairly even distribution of rain that it receives. The geomorphology of Agua Buena has mostly volcanic origins. This volcanic material is the product of eruptions of the Chiriqui Volcano some 60 miles away in Panama as well as numerous other volcanic peaks located in the Talamanca range (ICAFE Rojas and ChinChilla 2003). The volcanic Andisole soils sometimes display accumulations of over 130 cm of relatively recently deposited volcanic ash. In general the soils of Agua Buena contain a high level of organic material, and are fairly well suited for coffee agriculture.

The first non-indigenous settlement in Agua Buena took place in 1945, when a well connected engineer from the central valley, Evangelita Romero Fallas, registered a claim for a 4125 hectare plot of “virgin” land which he later sold to Andre Challes, a large-scale coffee producer from the Central Valley, in 1947, (Edelman and Seligson 1994). Other pioneers included Ernesto Araya, owner of 244 hectares in what is today “downtown” Agua Buena, and a Costa Rican-Italian joint enterprise which owned a 253 hectare plot named Finca Metapunto (Manger 1992). In the year 1950, 75 per cent of land in Agua Buena was in the hands of these three landowners. However, by 1960 squatters had invaded nearly all of Challe's uncultivated land. Challe was unable to evict or remove the squatters and soon defaulted on his loan and the National Bank took control of the property (Smith 2007). Upon moving to Agua Buena, many of the squatters took advantage of the altitude, rainfall, and fertile volcanic soil to produce coffee as their primary source of income (Garcia 2005). The National Bank organized the squatters and convinced them to form a coffee cooperative CoopaBuena, the first in Coto Brus. CoopaBuena began with 100 members and as with many Costa Rican cooperatives, when it started, it was already indebted. In exchange for the necessary property and equipment for startup, the founders of CoopaBuena inherited the previous owner's high interest loan (27%) from the *Banco Nacional de Costa Rica* (National Bank of Costa Rica) a practice that was common during the 1960s (Garcia, 2005). The cooperative, along with the Costa Rican land reform agency, the *Institución de Tierras y Colonización* (The Land and Colonization Institute-ITCO), parceled small farm lots from much of the land. ITCO attempted a policy that was common in Costa Rican land invasions, give legal title to the squatters in exchange for their below market price purchase of the land, transferring the resulting funds to the newly formed cooperative to help diminish a portion of the debt (Smith 2007). However, the CoopaBuena squatters refused to pay and the Rural Guard was unable to extract them from the dense, remote forests in which they dwelled. Word spread around Costa Rica and settlers, many of them squatters, continued to stream in from regions lacking available lands. Many of these squatters were landless migrant coffee and banana plantation workers.

Coffee agriculture and the green revolution in Agua Buena

Opened to settlement a little over 50 years ago, the area became the nation's highest-yielding coffee growing region in the country by the early 1990s (Cole-Christensen 1997). From 1973-1984, primary forest cover in Coto Brus dropped from 31,660 hectares (69,652 acres) to 7,577 hectares (16,669 acres), or a 76.1 percent reduction (Manger 1992). In 1984, more than 82% of the *canton's* 3,179 farms grew coffee, and coffee accounted for 99.8% of the area planted in permanent crops (Rickert 2005). Agua Buena was then and still is one of the most remote regions in Costa Rica, far from major markets, and has been dominated by cattle ranching and coffee farming for almost all of it's young existence as an agricultural center. In the early 1960's ICAFE introduced the "green revolution" technified coffee package to Agua Buena which included the hybrid-dwarf *Caturra* variety. Many of the settlers to Agua Buena had little to no previous experience with coffee agriculture and adopted this system readily; by 1999 most of Agua Buena production was characterized by limited shade, over 7000 coffee shrubs planted per hectare, high agrochemical use and yields between 35-60 fanegas per hectare (D. Cole, personal communication, May 15 2009). Chemical inputs increased over time to boost yields, kill weeds and control fungal diseases that were common in the area, particularly coffee leaf rust and *ojo de gallo* (*Mycena citricolor*). Prior to the coffee crisis, many farms in Agua Buena were totally devoted to coffee production. These monocultures were potentially much more vulnerable and less resilient to a severe and prolonged price collapse. This form of shade-less, monoculture production also left the ground unprotected and susceptible to nutrient and mineral loss as well as soil erosion.

The formation of the Sustainable Group

As coffee prices dropped and input costs increased, many producers were forced to minimize their use of chemical inputs, especially fertilizers. This was the inspiration for the formation, in 1999, of the “Sustainable Group” of farmers organized within the CoopaBuena producer cooperative. The Sustainable Group (SG) has promoted agroecological diversification as a strategy to build agroecosystem resistance to future economic and ecological disturbances. The program has been characterized by two main approaches. The first approach involves self-provisioning through diversifying the structure and function of shade trees as well as intercropping annual subsistence crops in the coffee fields (Chapter 6). The second approach involves diversifying the agricultural activities and land-uses of the farm outside of coffee as well as diversifying off-farm sources of livelihood (Chapter 4). In Chapters 4 and 6, I assess these two approaches through the quasi-experimentally designed, comparative case study of Sustainable Group and non-group farm-households. In particular, I compare farmer land-use change and coffee agroecosystem diversity between the SG and a Control Group of randomly selected farm-households. This will provide a much needed evaluation of the effectiveness of agroecological conversion programs as well as provide a baseline assessment that will be used for comparison with other studies in different countries, as well as form the basis for a program of longitudinal research on agrodiversity change (Bacon 2005; Méndez 2007).

CAN and the direct-market

In 2003 the SG established a direct marketing partnership with a U.S NGO, the Community Agroecology Network (CAN), which returned over $3 per pound net profit to the cooperative instead of the conventional market's $0.50 per pound. The additional profit was generated with the intention of supporting the SG's agroecological transition. However, Costa Rican cooperative law required that all profits be distributed equally among the membership, and with the direct market only representing one percent of the 700 member cooperative's sales, the increased return to individual SG farm families was negligible.

Soon that would all change as the drop in global coffee prices, combined with a processing accident, hindered CoopaBuena's ability to repay outstanding loans and by the first months of 2004 the debt ballooned to approximately US$3 million (Garcia and Babin 2006). The cooperative declared bankruptcy and ceased operations in May of 2004 without paying many farm-households for the 2003-2004 harvest. As the community searched for viable alternatives, the group of farm families who were committed to sustainable practices did an analysis of the direct sales and realized that they could sell at least 10% of their harvest in this way. This was enough incentive to create a new cooperative as 35 members of the SG, along with 28 other farm-households. They formed the *Cooperativa Agroecológica CoopePueblos* (CoopePueblos Agroecological Cooperative) in May of 2004. The CoopePueblos cooperative sold over three-quarters of their coffee to value added markets during the five harvests between 2005 and 2009. Certified Fair Trade (FT) markets accounted for 66% (207,034 pounds) of this, while 10% (32,826 pounds) of value-added sales were realized through the direct-market program managed with CAN that is further described in Chapter 5. Chapter 5 also seeks to understand if participation in these markets has translated to higher farm-gate prices and whether this benefit has reduced radical shifts in farm-household livelihoods, land-uses and class standing.

Conceptual framework: the pressure and release model

> *Interdisciplinary research is always a gamble. All too often it results in a series of discrete articles or monographs with no very clear connecting theme.*
> (B. Higgins, in the Forward to Geertz 2005).

The following conceptual framework is used to position the key findings, themes and results from each chapter in relation to each other and to the overall goals of this interdisciplinary dissertation. The theoretical underpinnings of the framework have been adapted from approaches to risk and hazard studies that acknowledge the social construction of disasters and crises[12] (Sen 1981). This is exemplified by the approach taken by Blakie, Cannon et al.

> *The risk of disaster is a compound function of the natural hazard and the number of people, characterised by their varying degrees of vulnerability to that specific hazard, who occupy the space and time of exposure to the hazard event. There are three elements here: risk (disaster), vulnerability, and hazard, whose relations we find it convenient to schematize in a pseudo-equation: R = H x V*
> (1994; p. 49)

I utilize a two dimensional definition of vulnerability; "the external side of exposure to shocks, stress and risk; and the internal side of defenselessness, meaning a lack of means to cope without loss" (Chambers 1995; p. 189). Thus vulnerability can manifest as both the heightened risk for exposure to an external shock/ hazard, typically the result of some form of inequality and also as the diminished resiliency, or ability to cope with a shock/hazard once it has been internalized following exposure. Disaster and vulnerability analysis seeks to identify the root causes of both dimensions of vulnerability with the intention of developing interventions that reduce or eliminate them[13] (Watts 1983; Blakie 1985; Blakie and Brookfield 1987; Blakie,

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[12] My analysis of disaster and crisis employs a theory of inequality that draws upon the capabilities approach to poverty developed by Amartya Sen. Noting that during times of famine, food exists in sufficient quantities within communities containing starving people; Sen distinguished an individual's capability to access entitlements as that which can prevent or determine starvation (1981). Entitlements are the resources and assets obtainable to a person or household using all possible rights and opportunities. It follows that the lack of sufficient entitlements due to inequality in their distribution within households or among individuals is what most often leads to famine, not food shortages. This stands in contrast to the mainstream, neoclassical economical approach to disasters that focuses attention and intervention only on the particular shock/ hazard event and remains inattentive to the history and political economy of social relations.

[13] I also employ a political ecological approach to identifying, understanding and confronting the social vulnerabilities that define disaster (Bohle, Downing et al. 1994). Political ecologists reject the dominant discourse that poor-peasants destroy land out of ignorance and short-sightedness. Instead, the

Cannon et al. 1994; Bohle, Downing et al. 1994; Robbins 2004). The pressure and release model (PARM) was developed for application of this line of analysis to social, economic and natural crisis situations that develop slowly and are of relatively low intensity such as prolonged market crises, drought, disease and pest outbreaks (Blakie, Cannon et al. 1994). The PARM model traces the progression of vulnerability from root causes through dynamic and structural pressures that transform the root causes into unsafe conditions distinguished by particular vulnerabilities which interface with a hazard to produce specific crises with unique dimensions and magnitudes. A political ecological and moral economic approach[14], along with the PARM model of the relationship between disasters and social processes, provide an excellent framework within which I conceptualize the

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causes for environmental destruction, land degradation and rural poverty are all ultimately linked to global capitalism. Explicit in the bulk of theorization on the political ecology of peasant agricultural production is the idea that for socially marginalized groups like peasants, often farming in ecologically vulnerable regions on small farms, the reliance on commodity cropping necessarily deepens the cycle of ecological degradation and social marginalization. Ecological degradation is experienced as hazardous agrochemical use, declining soil fertility, erosion and reduced food security as subsistence crops are replaced by commodity exports. Social marginalization is characterized by community stratification and the dispossession by differentiation of the smallest and poorest producers (Blakie 1985, Robbins 2004).

[14] While many political ecological case studies portray peasants as highly at-risk to crises brought on by the declining terms-of-trade due to a commodity price collapse, as well as capable of inflicting great environmental harm with their accelerating rate of soil and land exploitation, there are other logics that can also explain why some peasants might actually persist through crisis. The "economics of the subsistence ethic" was meticulously detailed by James C. Scott in *The Moral Economy of the Peasant* (1976). Scott shows, by way of a multitude of case studies, how peasants who are land or labor poor will focus on crops and techniques that yield the highest and most stable payment for labor - they will exhibit highly risk adverse behavior that he calls the 'safety-first principles". Questions of profitability, yield and productivity are secondary to securing enough subsistence crops for the family until the following harvest. Securing this harvest thus influences the whole arrangement of production choices about crop preferences, seed verities, input technologies and the spatial and temporal cropping regime. The "safety first-principles" in effect may shield the household's subsistence activities from the realm of neoclassical profit calculus as the only driving force in agricultural decision making. A moral economic approach is not inconsistent with a political ecological approach, as both agree upon the root cause of vulnerability.

relationship between the coffee crisis, trade liberalization and the various grassroots adaptations and resistances witnessed in Costa Rica (Scott 1985; Blakie and Brookfield 1987). Figure 1.2 below is a visual representation of the conceptual framework. Next I will describe this conceptual model before outlining the main findings of each chapter in this dissertation.

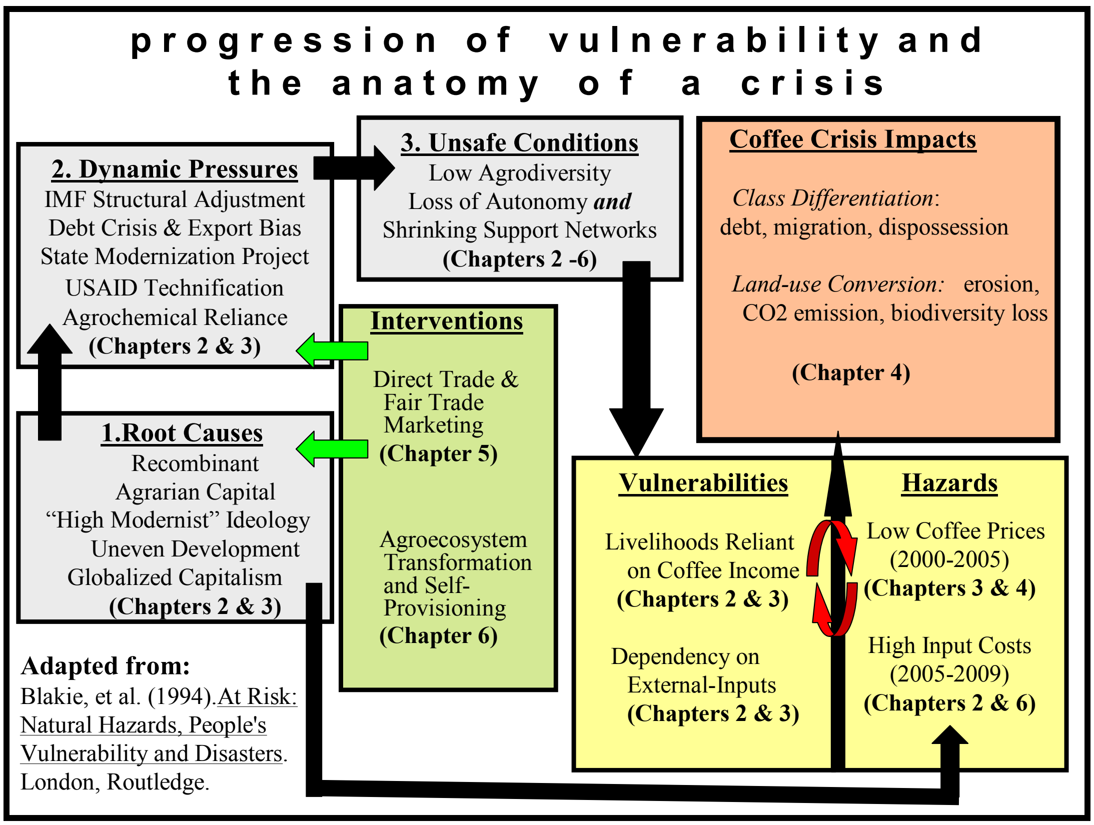

Figure 1.3. Conceptual framework of the dissertation

I begin in the bottom left corner of Figure 1.2; Chapters 2 and 3 will reveal that the political economic and ideological processes which control the way in which resources are distributed are the root causes of the coffee crisis and in the case of Costa Rica this includes, but is not limited to the roles of recombinant agrarian capital (Watts 1998), the formal and not real subsumption of labor (Goodman and Redclift

1981), the application of the green revolution's "high-modernist" ideology (Scott 1998) to Costa Rican coffee agroecosystems, and the uneven development that characterizes globalized capitalism's growth (Harvey 2006). Chapters 2 and 3 also reveal how these root causes have been transformed by the dynamic pressures of the debt crisis, the IMF imposed structural adjustment policies, the neoliberal export bias and the modernization and technification of coffee agroecosystems, all of which transformed these root causes into the unsafe conditions identified in Chapters 4-6, which include low agrodiversity in agriculture, the loss of autonomy and increased dependency of rural livelihoods on external factors and production inputs, as well as the disappearance of traditional support networks. These unsafe conditions can be distinguished by two specific vulnerabilities; the overreliance on coffee as a livelihood source as well as the high-level of agroecosystem dependency on external-inputs.

Chapter's 2 through 4 demonstrate how these existing livelihood and agroecosystem vulnerabilities have interacted with the specific hazards[15] of extremely low coffee prices and high costs of conventional coffee inputs. This interaction amplified preexisting vulnerabilities and produced a coffee crisis whose impacts are categorized

[15] In the examples presented by Blakie, Cannon et al. (1994), as well as in the majority of work utilizing this approach, hazards are conceived as "natural" occurences such as hurricanes and drought. The manner in which these "natural" hazards are influenced by human activities, especially that of greenhouse gas emmission, is left under-theorized. In this case study the hazards are "social" or "political-economic" occurences and so an arrow also connects Root Causes with Hazards in recognition of the clear impact globalized trade under neoliberal capitalism has had on the progression of these hazards. There are also undoubtedly many "natural" occurrences that could be linked to the progression of these hazards. For me, this recognition of the social and the natural as mutually constitutive serves to reinforce the validity of this approach to disaster analysis.

by two broad dimensions; agrarian change and class restructuring and coffee land-use conversion. The final piece of this conceptual framework consists of the interventions[16] which if designed and targeted correctly, have the potential to release peasant farm-household vulnerability and diminish the impact of any hazards or shocks encountered. The middle green box houses the interventions that undergo assessment in Chapters' 5 and 6, allowing me to evaluate the adaptations and institutions that have emerged in response to these pressures on agrarian change and land-use conversion.

[16] While I agree with Blakie, Cannon et al. 1994 that you can only eliminate vulnerability by tackling the root causes and not just the symptoms, I believe some of the dynamic pressures to be so interwoven with the root causes that intevntions focused here can also lead to transformative change. For this reason arrows flow from inteventions to root causes as well as to the dynamic pressures in figure 1.2. Other approaches differ from this, instead focusing on hazard reduction, development relief in the case of a disaster or by paying more attention to the unsafe conditions stage of vulnerability progression by focusing on local-level mitigation and preparedness.

Chapter 2.
The Agrarian Question in Costa Rica: 1800-1980

Introduction

This chapter establishes the national and historical contexts within which this dissertation's community case-study is embedded through the evaluation of the processes of agrarian change and peasant persistence in Costa Rica. Attention is given to establishing and contextualizing the role of agriculture in economic development and industrialization, and the identification of structural factors that have contributed to the contemporary persistence of the coffee producing peasantry in Costa Rica. The following research question guides analysis:

How did the agrarian transition to capitalism unfold within Costa Rica and what factors and dynamics have contributed to the contemporary persistence of the coffee producing peasantry?

The analysis begins with the introduction of coffee cultivation in early 19th century colonial Costa Rica and continues through the end of state hegemonic control over the national development project in the late 1970's. I observe for the case of Costa Rica that the agrarian transition to capitalism and the persistence of the coffee commodity producing peasantry are both products of particular historical circumstances. This chapter will show that labor relations between the coffee producing peasantry, capitalist producers, the oligarchic-elite processors and the

Costa Rican state have historically stymied processes of class differentiation and peasant dispossession. The pro-peasant politics of the state in the post-revolution era are regarded as a key determinant of Costa Rica's relatively high-level of social, economic and democratic development. I concur with Goodman and Redclift that "instead of looking at capital as a dynamic force at work in a static setting we should acknowledge that the dynamism of the setting has been a conditioning factor in the development of capitalism" (1981; p. 213).

Theoretical framework: the agrarian question and peasant studies

In order to interpret the macro-structural as well as contingent historical processes of agrarian change contributing to Costa Rican national development and peasant persistence addressed in this chapter, I draw on a rich body of work in Marxian political economy that evaluates the relationship between agriculture, the state and capitalist development through the analysis of shifting relations between capital, labor and peasant social classes. It is thus methodologically rooted in a historical-materialism that understands history to be defined in great part by struggles between the classes; with the particular types of social class relations present in any society determined to be dependent in part upon the predominant mode of production (MOP), or the specific ways a society organizes production (i.e. feudalism, capitalism, communism). In historical-materialist political economy, each distinct MOP is in turn propelled by the productive forces of human labor combined with the means of production such as tools, technology and land. Access to these means of production are constrained by the MOP's distinct social and technical relations of production, which includes codified laws, power dynamics and class relations. Thus, a Marxian conception of social class is determined by the MOP, whether the form of access to the means of production is as a buyer or seller of labor power, and finally the form in which labor power is remunerated, whether it be as gifts, cash, or in kind (Patnaik 1987).

Given the social and historical context for this research, the Costa Rican coffee producing peasantry most resembles petty-commodity production (PCP), defined as small-scale production organized at the familial and/or household level, and where there exists ownership or *de facto* possession over the means of production[17] (Friedmann and McMichael 1989). The dominant MOP in rural coffee-producing zones in Costa Rica is capitalism and the predominant social class the petty-commodity production type. The most recent figures reveal that 92% of the producers and 97% of the land dedicated to coffee in Costa Rica are owner operated, meaning not rented or borrowed (ICAFE 2003) and the types of labor-power in Costa Rican coffee production include all three of the above offered criteria (labor unremunerated in subsistence and/or commodity production within plots owned or

[17] Also requisite is the reproductive, not accumulative, form of specialized commodity production (SCP) of goods and/or services sold through the market (commoditization). SCP does not, however, need to be the principle source of household/ family unit reproduction. Wages as well as unpaid family labor relations are both present, but wage-labor cannot be bought or sold on an exclusive basis in PCP as that implies the social relations present in the "pure classes" of laborer or capitalist. PCP is considered a distinct economic class "space" because uniquely, the combination of both capital and labor are present, as well as the tendency but not necessity towards class differentiation (Bernstein 2004).

organized at the family/farm-household level, labor purchased from others for a wage, and/or labor sold for a wage).

Peasant differentiation

Marx posited that the social relations, labor relations, technologies, and laws governing capitalist industrialization applied equally to agriculture[18] and that the peasantry existed as a temporary social class soon to be enlisted into either the ranks of the proletariat or bourgeois (Marx 1967). This was an essential piece of his revolutionary theory, which hinged upon a full structural change towards capitalism

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[18] I politically and intellectually dispute the more reductionist interpretations of Marxist thought, especially those regarding the place of agricultural industrialization and peasant production systems in development. It is a shame that many of both Marx's most well-known detractors and followers have so dogmatically and un-reflexively engaged with his political economic framework. Political agendas, of both those on the left and the right, are probably the most common flagrancy of those who misuse this framework in self-interest. With much of the writing on Marxism and agriculture either painfully simplistic or hopelessly complex, it must also be assumed that intellectual ability also colors the results of analysis. Perhaps nowhere are the flaws of orthodox Marxism more politically reactionary or environmentally ill-informed as when they concern the role of technology in agricultural production. Here the teleological socialist Revolution is made dependent upon an equally deterministic green revolution in agriculture.

The empirically suspect and politically reactionary position on the role of technology in agriculture is best epitomized by a "High-Modernist Agriculture" paradigm that exalts large scale, capitalist, green-revolution monocropped agricultural systems as scientific, modern and productive (Scott 1998) . This paradigm is prominent within Marxist political economy and hegemonic within the neo-classical development economics literature (see Sender and Johnson 2004) and but is considered here a deeply flawed position. The Marxist version is most often cloaked with the assumption that the social and labor relations, technologies, and laws governing capitalist industrialization apply equally to agriculture. The claim that technologies and labor relations are completely commensurable between industrial and agricultural production, even if it wasn't technically flawed, is an open invitation to wholly transform any remaining natural processes in agriculture that can be substituted for by available chemicals and genes and then inserted into the fruits, fields and genomes of agriculture. It is based in a dangerously reductionist comparison that makes the claim that any production enhancing technology can, and should be scientifically adapted to agricultural production. Attempts to apply the formalized, predictable, inorganic and deterministic laws and technologies of industrialization to the natural, chaotic and organic processes of agricultural production are almost always lacking critical thought given to either the equitability of the resulting agricultural model as well as a disregard for the now widely documented environmental and human health impacts attributed to high input, industrialized agricultural systems.

in all sectors of society, agriculture included, as a precursor to socialist transformation of the entire economy. The central variable propelling these dynamics of agrarian change was understood as the movement towards partial wage labor within the landed peasantry and the transformation of this wage labor to full labor power through dispossession of their land. The agrarian transition is this process by which a majority peasant agricultural sector is transformed into a sector dominated by a rural proletariat and agrarian capitalists. Lenin was the first to describe the mechanism for this process as peasant differentiation, the split into classes of rich, middle and poor peasants (Lenin 1964). He theorized that this differentiation[19] was the result of the penetration of wage labor and an acquisitive, exploitative capitalist logic into the farm-household. This would lead to rural class polarization, the proletarianization of the peasantry and the eventual full capitalist transformation of the economy, accomplished by the accompanying large intersectoral labor transfers of capital and labor from agriculture, a major source of productive wealth in pre-industrialized societies. These precious resources were put to the expensive and labor intensive process of industrialization, which was a necessary precursor to a socialist revolution theorized to liberate the now proletarianized former peasantry[20] (Marx 1967; Kautsky 1988; Byres 1996).

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[19] Class Differentiation is defined as "a specific secular trajectory of economic change, whereby the market in products leads to a market in land which in turn leads to the concentration of landholdings that finally leads to differentiation between landowners and wage labourers" (Joel Kahn 1981:556).

[20] Lenin sketched out two possible agrarian transitions to capitalism; "capitalism from above" and "capitalism from below" (Byres 1996). Prussia was identified as an example from above where the existence of landlords and tenants slowed transition to capitalism and this made it 'reactionary" because some feudal vestiges remained. In contrast, the United States was held as progressive

Communist party economist Karl Kautsky distilled Marx revolutionary theory and Lenin's agricultural transition theory into the following inquiry that served as a launching point for his analysis of European and especially German agriculture; "Is capital, and in what ways is capital taking hold of agriculture, revolutionizing it, smashing the old forms of production and of poverty and establishing the new forms which must succeed?" (1988; p. 46). His "agrarian question" has become a conceptual and analytical framework utilized in historical-materialist political economy "to grasp the place of farming and agriculture in emergent and mature capitalist societies" (Akram-Lodhi and Kay 2010). The Marxian-Leninist answer or resolution to the classical agrarian question is characterized by the transformation of a majority peasant agricultural sector into a sector dominated by a rural proletariat and agrarian capital as a result of class differentiation[21]. A turbulent differentiation and dispossession of the peasantry was accomplished by the full transformation towards capitalist relations in agriculture, thus providing labor for the capitalist industrial sector and hastening the transition to a national political economy dominated by capital/ labor social relations (Kahn 1981; Bernstein 2004). The dynamic stages of this "classical agrarian transition" resolving the agrarian question have been synthesized quite usefully by Bernstein, from which the following schematic is adapted.

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capitalism from below because family farms dominated and this characteristic allowed wage labor and agrarian capital to develop the fastest and most smoothly (Akram-Lodhi and Kay 2010).

The classical agrarian transition assumes that pre-capitalist social relations consist of a landless peasant laboring renter class and a class of surplus extracting feudal landowners. Thus in feudal, pre-capitalist Europe, the surplus labor of peasants was appropriated primarily through labor rent. Acts of primitive accumulation[22] marked the transition to capitalism as well as created the market dependence that necessitated commodity production. Following the introduction of commodity relations, agrarian classes formed and differentiated, resulting in an agrarian proletariat class alongside both landed and industrial agrarian capitalist classes. Market-driven competition within and between the capitalist agrarian and landed classes resulted in technical and social innovations in agricultural production which increased labor productivity and crop yields. The surplus generated by this increased productivity then became available for transfer to the industrial sector. These developments, especially the gains in agricultural productivity, hastened the dispossession of the peasantry, causing a feedback loop that released the labor needed for industrial development. Finally, additional gains in the agricultural productivity of staple crops lowered food costs for the industrial proletariat, which allowed industrial capital to depress real wages, with the effect of accelerating capital accumulation in the service of industrialization. A

[22] In defining primitive accumulation, I follow Harvey's 2003 interpretation of Marx's *Capital*, referring to any one of the following processes; 1. the commodification and enclosure of land and forced dispossession of the peasantry; 2. the transformation of common, communal, national or colonial property rights into strictly private property rights; 3. labor-power commodification combined with the suppression or coercion of non-capitalist production and consumption patterns; 4. monetization of exchange relations and increasing taxation; and 5. the development of a national debt and an usurious credit system (page 145). There is a crucial role for the state in organizing and leveraging the primitive accumulation process, indeed without it the transition to capitalism is by no means certain.

full resolution of the classical agrarian question was thus achieved in Western Europe through this transition that transformed agricultural technologies and rural social relations and in the process fueled industrialization.

Kautsky himself found that the velocity and relative ease by which European nations travelled this transitional path was contingent upon the historical position of the peasantry within national agrarian class formations and that in some cases the agrarian transition could be severely retarded. Probably due to the fact that his investigations were motivated by the normative desire to promote the agrarian transition to capitalism and eventual state socialism, Kautsky focused much of his inquiry into the agrarian question on the identification of factors that slowed this process; he particularly focused on the detection and classification of factors that stopped large capitalist farms from replacing small peasant farms. Kautsky observed that while peasants sell some of their labor, they still kept their land and with it their access to the means of production, contrary to both Marx and Lenin's theorizing (Hussain and Tribe 1981). First recognized by Kautsky, this phenomenon of semi-proletarianization practiced by petty-commodity producers is recognized below as a major factor influencing the persistence of peasant agriculture in Costa Rica.

This theoretical framework at the core of classical agrarian political economy has inspired scores of empirical case studies documenting processes of class differentiation and agrarian change in a diversity of national contexts and rural landscapes, leading to what is an extensive and constantly growing body of research recording the diversity of different individual class forms, the different assemblages they create and the numerous types of social relations established between them (Lenin 1964; Banaji 1976; Harrison 1977; Seligson 1980; Goodman and Redclift 1981; Hussain and Tribe 1981; Patnaik 1987; Kautsky 1988; Friedmann and McMichael 1989; Byres 1996; O'Connor 1996; Akram-Lodhi 1998; Scott 1998; Bernstein 2004; McMichael 2004; Harvey 2005; Harvey 2006; McMichael 2008; Akram-Lodhi and Kay 2010). In turn, this has led to ongoing reflection, refinement and reformulation of the original, rather deterministic laws of motion and agrarian questions laid out by the classical agrarian political economists.

This inquiry was the subject of special interest in the 1970's where a confluence of factors led to the revitalization of the original agrarian question, among them an intellectual resurgence of Marxism and a growing dissatisfaction with the social and environmental consequences of the "green revolution"[23] (Wright 1985; Altieri 1989; Gliessman 2007). This was coupled with an era of peasant revolutions and a general slowdown in the process of de-peasantization. The peasantry of developing countries was seen as a historical subject ripe for academic debate. Soon a vibrant

[23] The green revolution has its world-wide origins in the collaboration between the Rockefeller Foundation and the Mexican government in the early 1940's. Its main aim was to increase agricultural yields and "modernize" traditional agriculture. The green revolution technologies consisted of a package of high yielding seeds and chemical fertilizers and pesticides applied to monoculture arrangements of crops. While in the short term yields for most crops increased, this was accompanied by a deterioration of the natural ecological processes necessary for sustainable production as well as forced reliance on expensive external inputs.

interdisciplinary field of agrarian political economy had emerged, “peasant studies”. The main issues of theoretical engagement were the analysis of peasants and their social structures as well as the logic of peasant agriculture. This analysis, in turn, fueled broader debates on the political economy of capitalist growth such as the nature of pre-capitalist transformations, paths of agrarian change to capitalism in developed countries, and the dynamics of development/underdevelopment in developing countries (Bernstein 2001).

However, the main debates in peasant studies broke down following more recent research which has revealed that the dynamic stages inherently assumed as the tendencies or even laws driving the classical agrarian transition outlined above are themselves products of the specific political economic history of capitalistic development in Western Europe (Goodman and Redclift 1981). For example, the classical agrarian transition assumes that processes of wage labor and agrarian capital formation have been steadily and equally proceeding everywhere in the world when in fact this process is highly contingent on when the introduction of commodity relations takes place and the modes of production, social relations and agrarian politics present during the historical epochs of the transition process. This has important implications for “peripheral” regions developing later and with unique classes of capital and labor defined by differing types of pre-capitalist relations and demographic conditions. This has particular resonance for understanding resolutions to the agrarian question characterized by widespread petty-commodity agricultural production alongside the predominance of capitalist social relations within the agricultural sector and society at large, such as the one explored in this chapter.

While this research embraces the epistemology and framework of Marxian political economy and especially the agrarian problematic, my utilization of Marxian concepts, theories and analytics is restricted to understanding *tendencies* within past, present and future capitalist development processes as they relate to agriculture. As David Harvey has pointed out, while the analysis of capitalist tendencies alone will not cure us, it does remind us how sick we are (Harvey 2006). It can help to interpret and situate messy and complicated circumstances as well as lay bare the politics and exploitative relations behind historical events. In the best cases, it calls attention to blatantly self-serving histories of the ruling capitalist cast.

Methods

This chapter identifies the historical transitions, contradictions and paradoxes emergent from a sustained engagement with Costa Rican agrarian history. In order to effectively and critically portray agrarian forms, relations and transitions; historic specification is required as any analysis of agrarian change must be prefaced by an account of national factions, elites and classes. Secondary sources of quantitative data utilized in this chapters agrarian historiography were derived from numerous Costa Rican agricultural and population censuses as well as other reports from a variety of

Costa Rican agencies including; the Central Bank of Costa Rica (BCCR), the National Institute for Statistics and Census (INEC), the Costa Rican Coffee Institute (ICAFE), the Agricultural Ministry (MAG), the Agrarian Reform Institute (IDA), the National Production Board (CNP) and non-Costa Rican reports from the Economic Commission on Latin America and the Caribbean (CEPAL) as well as the United States Department of Agriculture (USDA). On-line databases provided most of the graphical data presented in the chapter. I accessed databases from the World Trade Organization (WTO), the World Bank, the Interamerican Development Bank (IADB), the United Nations Food and Agriculture Program (UN-FAO), and the International Monetary Fund (IMF). Additional sources for data included academic journal articles, published books and newspaper articles.

I also conducted interviews of key informants at ICAFE, MAG and CNP as well as the staff and management of several Costa Rican coffee cooperatives. Finally, participant observation and countless informal interviews throughout the country and especially in the different coffee growing regions of Costa Rica were an essential part of the research process. These causal process observations enlivened other data collected at this level as well as contextualized the data set observations from the district level study within the national level and facilitated the triangulation of data sources in order to reach the most accurate findings possible.

Case study of agrarian change in Costa Rica

Pre-coffee colonial era (1560-1820)

Pre-coffee Costa Rica was characterized by non-capitalist social relations. Only after the proliferation of coffee commodity production and exchange did agrarian capitalism first develop in *la meseta central* or "the central valley" of the then impoverished, Spanish colonial backwater (Hall 1976; Seligson 1980; Samper 1990). However, while Costa Rican historiography includes volumes of material focused on the transition from colonial isolation, self-sufficiency and abject poverty to the ascendance of a coffee-export driven commodity economy in the 1840's, there is some confusion and disagreement surrounding the exact characterization of the state of pre-coffee and thus pre-capitalist relations in Costa Rica. One of Costa Rica's most well-known social theorists, Rodrigo Facio, wrote an especially influential book on the history of Costa Rica in which he claimed that pre-coffee Costa Rica was a homogenous and egalitarian peasant society characterized by geographically dispersed self-sufficient family farms (Facio 1972) . His emphasis on pre-coffee egalitarian society as a "natural" state of yeoman production has been for the most part uncritically adopted as both cultural heritage and point of reference for a national development model by politicians and the public alike (Facio 1972; Hall 1976; Seligson 1980). However, in *Costa Rica Before Coffee*, historian Lowell Gudmunson convincingly argues for the existence of nucleated settlements, land inequality, professional artisans and skilled merchants in the early years of the 19th century, just before coffee landed on Costa Rican soil (Gudmundson 1986). He utilizes notary, probate and export records to make his compelling case while pointing out the lack of historical evidence supporting Facio's influential theory.

According to Gudmunson, pre-coffee villages of the central valley were mostly populated by mestizos (mixture of Spanish and/or African and/or Indigenous); although a sizeable pure-blooded Spanish population existed as the colonial ruling elite class. The indigenous population was relatively tiny compared to elsewhere in Central and Mesoamerica. The principle economic activity was farming, in which the bulk of the adult population toiled, cultivating mainly subsistence crops such as corn, beans, rice and wheat in rotating slash and burn systems (Gudmundson 1986; Samper 2003). Land was held in a variety of different forms during this era including large estates, scattered peasant smallholdings, and public and communal village lands (Gudmundson 1986; Samper 2003). Use of these communal lands was granted on a hereditary basis with yearly taxes paid to the village leadership council, and tithes and dues paid to the Church. As land ownership required significant political and economic power and influence, most residents, including the elite themselves, did not accumulate substantial landholdings. However, as the Spanish colonial elite were frequently the political leaders within individual villages, they extracted tribute from landowning peasants. While large estates did exist during this era, they were never as numerous or large in other Central American nations. The existing estates depended greatly upon both landed and landless peasant labor, which was paid relatively well because of a shortage in supply. This labor shortage was in turn brought on by the colonies' remoteness, sparse population and lack of a sizeable indigenous population to coerce (Seligson 1980; Gudmundson 1986; Winson 1989; Edelman 1992; Samper 2010). Thus agricultural labor was sold (for wages) or traded (in-kind) by *both* the land-owning minority and the landless majority throughout colonial, pre-coffee Costa Rican society (Gudmundson 1986). Trade between villages and even internationally for items such as food, silver and tobacco was, according to Gudmundson, significant in pre-coffee Costa Rica and was "dominated by a 'quasi-Yankee" elite of merchant agriculturalists" (1986) page 45). Money was scarce, although existent, and most exchange was barter-based.

Emergence of agrarian capitalism during the coffee agroexport era (1820-1948)

The 1808 introduction of coffee quickly led to commodity relations, market dependence and a particular agrarian structure dominated by smallholder peasant production, part-time wage labor and a relatively small, landed, agrarian-capitalist class. First entrenched in the Central Valley, coffee commodity production was soon spatially reproduced throughout all of the highlands of Costa Rica with the initial pattern of family-operated smallholdings maintained. In 1831, ten years after acquiring independence from Spain, a governmental decree established land-title rights for anyone who planted coffee on unclaimed lands. Many of the lands acquired during the initial expansion that followed were already under some type of colonial-era land tenure arrangement, either as communal indigenous or mestizo village lands (Samper 2003). These were the easiest lands to dispossess, with parts or all of them already cleared and their dimensions and characteristics mostly known. By 1860, however, the primitive accumulation of all remaining indigenous and settler communal properties was complete, with those of direct Spanish descent gaining most from the process (Samper 2003). Peasant settlers soon turned to uninhabited regions north and south of the Central Valley, where the agricultural frontier remained open until well into the 20th century. With indigenous communal lands and their peoples not nearly as numerous as many other nations within Latin America, the newly formed coffee sector lacked easily conscripted, abundant, and cheap commoditized labor-power. This made politically feasible as well as economically sensible the relatively equitable state-sanctioned distribution of land in the highland coffee zones of Costa Rica. The historical shortage of labor limited the number of large estates that could form as it made haciendas or plantations expensive to operate and very risky in times of market downturns. This left coffee production to largely establish on smallholder family-farms instead of large plantations. Just like in the colonial era, relatively high agricultural wages encouraged smallholders to sell some of their labor, contributing to the increasing semi-proletarianization of the coffee producing peasantry (Gudmundson 1986).

Pre-capitalist class relations, the introduction of coffee and peasant persistence

Gudmunson's research manages to debunk the starting point for most previous studies of coffee and Costa Rica, especially those that assess the impacts of the coffee economy on development and democracy (Gudmunson 1986). In particular, he shows that egalitarian social relations epitomized by the self-sufficient yeomen farmer did not dominate in pre-coffee Costa Rican agrarian society, as incorrectly claimed by many scholars (Facio 1972; Hall 1976; Seligson 1980). This mis-characterization of pre-coffee Costa Rica as a closed, classless society implicitly assumes that the country was mostly unaffected by the colonial legacies of inequality and racism that were prevalent if not rampant in other Spanish colonies in the New World. This has led scholars to claim that the agrarian class differentiation that occurred in the late 19th and early 20th centuries was solely attributable to the introduction of coffee commodity production (Facio 1972; Hall 1976; Seligson 1980). This a-historical conception of pre-coffee power dynamics severely discounts the role of the colonial encounter in the development of Costa Rican agrarian capitalism, when in order to understand the historical factors leading to contemporary peasant persistence more attention must be directed towards identifying the principal pre-coffee colonial social relations governing land and labor and in understanding how they were transformed following the transition to agrarian capitalism; as I will now demonstrate.

Emergence and concentration of the agrarian capitalist class

Some measure of class formation and stratification was already been in place within pre-coffee Costa Rica (Gudmundson 1986; Samper 1990). However, while exploitative tribute, tax and labor relations were present in pre-capitalist Costa Rican society, there is no evidence for the existence of a feudal landowning class such as that assumed in the pre-capitalism of the classical agrarian transition. Accordingly, the larger estates of the colonial elite were unable to capture many of the benefits that followed the introduction of coffee commodity production precisely because their claim to peasant labor on the eve of introduction was not based on coercion. Instead, what Gudmundson called the "quasi-Yankee", form of farm-household agricultural organization was transformed into a petty-commodity producing form following the introduction of coffee (1986). These observations are not trivial; they have historically shaped the development of Costa Rican agrarian capitalism and peasant persistence up unto the present day.

Agrarian capital evolved and consolidated most quickly in the processing sphere, after which it branched out into export, credit and input markets. The key institution throughout the historical development of agrarian capitalism in Costa Rica has been the *beneficio humedo* or "wet processing mill". In this system, smaller producers haul their ripe coffee cherries to the nearest mill, usually owned by a fairly large-scale plantation, where the pulping, fermenting, washing, drying, storing and curing are all performed, as well as an often large surplus extraction from smaller producers by the mill owners. The mills have played a significant role in disintegrating the supply chain and capturing added-value above and beyond what processors could manage in other settings (i.e. other countries). Even up to the present day, the wet processing mills constantly employ new, capital intensive technological advances to their various stages of mechanical and biological processing. This capital barrier has ensured, since first deployed, their ready availability primarily to the existing elite (Samper

2010). Not surprisingly then, these mills display a historic tendency towards concentration; in 1887 there were a reported 256 coffee mills in Costa Rica and by 1940 this dropped to 221 (Seligson 1980). In 1938, 193 exporting firms were in business, many of them coffee mill owners and smallholder credit providers as well. After the US organized the Inter American Coffee Agreement, which fixed prices for its allies, avoiding a price meltdown in the wake of the disappearance of the European market due to the Second World War, this number was reduced to just 19 firms, of which just six American firms controlled over 80% of the nations coffee exports (Winson 1989). By the end of the 1930's this oligarchy of coffee "barons" was in control of credit, input sales, processing and exportation within the country's top economic sector, as well as seated in the most important political positions. Their stranglehold on the agroindustrial sector allowed surplus value extraction at many sites, stages and activities of production including some, such as the wet processing mill, which did not emerge in the historical development of national coffee sectors elsewhere.

The collapse of coffee prices due to the Great Depression led to heightened class tensions between an already suspicious peasantry and the conservative oligarchy of the agrarian capitalist coffee barons. In the case of the depression era crisis, low international coffee prices were accompanied by inflationary pressures negatively impacting all parts of the economy. Interestingly, this "price squeeze" probably hurt the oligarchy more, as it was magnified by hired-labor costs that were significantly higher than the flexible and "free" farm-family labor of peasant production. In addition, peasant producers of this era were able to retain a large portion of their subsistence from fruits and crops intercropped within the coffee agroecosystems, a practice uncommon on the larger estates of the oligarchy (Chayanov 1986; Samper, Naranjo et al. 2000; Samper 2003). The endogenous characteristics of 1930s coffee agriculture in Costa Rica – an easily intercropped agroecosystem with high labor needs in a nation with a limited and expensive labor supply, combined with the exogenous forces of low international coffee commodity prices and high domestic inflationary pressure - creating a vulnerable situation for those coffee barons still involved in the production sphere. This contributed to agrarian capitals steady retreat and strategic refuge within the agroindustrial sphere of processing, exporting and financing. The weakened position of large, landed capitalist coffee producers during the Great Depression establishes a trend of smallholder persistence, if not resurgence in the face of generalized commodity price crisis at the expense of large scale capitalist operations (Samper, Naranjo et al. 2000). In this case the flexibility of peasant production units, as well as the high relative labor costs and adaptability of coffee agroecosystems were key factors contributing to peasant persistence.

Agro-industrialization and the welfare state (1948-1980)

However, high tensions between these classes still existed. Smallholders had limited choice, hence little competition with the mill owner oligopoly, who were the input supplier, creditor and exporter as well. There was no government oversight of the coffee mills and the entire economy was almost completely unregulated and untaxed prior to the 1948 revolution. Exploitation was widespread as mill owners set high interest rates for loans and in return, paid below what was the going market price in nearby countries for the coffee cherries. This combination of low international coffee prices and domestic exploitation resulted in the passing of a law entitled, *La Defensa de Café de Costa Rica* or “The Costa Rican Coffee Defense Law” in 1933 (Sick 2008). This law eventually grew into its own organization, becoming the Costa Rican Coffee Institute (ICAFE), which has since 1933 regulated the relationship between coffee farmers and coffee mill and export companies. In 1952, an amendment to the law, still in effect, limited the maximum proportion of profits that a mill could make at 9% while requiring mill operators to pay an annual 7% tax to the state (Winson 1989). In this manner, the state appropriated and redirected a sizeable portion of the agrarian surplus, a full 7%. This appropriation was taken at the expense of the oligarchy and, as described below, redirected for use in the national development project. While this is a significant surplus historically leveraged by the state, it is important to point out that the coffee defense law also assured that agroindustrial capital would earn 9% profit year in, year out. The law provided no protection for producers, who have remained exposed to annual fluctuations in the global coffee price (Winson 1989).

Indeed, this agrarian power struggle, combined with a contested presidential election whose results were nullified under dubious conditions, led to an armed rebel insurrection that battled and defeated government forces in under two weeks. The 1948 Costa Rican revolution ushered in an interventionist social-welfare state intent on using coffee as an engine of national growth. The rebel junta that would rule for a year and a half was closely tied with middle class urban and peasant coffee producer interests and was intent on eating into the elite coffee barons' power (Winson 1989). The junta nationalized the banking system to more directly allocate funds to development projects and created a state owned electricity company in order to develop the infrastructure for future economic growth. The junta evolved into a political party, the Partido Liberacion Nacional (PLN), that won elections following their year and a half in power, and which came to dominate national politics for decades to come.

Coffee modernization era

Rodrigo Facio's highly influential history of coffee and class in Costa Rica was used to formulate the reforms that would come during the state-led modernization project analyzed below (Facio 1972). His main arguments, from a political economy and agrarian change perspective, were:

1. As noted above, peasant coffee production was a manifestation of the egalitarian, smallholder society that was the nation's heritage from the colonial era.

2. Peasant society, as a source progressive politics, had to be considered the cornerstone of future national economic development.

3. The agrarian capitalists, or *coffee barons*, were an unholy alliance of estate owners, unregulated usurious lenders and a processing and exporting oligarchy that quickly arose following the introduction of coffee commodity production.

4. Exploitation by the unregulated and monopolistic coffee barons had jeopardized the potential for equitable national democratic development

5. Only major reforms and heavy state intervention could salvage the progressive, smallholder model of coffee agriculture key to national development.

Facio's arguments for reform were transformed into a plan aimed at boosting agricultural productivity growth, especially within the peasant dominated coffee production sector. In neoclassical and Marxian development economics, productivity growth in agriculture is often considered a structural precondition to industrialization; similarly countries with high productivity growth in agriculture are posited as the most likely to complete a successful industrialization process (Stern 1989). Beginning in 1952, revenue from the 7% tax on coffee processing mills was used to fund important infrastructure and industrialization projects as well as the government agricultural investigation and outreach organizations that would later be the source of most national economic growth (Winson 1989; Edelman 1999). The central component of the new state's infrastructure, agriculture and industrialization projects revolved around a coffee modernization plan aimed at drastically increasing yields (Luetchford 2008).

Prior to the modernization program Costa Rican coffee production, especially those of peasants, was cultivated in polycultural intercropped systems that included fruit shade-trees such as avocado and oranges, firewood and nitrogen fixing shade-trees as well as annual and biannual crops such as sugar cane, bananas, plantains, manioc, taro, beans, and corn. Coffee yields in these systems were much lower than in the technified monoculture systems described below, but polyculture coffee systems provided food for family consumption as well as for market sale (Samper, Naranjo et al. 2000). While attuned to the necessities of the family farm, the low yields precluded the Costa Rican state from extracting the sizeable surpluses required for the future economic progress of the country. To enhance yields, a combination research and extension program was initiated by the Costa Rican government, with financial and technical the support from the US (Romero Ramirez ICAFE 2007). Some of the principal goals of this modernization plan were:

1. To develop high yielding disease tolerant coffee varieties
2. To produce seeds of these high yielding varieties and to supply credit so farmers could buy them and replace all existing coffee plants

3. To experiment with different fertilizer application regimes and *require* the purchase of fertilizers subsidized by more than 30 percent

4. To provide annual credit for input purchases (herbicides, pesticides)

(Luetchford 2008)

Between 1960 and 1970, average productivity growth in agriculture was 5.2% in Costa Rica, which was the second highest growth recorded among 37 Latin American countries for that decade (Ludena 2010). Coffee productivity growth due to the state-led modernization project was very impressive, more than tripling from 6 fanegas[24]/hectare in 1960 to 20 fanegas/hectare in 1970 (Romero Ramirez).

Peasant cooperative sector as state-led agrarian reform

During the late 1950s and early 1960s a sustained coffee price decline took effect as new plantations in Brazil, Africa and Mexico came into production (Daviron 1994). In Costa Rica, these low prices, along with increasing concentration in the agroindustrial sphere heightened class-based antagonisms between peasant growers and agrarian capitalist processors once again. This led to the creation of the Federation of Cooperatives of Coffee Growers (FEDECOOP) in 1962 to reduce the exploitation by the heavily monopolized exporting business. Policies adopted supporting smallholder processing and export cooperatives included no land tax for

[24] A fanega is equal to 400 liter s of ripe coffee berries, and when processed yields ~ 100 pounds of unroasted coffee beans.

10 years, no tariffs on tools, machinery or agrochemicals. As coffee prices continued to lag throughout the 60s and the government subsidies remained, producer cooperatives expanded and soon processed the majority of production from peasant farm-households.

ICAFE data from the 1970s clearly demonstrates that on Costa Rican coffee farms between 0 and 5 hectares familial labor prevails while on farms between 5 to 10 hectares wage labor becomes important but not dominant. Finally, on farms over 10 hectares waged labor predominates (Gamboa Marin 1977). The 1950 and 1973 Costa Rican agricultural censuses utilized farm size classes of 0-4 hectares, 4-20 hectares and 20+ hectares. Peasant, or petty-commodity production units undoubtedly map onto the smallest farm-size class (0-4 hectares), although peasant forms of production probably exist on many of the operations within the medium farm-size class as well (4-20 hectares). Between the years of 1950 and 1973 these petty-commodity producing farms 0-4 hectares in size grew in number from 6970 to 17072 total farms, which is a growth in farm-households of 145%. This corresponded to a 21% increase in their share of total coffee farms in the nation between 1850 and 1973; from 32% to 53%. This same class's proportion of total coffee area in the nation increased 7% from 10% to 17%. Coffee farms in the medium 4-20 hectare range grew in number only very slightly from 9117 to 9741 and their proportion of total area did not change much, increasing only 1% from 31% to 32% of total coffee lands. The remaining large 20+ hectare capitalist farms actually decreased in absolute numbers from 5871 to 5537 total farms and in total area from 60% to 51% (Winson 1989). What were the factors that contributed to this flourishing of peasant coffee production in Costa Rica?

While the state-initiated formation of producer cooperatives played a part, expansion of peasant production was also partially due the fact that a frontier of premium land, much of it in the right altitudinal belt for high quality Arabica coffee, opened for coffee cultivation in Perez Zeledon and Coto Brus (the county that the lower level district in this study is located). These more recently colonized zones of coffee production are characterized by smaller contemporary average farm sizes and a more egalitarian distribution of land than in the historic center of production in the Central Valley. The oldest settled coffee zones have been more adversely affected by the fragmentation of family farms as inheritance was often split among each male sibling in the family. Then, because the accumulation of productive land was not as profitable for agrarian capital as the concentration noted above in financing and industrial processing, small 0-4 hectare farms did not face intense pressure from lower cost producers on large scale heavily capitalized farms.

The introduction of commodity relations in Costa Rica led to the formation of peasant, proletariat and industrial agrarian classes. However, unlike the classical agrarian transition, a sizeable landed capitalist class never developed. In turn this reduced the pressure of the market-driven competition between and within capitalist agrarian and landed classes that a classical agrarian transition relied upon to promote innovations in agricultural production. However, state-intervention substituted for market competition in developing the technical changes that would boost coffee yields to the highest in the world. And partly because of the state-led regulation of the export market and development of cooperative organizations, the peasantry not only persisted, but thrived through these progressive revolutions in the productive organization of the coffee sector.

AISI industrialization

As noted above, agricultural productivity grew at an average of 5.2% during the 1960s due to incredible gain in coffee yields, over 300% between 1960 and 1970 (Ludena 2010). The surplus resources created by this growth became available for investment in other sectors of the national economy, an attractive proposition considering that throughout the 1950s and 1960s the Costa Rican economy was almost exclusively dependent on revenues generated from the export sales of coffee and bananas. Hence, Costa Rica's developmentally-minded state government did closely follow the archetypal path of the classical agrarian question by reinvesting this surplus into industry. Not surprisingly, the particular foci of initial surplus transfer favored the historical agroindustrial capitalist class interests closely.

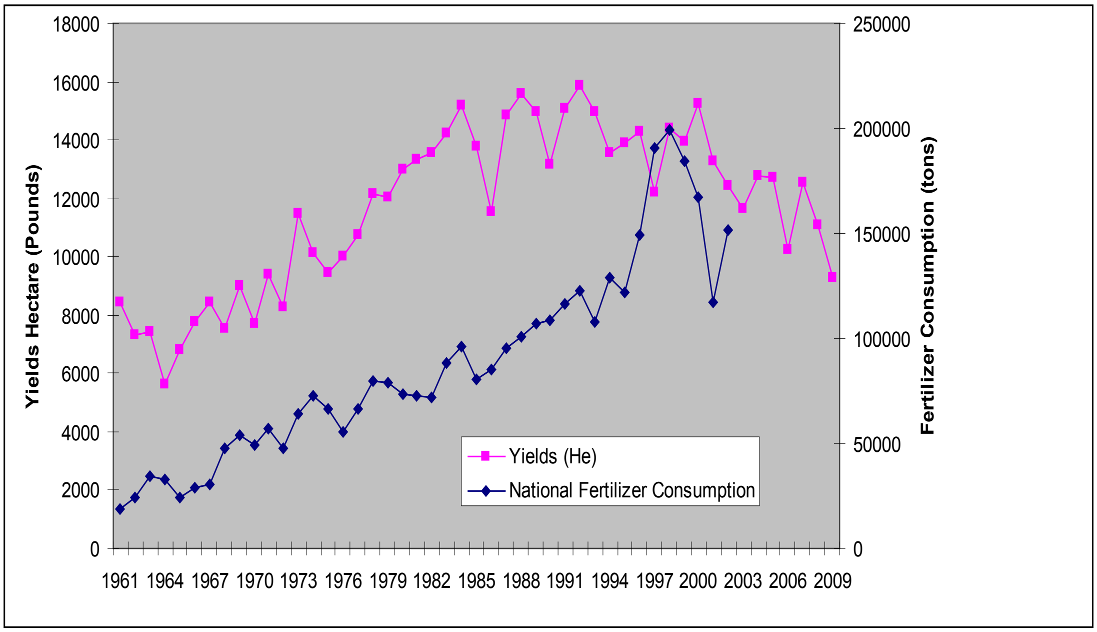

Figure 2.1. Relationship between average coffee yields and fertilizer use in Costa Rica, 1961-2009. Source: (FAO 2011).

The yield gains in coffee were tied to the rapid adoption of agrochemical inputs and especially nitrogen fertilizers. Figure 2.1 demonstrates the close relationship between average coffee yields per hectare and total national fertilizer consumption between the years of 1961 and 1979. The agricultural surplus extracted by the state was used to invest in domestic agro-industrialization, or what I will call agroinput-substitution-industrialization (AISI) through the 1959 passage of *The Law of Industrial Production and Development*[25] Costa Rican AISI, like Import Substitution Industrialization (ISI), operated under the assumption that if core developed countries

[25] *The Law of Industrial Production and Development (1959)* Article 1 -The present law has as its fundamental objective to constitute, by means of the development of industries to be specified, the diversification and strengthening of the economic activities of the country, endeavoring to channel national savings and to attract investment originating in the exterior in order to create new sources of better remunerated employment as an essential measure in obtaining the general welfare of the people (As quoted in Winson 1989; p. 148).

provided finished industrial goods while peripheral developing countries supplied cheap raw materials, and the terms of trade between finished and raw goods tends to decline, then peripheral countries like Costa Rica would be trapped exporting more raw materials in exchange for declining amounts of finished goods (Prebisch 1950). The specific course of action followed by Costa Rica's AISI model was to focus first on the replacement of formerly imported agro-industrial goods such as agrochemical inputs (fertilizers, herbicides, fungicides, etc.) and machinery for coffee and equipment for other crops which were produced domestically in Costa Rica (WB 2006; Sick 2008). This meant heavy state involvement in the subsidy of domestic agro-industry and the enactment of protective tariffs. Agro-industrialization was managed by the state through specific entrepreneurial projects such as the state run agrochemical manufacturer FERTICA, targeted subsidies and aggressive protection of domestic agroindustrial goods through tariffs and quotas. In 1963 Costa Rica joined the Central American Common Market (CACM), along with Guatemala, Nicaragua, Honduras and El Salvador. Tariffs between the participating countries were eliminated, boosting Costa Rican manufacturing exports. This strengthened Costa Rica's nascent agroindustrial sector, but as tariffs remained comparatively high to countries outside of the CACM, Costa Rica became extremely dependent on this market which created vulnerabilities discussed further below. Still, between 1961 and 1979, this model of agro-industrialization was very successful in transforming the Costa Rican economy to one increasingly dominated by industrial capital. As figure 2.2. demonstrates, after 1961 the total value added by the industrial sector steadily grew from under five-hundred million US$ to over two billion US$ by 1979, a more than four-fold increase, while the total value added in the agricultural sector barely doubled from around three-hundred million US$ to a little over six-hundred million US$.

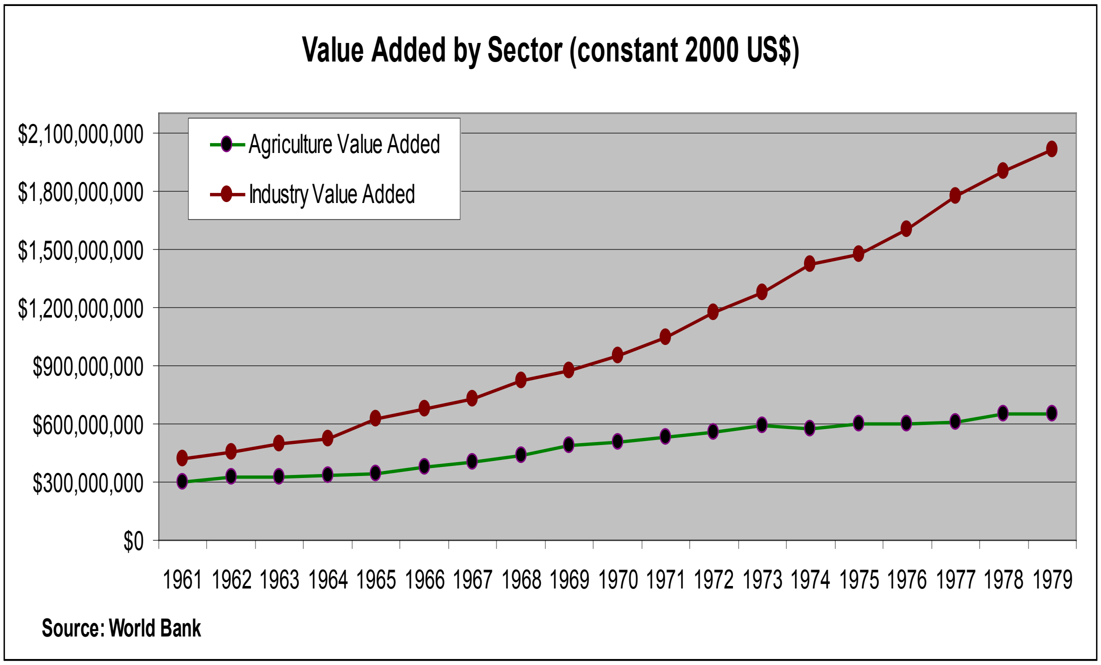

FIGURE 2.2. Value added by Costa Rican industrial and agricultural sectors, 1960-1980. Source: (WB 2011).

Basic grain production

The drive for state-led industrialization had important implications for domestic food production as successful industrialization hinged on finding a cheap source of basic grain staples like corn and beans for the new urban proletariat. Because of this necessity, which represents the final step in the classical agrarian transition, the Costa Rican government carefully assembled an elaborate peasant-state production partnership and patronage system. This new system was organized around the

National Production Board (Consejo Nacional de Produccion (CNP), an autonomous institution regulating basic grain production, consumption and distribution. Throughout the 1970s, the CNP's mission was to stimulate agricultural and industrial production while stabilizing national prices for food and industrial raw goods (Cervantes 1975). In order to fulfill this broad mission the CNP controlled all aspects of the production and marketing of basic grains from 1970, when the Secure Harvest Program began, until well into the 1980s (Cervantes 1975). They set all the prices at which grains were bought from producers (mostly peasants) and often set them above international prices. They also fixed retail prices, commonly below the going international market price. Finally, they coordinated the national grain purchase, storage and consumer retail, managing a commercial infrastructure that effectively replaced the market as arbiter of "private" profit levels for basic grains. Additional state agencies offered subsidized credit for land, labor, input and machinery expenses, while others provided agriculture extension, agronomic training and technical assistance (Edelman 1999).

Coffee and development in Costa Rica

Coffee production brought important national capital into circulation within Costa Rica and fostered the industrialization of the nation's agricultural sector, as well as the growth of an import-substituting manufacturing sector. These are advances not usually associated with the terms of trade governing 20th century developing country agro-export models of development. Indeed, much of the infrastructure, education and healthcare investments that have set Costa Rica apart as a peaceful, social-democratic society have been either the direct or indirect result of the coffee sector. As Table 2.1. below demonstrates, between 1940 and 1980 illiteracy rates dropped from 27% to 10% in Costa Rica and the proportion of households with piped water rose more than 30%. In addition, while infant mortality rates were reduced by more than six-fold, life expectancy at birth climbed from 47 to 73 years due to the establishment of a nationalized health-care system on par with any other in the world. In fact, as Table 2.2. demonstrates, Costa Rica had by 1985 not only attained an average life-expectancy more than a decade longer than any of it's central American neighbors, but also had surpassed European average life expectancy by more than two years.

Indicator	1940	1950	1960	1970	1980
Illiteracy (% 15 and over)	27	21	16	13	10
Life expectancy	47	56	63	65	73
Infant mortality (per 1000)	137	95	80	67	21
Population covered by health insurance (%)	0	8	15	39	78
Pop with piped water (%)	-	53	65	75	84

Table 2.1. Costa Rican basic indicators of well-being, 1940-1980. Adapted from: (Deneulin 2005)

Country	1950-1955	1955-1960	1960-1965	1965-1970	1970-1975	1975-1980	1980-1985
Costa Rica	57.3	60.2	63	65.6	68.1	71	73.8
El Salvador	45.1	49.3	53	55.6	57.1	57.2	57.2
Guatemala	42	44.2	47	50.1	53.9	56.2	58.3
Honduras	41.8	44.6	48	51	54.1	57.7	61.6
Nicaragua	42.3	45.4	48.6	51.9	55.2	57.6	59.5
Europe	65.6	68	69.7	70.4	70.8	71.2	71.7

Table 2.2. Life expectancy in Costa Rica, Europe and selected Central American nations, 1950-1985. Adapted from: (CEPAL 2010)

This was the result of a highly successful set of state-interventions to modernize agriculture and redirect the resulting surpluses to social services, infrastructure and industrialization. Between 1961 and 1975, agriculture was the dominant source of foreign exchange in Costa Rica, although the proportion of total national export value derived from agriculture fell from 90% to 73% (see Figure 3 below). This was matched by a rise in the proportion of total export value deriving from industry (10% to 27%). The agricultural surplus used in for the investment in productive activities and the formation of an advanced welfare state was mostly generated by coffee, the single most important agricultural crop in terms of export value during the industrialization process. Coffee yield gains due to a state-led agricultural modernization project were impressive, rising 500% from 1960 to 1980 from 6 fanegas/hectare in 1960 to 30 in 1980 (Romero 2006). This distinguished the sector as the highest yielding in the world. While this combination of high yielding, surplus generating production is historically and theoretically linked with full capitalist production relations, by the late 1970's the Costa Rican agricultural sector was still characterized by the predominance of smallholder farm-households economically organized around familial labor provision.

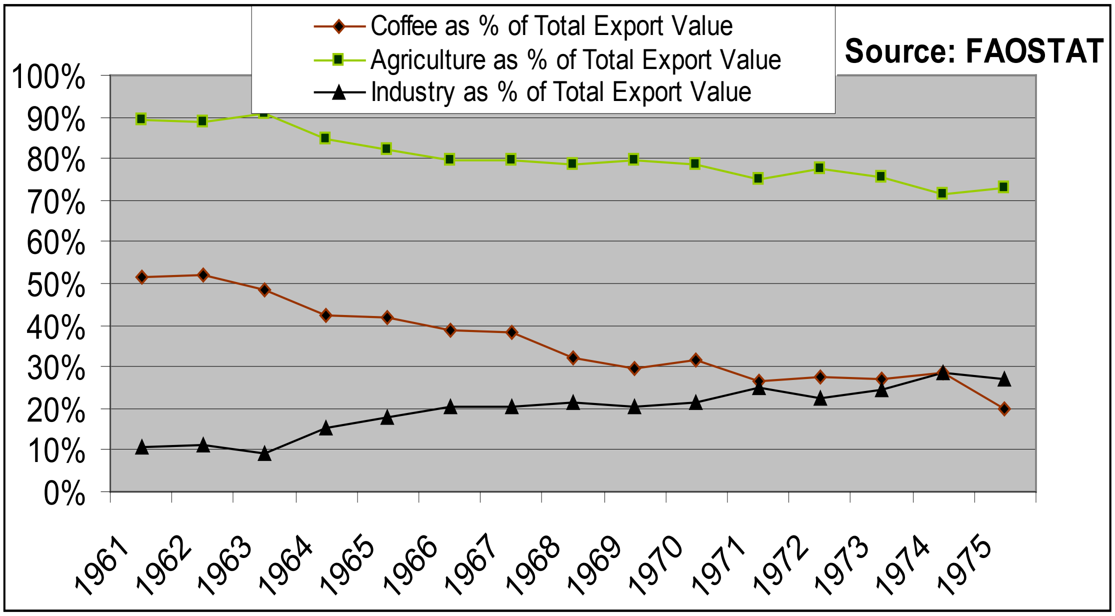

Figure 2.3. Agriculture, industry and coffee proportion of total export value, 1960-1976. Source: (FAO 2011)

As detailed in table 2.3. below, Costa Rica experienced a more than 10% growth in the proportion of total export value embodied within manufactured products between 1970 and 1980, which was the highest rate of growth in Central America for that period.

Country	1970	1975	1980
Costa Rica	18.7	24.3	29.8
El Salvador	28.7	27	35.4
Guatemala	28.1	25	24.4
Honduras	8.2	11.1	12.8
Nicaragua	17.8	17.7	18.1
Total	10.9	16.3	17.8

Table 2.3. Exports of Central American manufactured products as percentage of total exports, 1970-1985. Source: (CEPAL 2010)

The coffee modernization program served its purpose in propelling a stagnant, agro-export dependent nation on a path towards industrialization and the creation of an advanced welfare state. Modernization was incentivized by the Costa Rican state, with credit provision for the introduction of new high yielding varieties as well as for the purchase of agrochemicals. Prior to the 1950's modernization, state involvement in economic development was negligible. However, as Figure 2.4. shows, government expenditures rose from less than 13% of GDP in 1970 to over 18% by 1979. These expenditures were key political tools of the state apparatus in promoting agro-industrialization and mediating tendencies of peasant dispossession by class differentiation in the Costa Rican context.

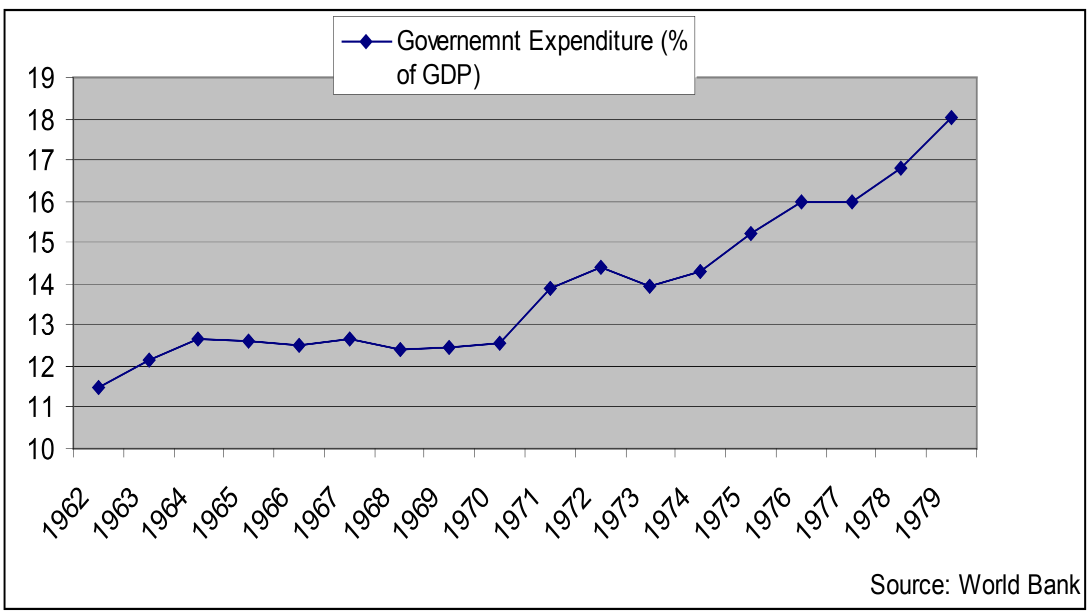

Figure 2.4. Costa Rican government expenditure as a proportion of GDP, 1960-1980. Source: (WB 2011)

Discussion

The Costa Rican agrarian transition was shaped by local history, agroecology and culture. The specific form that agrarian capital took in Costa Rica, entrenched within processing and factor input sectors, overshadowed the theoretically deduced "classical agrarian question's" tendencies for producer differentiation (Bernstein 1996; Byres 1996; Akram-Lodhi and Kay 2010). In Costa Rica "the agricultural sector has contributed significantly to the post-war import-substituting industrialization process but without completing the "classic" trajectory of agrarian transition", which would have entailed complete capitalist social relations in agriculture as well as the full dispossession of the peasantry through class differentiation (Goodman and Redclift 1981). However, by 1980, the country had successfully completed the first stages of agroinput-substitution-industrialization and was widely considered one of the most stable and developed democratic societies in Latin America. The contingency of the Costa Rican agrarian transition resulted from the particular balance of class powers, including the prominence of state politics both guiding and exploiting the transition (Byres 1996). In Costa Rica, this was perhaps best epitomized by the state-led modernization process.

The Costa Rican coffee modernization project introduced expensive, chemical inputs whose manufacture and sale was controlled by the agrarian oligarchy, which also maintained control over processing, credit, input-sales and exportation. Technically speaking the price per pound of coffee paid to small and medium-holder farmers by processors could be considered a “concealed wage” because it signifies a proxy sale of household coffee producing labor power to the agroindustrial and merchant capitalists who finance, process and export their product (Goodman and Redclift 1981). In this manner, agrarian capital has found a mechanism for asserting partial control over the production process, but without the guarantee of peasant dispossession. However, until the peasantry is completely reliant on actual wage-labor relations, the subsumption of peasant labor processes to agrarian capital can only be considered formal and not real. Within a given agricultural sector, if labor relations are actually subsumed to capital (aka real subsumption), this suggests that dispossession of the peasantry is well underway if not completed and that processes of firm concentration, labor rationalization and technological innovation have begun. Meanwhile, an agricultural sector whose labor relations are characterized by only formal subsumption to capital is a sector that can be presumed to be dominated by petty-commodity production.

“Recombinant agrarian capital” and the real subsumption of nature

Just as the real versus formal subsumption of labor processes was instrumental in understanding the appearance and differentiation of agrarian social classes, so the real versus formal subsumption of nature by agriculture is instructive in conceptualizing processes of technological innovation and surplus capital accumulation in agriculture. The formal subsumption of nature refers to the process whereby capitalist firms exploit natural processes for commodity production “but are unable (or unwilling) to control, intensify, manipulate, or otherwise ‘improve’ upon nature to suit their own purposes”. In contrast, the real subsumption of nature finds firms increasing biological productivity as capital “circulates through nature” (Goodman, Sorj et al. 1987). When land shortages prevent the easy expansion and future transformation of agroecosystems, capital instead devotes itself to completing the real subsumption of nature and agriculture. (Boyd, Prudham et al. 2001). This tendency of agrarian capital to expand reproduction through the transformation of coffee agroecosystems is a prime example of the real subsumption of nature and agriculture. (Boyd, Prudham et al. 2001). These particular processes of commoditization and expansion of agrarian capitalism in Costa Rica are suggestive of:

> (w)hat Watts (1998; p.450) memorably terms recombinant agrarian capital (which) might, in particular circumstances, prefer to sustain a hybrid, non-capitalist rural economy subsumed to capital”…as well as the capacity of family-based petty commodity farm production to, as Marx had noted, depress real wages by working harder and longer…agro-industrial capital would restrict itself to food processing, farm inputs, and rural financial systems, using science, technology, and money to subsume petty commodity production to the demands of agroindustrial capital. (Akram-Lodhi and Kay 2010; p.188)

However, the flip-side of this arrangement is that this agrarian transition has by default reinforced peasant social control over the means of production. The historical predominance in Costa Rica of “recombinant agrarian capital” in place of landed agrarian capital has thus positively affected future peasant autonomy by maintaining a source of subsistence, and hence, use-value creation (Chapter 6 evaluates the extent to which this maintenance of use-value production has led to the contemporary persistence of the coffee producing peasantry in Costa Rica) .

The state also figured large in the appropriation of the surplus capital accumulation generated by coffee production. The 7% state tax on all coffee production provided fiscal support for the politics of welfare-state capitalism that have shaped the peasantry as well as the speed and scope of import-substituting industrialization of the economy. It is worth restating that it was mostly coffee agriculture that provided the surplus that was appropriated by the state in order to fund industrialization and so achieve such high levels of human health and social development. It was done so in a unique and contingent "tico" style. As agrarian capital increasingly did not concern itself with the actual production of coffee, the internal processes of peasant differentiation in Costa Rica were markedly less impacted by the intense pressures wielded by landed capitalists in other national contexts, (esp. Columbia, Brazil and Puerto Rico), in their hunt to spatially expand and socially concentrate their powers within the productive sector (Winson 1989). In the case of coffee the initial Costa Rican agrarian transition (to capitalist agricultural relations) was not one predicted by the classic agrarian question, which would have assumed the trifurcation of the sector into a landless proletariat class, a landed capitalist producer class and an agroindustrial class. Instead, agroindustrial capitalists and petty-commodity producers emerged as the two most prominent agrarian classes and peasant dispossession by differentiation due to the concentration of land in the hands of agrarian capital has not been a historically important cause of peasant disappearance in Costa Rica. This is because, as noted above, the tendency for agrarian capital to concentrate in the agroindustrial sphere does not, by default force agriculture to obey a law-like "path-dependent" march obliterating peasant forms of social organization.

The Costa Rican state took a unique, and hence contingent role in diffusing agrarian class tensions so that differentiation within the agricultural production sector was minimal, while at the same time accumulation within the agrarian capitalist class was maintained and actually fomented - a key factor leading to the high levels of social-development, the capitalist transformation of society and the agro-industrialization of the national economy

I dub all these state mediated processes up until 1980 "the state-led agrarian transition of class contingency". I will conclude with the identification and preliminary discussion of important contradictory forces already apparent from the analysis of this particular national agrarian transition that have historically impacted, and continue to impact, the environmental, economic and social sustainability of peasant coffee and basic grain production in Costa Rica.

One of the policies contributing to the persistence of the peasantry was the state-led development of a large cooperative sector. This has been lauded as a direct intervention to ease rural unrest, limiting exploitation by the oligarchy and helping preserve peasant production (Sick 2008). However, the internal contradictions within the state-peasant alliance reflected in the creation of cooperatives are readily apparent. These cooperative institutions were themselves formulated in direct response to the adverse impacts on peasants of the uneven and capital intensive process of modernization and industrialization of the coffee agroecosystem that itself was planned and executed by the state. It was the state's own strategies for agricultural modernization that increased inequalities in yield attainment between larger and smaller farms. However, at the same time the coffee cooperative creation of economies of scale for small and medium producers in the purchasing and processing of production and provision of credit has been a very important political reform of Costa Rican agrarian capitalism. It was an especially important precursor to the development of certified Fair Trade coffee markets, which only source from cooperatively structured, smallholder producer organizations, and are the subject of investigation in chapter 5 of this dissertation.

However, when establishing and capitalizing a new peasant producer cooperative a substantial debt was usually incurred by the incoming peasant membership. Foreclosed mills of formerly private agrarian capitalist owners passed the liability to the National Bank which sought groups of peasant producers to inherit the facilities as well as the accompanying potential for obtaining an economy of scale and substantial debt burden. In many cases, including that of the CoopaBuena Coffee Cooperative discussed in subsequent chapters, the producers have been forced to abandon the venture and assume the debt because of poor management skills, high interest rates and periodic busts in the market. This apparent state-mediated devaluation of the peasant production sector to recoup losses incurred by the agrarian capitalist class is in tension with the values, goals and abilities of producer cooperatives to serve their peasant production base. This has seriously impacted the social sustainability of peasant forms of coffee production. These dynamics are further evaluated through the case study presented in Chapters 4-6.

Additionally, by focusing so much state political will, financial capital and environmental resources in the agricultural modernization process, as well as in agroinput-substituting industrialization, the coffee and basic grain agroecosystems, as well as the national model of industrial development, have become increasingly vulnerable ecologically and economically. The increasingly volatile nature of the global coffee commodity market price throughout the 1980s and 1990s, combined with the Costa Rican growers expensive reliance upon agrochemical inputs, made high rates of GDP growth due to increases in agricultural productivity and agroindustrial productivity experienced throughout the ‘60s and ‘70s unsustainable. This theme is further elaborated in the chapter that follows. Similarly, as coffee agroecosystems and their managers became increasingly dependent upon industrial agricultural practices; soil degradation, water contamination, human health dilapidation and over all system vulnerability has increased.

Conclusions

By actively intervening in rural politics the state was able to shape rural accumulation and production processes so that capitalist transformation and peasant persistence went hand in hand. This was apparent from the *ad-valorem* tax on coffee production enacted prior to the 1948 revolution to the creation of state institutions ICAFE and the CNP immediately following the revolution, both of which actively regulated the farm-gate prices paid to coffee and basic grain producers. This case study provides empirical and historical evidence rejecting the notion of peasants as a residual category or social class destined for enlistment into the ranks of the proletariat (Brass 2002). That type of path-dependent transition is incorrectly interpreted as a theoretical necessity based on the equally mistaken belief of the inevitability of full structural change towards capitalism in all sectors of society, agricultural included (Marx 1967). In fact, Marx was very careful to acknowledge the historical and material specificity of each agrarian transition. In this case, capital intensive coffee processing mills were a unique historical and material solution to agrarian capitals lack of direct ownership over labor and landed production in Costa Rica. Continued access to the means of production, the maintenance of a subsistence economy and the employment of non-remunerated family labor, all are factors that have contributed to a form of Costa Rican coffee producing peasant agriculture not subject to “classical” resolutions of the agrarian question as either landless proletariat or agrarian capitalist (Lenin 1964; Kautsky 1988). This combination of commodity and self-sufficient modes of production emerged as the dominant form or class of producer within the peasant sector of Costa Rica in the early twentieth century. Following Goodman and Redclift in their analysis agrarian change in Mexico, I contend that in Costa Rica, the formal subsumption of peasant labor processes to agrarian capital is a result of a specific agrarian transition and is "a measure of the extent to which capital itself has adapted to the structural constraints imposed" (1981; p.213)

With many of the contingent factors contributing to the unique Costa Rican agrarian transition and peasant persistence have been identified, we are well situated historically and theoretically for the following analysis of the structural dynamics and resistance strategies that have contributed to the contemporary persistence of peasant agriculture in Costa Rica. Understanding the strength of this legacy in the face of contemporary agrarian and food crises, as well as the specific resistance strategies it has inspired are important tasks taken up in the remainder of this dissertation (Chapters 4- 6).

Chapter 3.
Structural Adjustment, Neoliberalism and the Persistence of the Costa Rican Peasantry: 1980-2009

Chapter overview

This chapter historically contextualizes the neoliberal turn and the recent (since 1985) trend of dispossession and political and economic subordination of the Costa Rican basic grain producing peasantry to non-traditional export (NTE) models of agricultural development. I contrast this with the current persistence of the Costa Rican coffee sector peasantry, partially due to what I argue is an uneven, incomplete and job poor industrialization process shaped and exploited by international finance capital, and thus incapable of providing a viable livelihood alternative. I identify both macro-structural factors and specific household strategies that help, as Bebbington and Batterbury have suggested, to reconceptualize the peasantry in light of the globalization process (2001). Finally, the key resistance strategies employed by Costa Rican smallholders in the face of the coffee crisis are identified for investigation in the community case-study chapters which follow. While the classical agrarian question was helpful in understanding the peasantry's role in national development when the sectors of agriculture and industry were coupled (Chapter 2), when decoupled or disarticulated, as is the case at hand, new conceptual models are called for that incorporate linkages (networks), scales (agroecosystems) and actors (transnational peasant social movements) appropriate for the particular world-historical moment.

Background

The conceptual tools and analytical framework (utilized in Chapter 2) of the agrarian inquiry proved useful in pointing out that the theoretical path of the classical agrarian transition was a product of a specific world-historic moment, Europe in the 19th century. The variation between the Costa Rican actors and stages of national capitalist transition and those featured in the classical agrarian transition schematic proved constructive in identifying the contingency of the Costa Rican experience. I found that dynamics within the Costa Rican coffee producing peasantry were best understood through the examination of the shifting national balance of class powers as well as the specific surplus-capital accumulation regime. In both of these analyses I also found state-politics of market intervention and land distribution to be key variables explaining the unique transition to commodity capitalism in Costa Rica.

Agrarian questions under globalized accumulation

One of the principal dynamics of the classical agrarian question is the mobilization of an agricultural surplus for the industrial transformation of a *national* economy. It is a product of the world-historical accumulation regime under which it was formulated-state-centered capitalism (Warren 1980; Bernstein 2004). While suitable for the analysis undertaken in the previous chapter, the classical agrarian question's analytical focus on the nation-state has been widely argued to have left it unequipped to interpret contemporary agrarian class configurations and surplus-regimes when the dynamics of accumulation have been globalized (Friedmann and McMichael 1989; McMichael 2008).

This led to a re-evaluation of the agrarian question framework, as by the late 1970's profound changes in the global economy, a world-wide recession resulting from persistent stagflation in developed countries and the debt crisis in developing countries led to a "counter-revolution" in the development debate as the efficacy of state-led growth began to be called into question (Peet and Watts 1996). Ultimately, the collapse of the former socialist economies created an ideological vacuum filled by an ascendant neoliberalism (Booth, (1985) 1995; Edelman & Haugerud, 2005). Deregulation and structural adjustment of national economies to deal with stagflation and the debt-crises soon led to a newly identifiable model of food and agriculture development that was predicated upon the agency of transnational corporations (Friedmann and McMichael 1989).

In this neoliberal political economy, peasant dispossession, the determination of food prices and the extent and structure of industrialization became primarily dependent on globalized accumulation patterns, which are no longer dependent on agriculture as well as de-linked from national-level capitals. (Bernstein 2001). This is partly because, as other analysts have noted, of a mismatch between the loci of primary activity surrounding the classical agrarian question, the nation-state, and the scale and dynamics of accumulation under neoliberal, globalized political economic configurations (Bernstein 2001). This has led Bernstein to ponder a new agrarian question of labor:

> *With contemporary "globalization" and the massive development of the productive forces in (advanced) capitalist agriculture, the centrality of the "classic" agrarian question to industrialization is no longer significant for international capital…there is no longer an agrarian question of capital on a world scale, even when the agrarian question…has not been resolved in many countries of the "south"…in poorer countries today, might there be a "new" agrarian question of labor…manifested in struggles for land against "actually existing" capitalist landed property?.......The tendency of "globalization' to fragment labor…now detached from that of capital, rooted in crisis of unemployment, and manifested in struggles over, and for, land to secure some part of its reproduction needs.* (Bernstein 2004; p. 202 and 221).

Importantly, under this scenario the impacts are uneven and diverse, as the forces of global capital no longer need agriculture to continue accumulating. This leaves space (but little agency) to create or consolidate certain spaces for peasant production, like in coffee production, while destroying others, like in corn production, In those spaces afforded peasant production, class differentiation is a tendency, but not inevitable. Underscoring the uneven nature of this transition, capital cannibalizes certain industrial centers leading to re-peasantization in the absence of urban employment. However, the main sites of resistance in this transition are in the countryside of developing countries, where capital is unwilling or unable to provide sufficient employment in either the urban or rural sector, a redundant class of labor engages in a struggle for survival. While no resolution to the transition is theorized, resistance in the form of land invasions is identified as a powerful current strategy and future tendency (Bernstein 2004).

In those spaces where the increasingly transnational, technologically advanced and highly mobile nature of industrial capital no longer requires the appropriation of capital and labor surpluses from national agrarian sectors in order to ensure continued accumulation, neither demand for peasant agricultural production nor supply of industrial jobs can be guaranteed (Bernstein 2001). Without simple commodity production or proletarianization a core tendency of capitalism, with the surplus production of agriculture no longer a teleological necessity, the plight of the peasantry becomes linked to the ways in which neoliberalism was ’rolled out” in particular places, with some cases featuring peasant persistence, like in Costa Rica’s coffee sector, or even the re-peasantization of formerly disposed smallholders like in the case of Brazil’s MST. Understanding the persistence of smallholder production is the main motivation for this investigation, which is guided by the following research question; <u>What have been the macro-structural factors, as well as farm-household and institutional strategies, that have contributed to the contemporary persistence of the coffee producing peasantry in Costa Rica in the face of the coffee crisis?</u>

A brief history of neoliberalism in Costa Rica

The Costa Rican national economy was, by the end of the 1970’s, dependent on exports of coffee, bananas and sugar (the “traditional” export crops) as well as heavily in debt, approaching the highest per capita debt holdings in the world

(Edelman 1999). While part of this debt was used to fund import–substituting industrialization and the development of an elaborate welfare state unseen in most other developing countries of the world, overzealous lending practices of U.S. based investment banks exacerbated the magnitude of the "debt crisis" faced by Costa Rica as well as many other Latin American countries (Harvey 2005). In turn, the lenders indiscretion can be linked to overheating and over-accumulation within the international financial system. This condition was partly the result of the oil embargo of 1973, when middle-eastern oil producing states awash with a glut of "petrodollars" funneled them primarily to New York based investment banks. The capacity of US domestic industry to profitably absorb this surplus capital was limited by the waves of deindustrialization visited upon the U.S. during the 1970's. The quantity of surplus financial capital that was internationally dispersed then significantly increased with the degree of over-accumulation of capital so high that loans were made under dubious terms because alternative domestic opportunities of profitable deployment of the capital were rare to non-existent. Thus the banks often sought foreign governments, many of them in Latin America, to withdraw substantial loans for infrastructure and social spending[26]. This phenomenon can be considered a variation of the tendency, identified by Marx, of capitalist industrial production to experience a falling rate of profit (Marx 1967). Investor inability to realize consistent returns to

[26] But only when the returns to investment are relatively high or the collateral leveraged exceeds the amount of the loan and is easily liquidated.

productive investment produces a surplus of financial capital that eventually proves toxic. According to David Harvey:

> *If the amount of capital in circulation is to remain in balance with the limited capacity to realize that capital through production and exchange…then a portion of the total capital must be eliminated…the devaluation of capital* (Harvey 2003; pps. 192-193).

A default in the repayment of these loans would have meant the destruction of a significant quantity of U.S. based financial capital that threatened economic depression or even collapse within the core capitalist economies. The mounting dilemma of who would suffer the devaluation of this excess capital accumulating in the investment banks and economies at the center of capitalism was thus resolved in the form of high-risk loans to peripheral governments and by extension, their citizenry, adding credence to the observation that crises of capitalism are never solved, only moved around (Harvey 2005). These loans contained unfavorable terms for debtor nations such as volatile variable interest rates, as in the Costa Rican case (Edelman 1999). In the eyes of the banks these governments were relatively low-risk recipients with substantial collateral available for sacrifice in the form taxpayer funded state budgets as well as state-owned banks, businesses and infrastructure.

Across the globe, the conditionality of structural adjustment loan packages has introduced policies that have been linked to decreased food self sufficiency and increased vulnerability to shocks and stresses at the household, community, and national scales (Blakie, Cannon et al. 1994; Goodman 1996; Bryant and Bailey 1997; Edelman 1999; Barkin 2002; Rigg 2006). In Costa Rica, these very deep, structural changes within the economy and society have had huge impacts, leading to the eventual domination of national agricultural and industrial sectors by foreign capital. Within agriculture, the peasantry was hit especially hard as the once extensive basic grain producing sector was all but eliminated due to the national reorientation of agriculture from smallholder production for domestic consumption to vertically integrated, corporate agricultural production of non-traditional exports. By the late 1980's, coffee was the sole crop with any kind of sizeable peasant producing sub-sector.

The beginning of the crisis came in 1979 when interest's rates detonated following an oil price spike. Low international commodity prices for coffee, still Costa Rica's leading agricultural export, combined with the collapse, due to unrest and war in Nicaragua, of the biggest export market for Costa Rican manufactured goods, the Central American Common Market, and left the nation with scant resources in the face of sudden inflationary pressures. (Tardanico 1996). In 1981 Costa Rica became the first Latin American country to default on loan repayments. In Costa Rica the immediate implications included the "creative destruction" and devaluation of national capital stocks by inflationary pressures and widespread unemployment. Following two years of sustained heavy indebtedness and the adoption of the internationally proscribed "shock treatment", the first structural adjustment loan

(SAL) was signed between Costa Rica, the U.S. and the World Bank in 1985. Neoliberal policy was now in the front and center politically and economically within Costa Rican government and society.

The nominal goal of the structural adjustment of the Costa Rican economy was to reorient the industrial and agrarian sectors from domestic to international production through tariff reform and modernization of manufacturing and agriculture. In agriculture, this entailed World Bank required reductions, and eventual elimination, of subsidies for basic grain production; corn, beans and rice. The bank further required agricultural research and development moneys be significantly rededicated to new and non-traditional exports (not coffee, sugar and bananas). This was partly accomplished through the privatization of the banking sector and the subsequent restriction and reorientation of credit.

The second SAL was signed with Japan and the World Bank in 1989 for $200 million dollars (Cattaneo, Ojedaa et al. 1999). This loan stipulated that the government complete the removal of basic grain production subsidies (including credit provision) and further lower import tariffs, effectively killing domestic corn production. The second structural adjustment loan also required the finish of all infrastructures, such as ports, irrigation and storage facilities, needed for the non-traditional agricultural export (NTE) sector to blossom. These measures were coordinated with the goal of redirecting agricultural activities to high-value exportable items such as melons, macadamia nuts, papayas, mangos, citrus and pineapples. As you can see in Figure 3.1. the annual production value of most NTE's rose from near nothing in 1985 to over $500 million by 2008 in the case of pineapple alone. The government dubbed these NTE's "la agricultura de cambio" (the agriculture of change) and with the huge impacts detailed below, it was no misnomer.

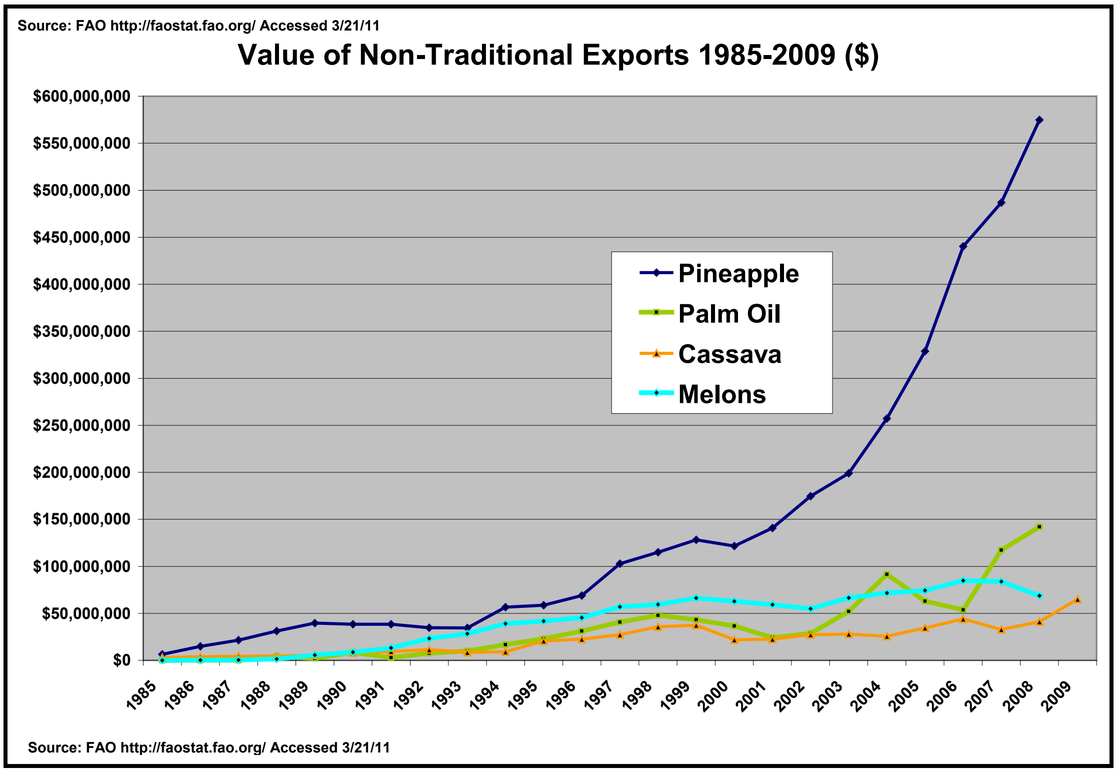

Figure 3.1. Rise in value of Costa Rican non-traditional exports, 1985-2009. Source: (FAO 2011).

The rapid adoption of NTE's carried substantial implications for the balance of power in agrarian class relations such as:

1. NTE crops had high capital barriers to entry

2. Peasant access to agricultural credit now scarce due to bank nationalization

3. Technical knowledge and training for NTE crops were needed but not readily available

4. NTE crops were scale dependent, favoring the large scale, capitalized operations

5. The produce itself was subject to markets much more volatile than those of the traditional crops

With all of these characteristics unfavorable to peasant production it is not surprising that many studies have shown that the benefits of NTE's often concentrated in the hands of a very few and usually very large international firms (Thrupp 1995). Thrupp points out only these large capitalized firms can afford the large up-front capital costs of start-up as the crops involved usually require higher outlays than traditional crops. (Thrupp 1995). The relative domination of foreign firms is also due to the specialized transport, market information and credit availability (Barham 1992). As a result, Del Monte controls almost every pineapple harvested in Costa Rica.

Soon after SAL2 was signed peasant basic grain production began its steady decline and final collapse. The 1989 deregulation and liberalization of global coffee supply chains promised more of the same and resulted in the lowest real coffee commodity prices ever and a highly uncertain and vulnerable future for the estimated 100 million people worldwide who rely on coffee for an income. Heavy losses due to low farm-gate prices and high input costs caused coffee volumes to decline 34% between 1999 and 2008 in Costa Rica (ICO 2011). In addition, the number of coffee producers in

Costa Rica dropped 35%, from 73,707 to 48,256 between the years of 2000 and 2009. However, the sector emerged from the crisis still characterized by small-farm production, with coffee farms less than three hectares making up 83.5% of all farms, 31.9% of total area and 28% of national production in 2004 (INEC 2004).

By the late 1980's, coffee was the sole crop with any kind of sizeable peasant producing sub-sector and the Costa Rican coffee sector remains one of the most regulated in the world with ICAFE a price-fixer, setting the minimum farm-gate price for each mill in the country. The state has maintained or severely delayed the cutback of many institutions and services that Costa Rican coffee-producing peasants rely upon such as agricultural research, extension and subsidies. After forty years of living under the safety net that was the Costa Rican welfare state, change would come slowly, and not without a fight. Peasant groups, especially basic grain producers, organized themselves and took militant actions culminating with the 1988 general strike and occupation of a municipal building in Guanacaste (Edelman 1999).

Additionally, because of democratic and liberal Costa Rica's strategic position between a Panamanian dictatorship and the Sandinistas of Nicaragua, the full effect of the austerity measures was buffered by massive amounts of US aid money and debt relief. According to Edelman, between 1983 and 1985 U.S. economic aid to Costa Rica totaled $592 million and made up 10 percent of the nation's GDP while in 1985 Costa Rica received the second highest per-capita amount of U.S. foreign aid in the world, trailing only Israel (1999; p. 78). U.S. purchase quotas for Costa Rican products also expanded in the years of structural adjustment. Thus the full impact of structural adjustment policies and austerity measures was mediated by the Costa Rican state as well as it's international lenders, leading Edelman to declare that "Costa Rican neoliberalism has rarely been as liberal as it claims to be" (1999; p. 82).

The problematics

The phenomena of contemporary peasant persistence and resurgence in the peripheries of global capitalism has motivated Byres' re-formulation of Karl Kautsky's agrarian question 100 years after its genesis, as an inquiry into "the continued existence in the countryside, in a substantive sense, of obstacles to an unleashing of accumulation in both the countryside itself and more generally – in particular, the accumulation associated with capitalist industrialization" (Byres 1996; p. 26). In order to evaluate these theories on the AQ and the role of the peasantry in contemporary CR politics I will pay attention to three fundamental "problematics" worthy of special attention by analysts of agrarian change and capitalist development: <u>accumulation</u>, <u>production</u> and <u>politics</u> (Bernstein 1996; Byres 1996).

The accumulation problematic recognizes the potential role that agricultural production has in creating a sizeable surplus of production that can be appropriated and dedicated to the expensive development of industry and other sectors in the national or international economies. The analytical task involved in this problematic is to evaluate the possibility of agriculture to produce a surplus and if so, identify how and by whom it is appropriated. This problematic was resolved in the state-led development era through the formal subsumption of peasant labor by agrarian processing capital.

The production problematic does not stray far from classic Kautsky and Leninist agrarian theory in its focus on capitalism's barriers or harbingers to rural restructuring and the processes of peasant class differentiation into wage laborers and agrarian capitalists. The analytical task involved here is to analyze on the ground level the existence and extent of class differentiation, dispossession, repeasantization or other significant production processes in the countryside. The production problematic was only partially resolved as the elimination of most landed capitalists left rural spaces relatively free of differentiation pressure.

The final politics problematic examines the interalliances between peasant classes and other societal classes, the state and social-political movements or networks (Bernstein 1996; Byres 1996; Akram-Lodhi 1998; Akram-Lodhi and Kay 2010; Akram-Lodhi and Kay 2010)[27]. The analytical task here is to identify alliances between peasant classes and other societal classes and evaluate when and why or why not this pact succeeds in procuring social, political and agrarian change through deliberate and

[27] In addition to my careful reading of the original Byres book and subsequent review by Bernstein, much of the clarity and organization present in my treatment of these problematics is drawn from Akram-Lodhi's review of the Byres book (1998) and a more recent (2010) set of articles that he and Cristobal Kay published in the Journal of Peasant Studies.

strategic struggles, whether violent or not. Following the 1948 revolution, this problematic resolved itself through the welfare state/s close attention to the class antagonisms that arose between agrarian capital and the peasantry. The state's political interventions to diffuse these tensions favored peasant interests more frequently than in other Central American contexts. As I will demonstrate below, attention to the individual manner in which these three problematics are resolved leads to a nuanced understanding of the structural factors and agent-based resistance strategies that have contributed to Costa Rican coffee sector peasant persistence in a globalized political economy.

The accumulation problematic

The impacts of the rapid structural adjustment of the Costa Rican agricultural sector have transformed agrarian relations more radically than any period since the introduction of coffee almost 200 years earlier. The amount of land dedicated to basic grain production plummeted following this elimination of state-support for the sector. In 1984 over 50,000 hectares of land were planted with corn, plummeting to 7675 hectares in 2001 and to 6837 hectares by 2008. This represents a more than an 85% reduction in corn area planted between 1984 and 2008, drastically reducing the Costa Rican corn producing sector from 30,000 total farm-households in 1984, 10,000 of which were farms under five hectares, to an estimated total sector size of 5000 farms in 2008. (Hansen-Kuhn 1995). As the figure 3.2. shows, the costs of corn and bean imports rose from near nothing in 1985 to over $180 million a year for corn. By the year 2008, fully 100% of the wheat, yellow corn and soybeans sold in the country were imported.

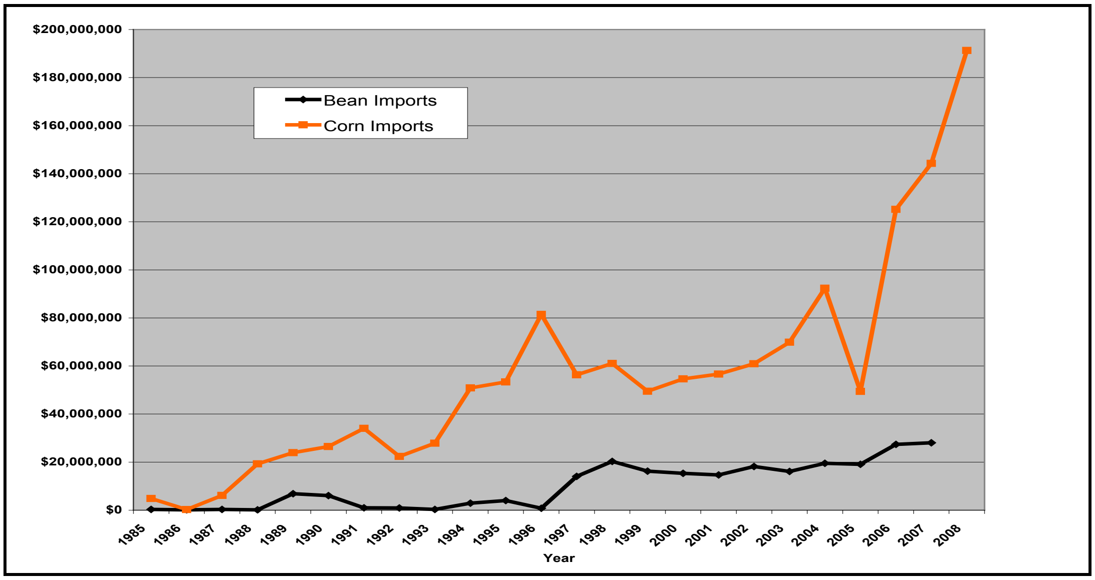

Figure 3.2. Corn and bean imports, 1985-2008. Source: (FAO 2011).

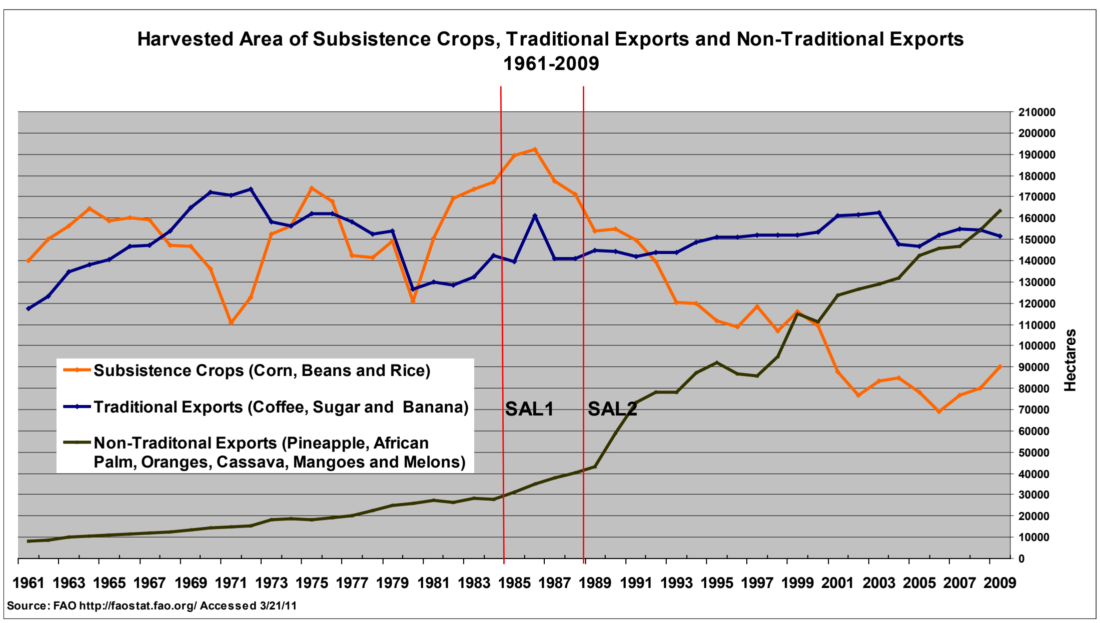

Figure 3.3. Land-use change; selected crops, 1961-2009. Source: (FAO 2011).

As figure 3.3 shows, while the amount of land dedicated to traditional exports (coffee, sugar, banana) has remained fairly constant between 1961 and 2008, land-use change in both the non-traditional and basic grain sectors has been very pronounced, especially following SA1 in 1985 and SA2 in 1989. The combined result of structural adjustments within the Costa Rican agricultural sector has been to orient both capitalist and peasant agriculture toward export production.

Adaptation and anti-accumulation

However, adaptive subsistence and self-provisioning dynamics are agroecologically as well as culturally woven into the fabric of peasant coffee agroforestry production in Costa Rica. Thus, the new era of constant volatility and recurring price crises for coffee and it's principal productive inputs can be mitigated by peasant adaptations in labor allocation such as self-exploitation through increasing substitution of purchased inputs for labor or conversely by the *temporary* abandonment of the coffee agroecosystems for more profitable activities which is made possible by the perennial nature of the agroecosystem. The following quote is from an oral-history documenting 1940s peasant coffee agriculture in the province of Alajuela, Costa Rica:

> *(O)n the same little plot of land you would find coffee, tiquisque (malanga or spoonflower), and yuca plants (cassava), everything planted on the same piece of land…(the coffee trees) were not planted very thickly, no because they used to plant things in between. Not very thickly, but not too far, either…in between they would plant some yuca, and people before would not waste anything; at the beginning of each row, they planted yuca, and in the middle, or where they thought best, the tiquisque, or a chayote, and let it spread out* (Samper 1990; p. 201).

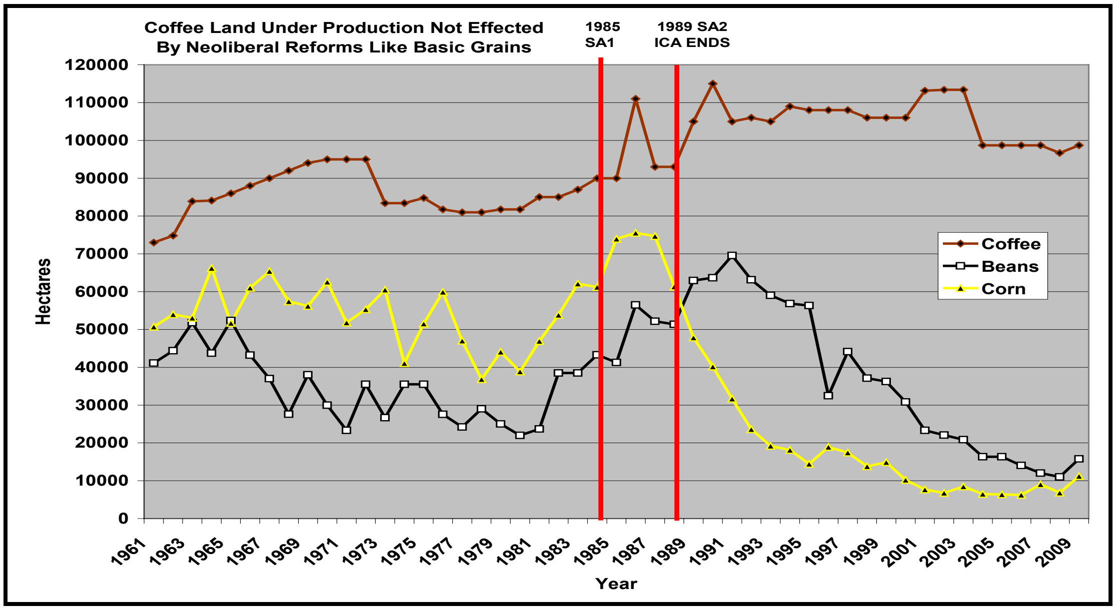

Figure 3.4. Costa Rican area in corn, beans and coffee, 1961-2009. Source: (FAO 2011).

The spatial and structural configuration of coffee agroforestry, combined with the cultural proclivity of the Costa Rica peasantry to value self-sufficiency, opens opportunities for the intercropping of subsistence crops and ecological service trees. These are only a few of the adaptive strategies employed by the peasantry that erect obstacles for resolution of the agrarian question's accumulation problematic, as self-provisioning and decommoditization are clear anathemas to surplus production. Note in Figure 3 that the land-use in coffee was not impacted by the economic crises nearly as much as corn or beans. This indicates lower yields on the same amount of land, probably because of less agrochemical application but ALSO indicates a structural difference between an annual cropping system and a perennial agroforestry system. The agroforestry system can be left to "limp" along until a price increase makes it viable again. The lower productivity in Figure 3.4, combined with the data in Figure

3.3, suggests that since 1991 production has almost halved while land in coffee has only declined 15%.

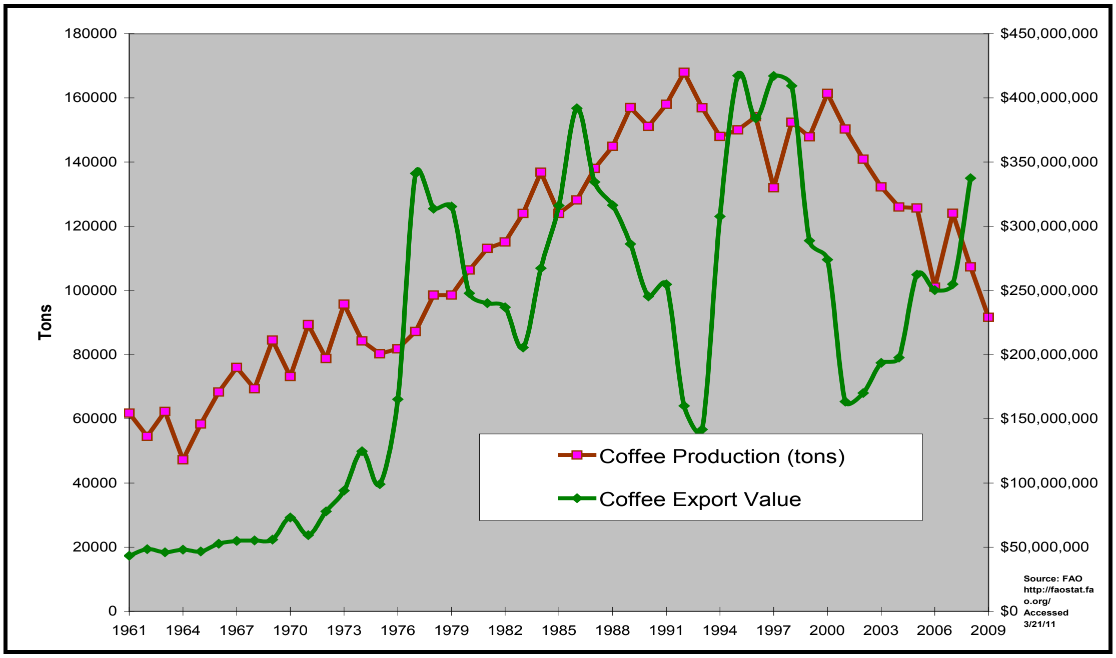

Figure 3.5. Costa Rican coffee production (tons) and export value, 1961-2009. Source: (FAO 2011).

The production problematic

The analytical task invoked in the production problematic is to analyze on the ground level the existence and extent of class differentiation, dispossession or other significant production processes in the countryside.

As part of the shock treatment advised by the World Bank, the Law for Export Processing Zones (EPZ) was passed in 1981 and attracted foreign direct investment (FDI) by establishing free-trade export-zones that were 100% exempt of any import duties on machinery or equipment, as well as completely exempting export-zone businesses from sales tax, municipal taxes and free of any taxes on capital or profit flows of repatriation (Jenkins 1997). Between 1997 and 2003 65% of FDI went into industry and almost every penny was invested within the confine of the EPZ's (Paus and Gallagher 2008). In 1999 there were 145 EPZ firms in Costa Rica. Of these, 90 firms, or 62% were owned by United States capital. These 62% of the firms employed 24, 417 people, or 82% of the total population employed within EPZ's. Costa Rica came in a distant second in both percentage of total firms (15%) and percentage of total employed (6%) (Jenkins 1997). Between 1998 and 2008 these EPZ's jumped from accounting for 35% to 51% of the total value of all Costa Rican exports while agricultural exports declined from 20% to 11% in the same period (see Table 9). EPZ's had quite quickly become the biggest source of foreign investment and exchange.

Table 3.1. Percentage of total export values; agriculture and coffee, 1998-2008. Source: (PROCOMER 2010).

Sector	1998	2008
All Agricultural	20.7	11.2
Coffee	7.4	3.2
All Non-Agricultural	79.3	88.8
Export Processing Zones	35	51.2

Table 3.2 demonstrates the relatively rapid ascendency of the manufacturing export sector as the leading source of foreign exchange in Costa Rica between the years of 1970 and 2008 compared with other Central American economies. While Costa Rica's economy industrialized heavily during the structural adjustment era, the preceding era of state-led agro-input substitution industrialization also saw substantial

growth in Costa Rica's proportion of foreign exchange derived from manufacturing, so much so that by the time that the first structural adjustment program was agreed upon in 1985, the country was already Central America's second most industrialized nation (see table 3.2.). The industrial infrastructures, transportation networks and employee training programs implemented during state-led AISI were extensive for the region at that time, positively influencing the strength and duration of Costa Rica's second-wave in industrial growth that began in the late 1990's and continues to this day.

Table 3.2. Central American exports of manufactured products as percentage of total exports, 1970-2008. Source: (CEPAL 2010).

Country	1970	1975	1980	1985	1990	1995	2000	2008
Costa Rica	18.7	24.3	29.8	22.3	29.3	25.1	65.5	62.4
El Salvador	28.7	27.0	35.4	25.7	35.5	38.8	48.4	54.7
Guatemala	28.1	25.0	24.4	20.2	24.5	27.7	32.0	37.2
Honduras	8.2	11.1	12.8	4.0	9.5	22.8	22.1	29.3
Nicaragua	17.8	17.7	18.1	8.9	8.2	20.3	7.5	10.1

Incomplete and jobless industrialization

However, this program of attracting FDI and liberalizing trade spawned an industrial structure with many of the shortcomings common to IMF imposed neoliberal deregulation projects. Table 3.3 displays EPZ data from the years 1994-1998 and clearly illustrates a few of the contradictions that have come to characterize Costa Rica's modern industrial sector. First of all, even though investment more than doubled and export value more than quadrupled during this time period, none of the profit generated was subject to taxation and the majority of all earnings were repatriated tax-free to the owning entities in the US. As a consequence very little of the wealth generated by this sector persists in the country and therefore contributes next nothing to the future growth. Second, while investment and profits skyrocketed during these four years, the number of jobs generated barely increases, either as a proportion of national jobs (1.9 to 2.3%) or percent growth in absolute numbers (21,520 to 29711 jobs; 38% growth). This indicates that although in 1998 EPZ's accounted for over 35% of national exports, they only generated enough jobs for about 2% of the country's workforce.

Table 3.3. Selected indicators of EPZ contribution to the Costa Rican national economy, 1994-1998. Source: Adapted from (Jenkins 1997) and (Cordero 2000).

Year	EPZ Employ-ment	% of National Employ-ment	EPZ Investment (millions US$)	EPZ Gross Exports (millions US$)	% of Nation Total Export Value	Local Inter-mediate Material Purchases/ Export Value
1994	21,520	1.9	254.5	343.4	12	9%
1995	25,374	2.2	311.4	434.2	12.6	7%
1996	25,525	2.2	334.7	643	17.2	5%
1997	25,699	2.1	484.1	891.5	21.2	6%
1998	29,711	2.3	650.3	1960.6	35.6	3%

Calculating the relationship between export earnings and local material purchases serves as a metric for understanding the extent to which positive spillover effects are being generated by FDI because as foreign firms located in the EPZs form backward linkages to domestic suppliers of intermediate inputs this ratio should increase. In Costa Rica the evidence is stark as the ratio of local material purchases to export earning drops from 9 to 3% between 1994-1998. No matter how you slice it, the project of promoting FDI through EPZs enclaves is not significantly linked with the

Costa Rican economy at large, and generates very little employment, tax revenue or industrial sector growth.

Dual industrial economy

What has effectively developed in post-structural adjustment Costa Rica is a dual industrial economy characterized by an exceedingly competitive foreign capital sector dedicated to high value, high profit exports and an uncompetitive domestic industrial sector that languishes increasingly separated from any positive spillover from the foreign-owned sector. The capture, extraction and repatriation of value untaxed without any circulation in the national economy has a significant negative impact on public spending, job creation and overall economic development although it continues as the default model of industrial growth in an era of curtailed state-powers and liberalized trade laws.

Table 3.4. Year 2009 top five imports/ exports. Source: (PROCOMER 2010).

Product	**2009 Imports Millions US$**	**Leading Export Country**	**Product**	**2009 Exports Millions US$**
Silicon Microchips	1087.9	US (83.8%)	Computer Parts	1227.3
Petroleum Products	1026.7	US (76%)	Silicon Microchips	861.4
Pharmaceuticals	403.7	Swiss (20%)	Banana	624.2
Circuit Boards	395.5	Japan (73.4%)	Pineapple	572.8
Automobiles	245.8	Japan (44.3%)	Transfusion Equipment	480.5

In the decade plus since Intel first established its semiconductor assembly and test center in Costa Rica there have been other multinationals that have followed their lead such as Proctor and Gamble, Microsoft and most recently IBM (Sanchez-Ancochea 2006). These new industries stirred hopes that Costa Rica would reap real benefits such as the creation of domestically owned tech-companies and parts providers. The results, however, are disappointing; all of the companies remain U.S owned and over 80% of the intermediate goods utilized in the semiconductor sector are imported directly from the US. All indications are that imports of intermediate goods used in the EPZs will continue to flow from China and the US. Ironically, traditional agricultural exports and AISI were the main engines of tax revenue in the era when all the infrastructure and social programs were developed that made Costa Rica an attractive site for FDI in the first place. Current levels of investment in public goods such as these remain at a fraction of their pre-structural adjustment level while more than half of the countries export value leaves from a non-labor intensive, highly capitalized, extremely profitable sector that is untaxed and unable or unwilling to make productive linkages with the greater economy. This is not a viable industrial growth model except for the foreign firms leading production in the EPZs, capitalizing on Costa Rica's cut-rate provision of human and physical capital produced by the redirection of agricultural surpluses, especially coffee from the 1950's through the end of the 1970's.

Within the context of a steadily growing economy that is characterized by highly-capitalized agricultural and industrial sectors, one would expect the incidence of poverty to decline. However, while poverty rates declined from 32% in 1989 to 23% in 1994, the proportion of impoverished has remained steady, with 24% of Costa Rican's classified as impoverished in 2004. A corresponding trend can be observed when extreme poverty is analyzed; while it declined from 9.9% in 1989 to 6.8% in 1994, it remained at 6.6% in the year 2004 (WB 2006). Income inequalities have also worsened since the beginning of the FDI era with national, Gini coefficients rising from 0.438 in 1990 to 0.501 in 2004, the largest increase by far among Central American countries (Table 3.5). Costa Rica also was the only Central American country with income inequality that rose in both the rural ***and*** urban sectors following structural adjustment. This indicates that an astronomical amount of FDI, lured by state-sanctioned tariff and tax breaks has resulted in urban EPZ's and a "rural agriculture of change" that has failed as an equitable development strategy. In order for FDI to succeed as a development strategy more linkages need to be made between EPZ industries and the greater Costa Rican economy. This requires the State assuming a more active role in charting a comprehensive national development policy and promoting future industries carefully so that the value added is not only located in repatriated profits but also accrues as income to domestic firms and individuals.

Table 3.5. Central American Gini coefficients, 1989-2009.
Source: (CEPAL 2010)

Country	Years	National	Urban	Rural
Costa Rica	1990	0.438	0.419	0.419
	2008	0.501	0.494	0.465
	Change	**+0.063**	**+0.075**	**+0.046**
Nicaragua	1993	0.582	0.549	0.536
	2005	0.532	0.5	0.497
	Change	**-0.05**	**-0.049**	**-0.039**
El Salvador	1995	0.507	0.466	0.442
	2009	0.478	0.451	0.418
	Change	**-0.029**	**-0.015**	**-0.024**
Guatemala	1989	0.582	0.558	0.513
	2006	0.585	0.547	0.526
	Change	**+0.003**	**-0.011**	**+0.013**
Honduras	1999	0.564	0.517	0.512
	2007	0.58	0.494	0.571
	Change	**+0.016**	**-0.023**	**+0.059**

Figure 3.6 depicts the 1998 transformation of the Costa Rican economy when manufacturing exports surpassed agricultural exports in total value. In the 10 years since, manufacturing has expanded the sectoral gap between total export values by a factor of 2 to 1.

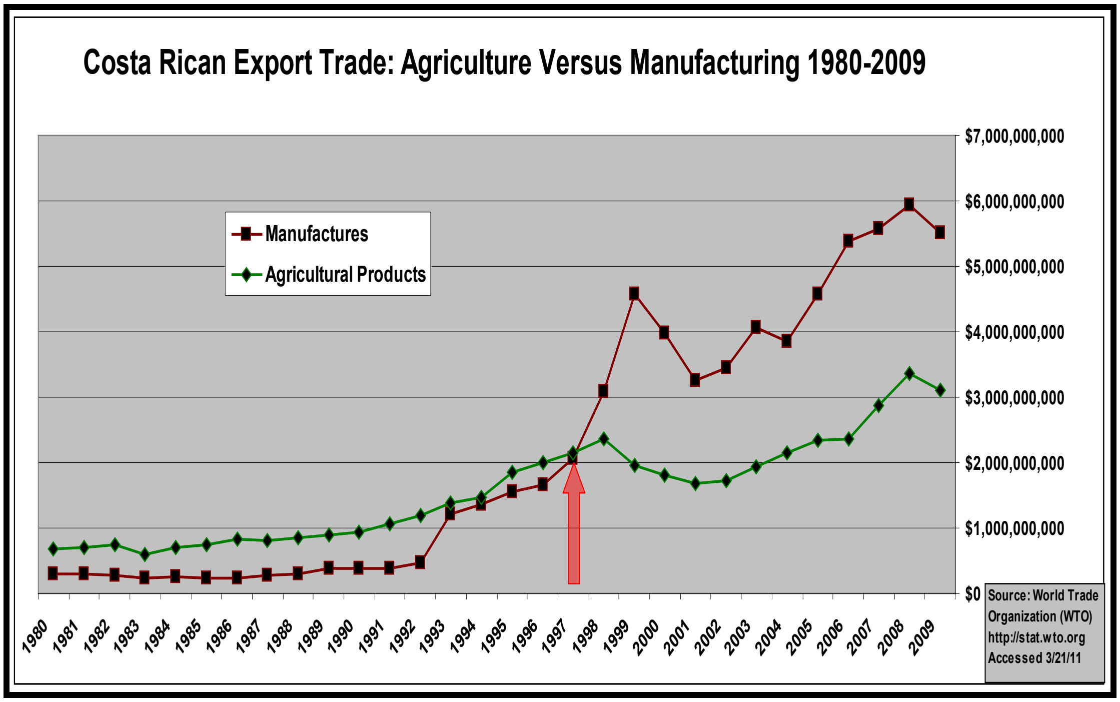

Figure 3.6. Agriculture versus manufacturing exports, 1980-2009. Source: (WTO 2011)

The relative employment by economic sector within Costa Rica is displayed in Table 6. The time-frame corresponds to the dominance of NTE and EPZ in the national export-economy as well as the collapse of the basic grain sector and the onset of the coffee crisis. Between the years of 1990 and 2007, relative employment population growth only occurred in the service sector. The agricultural sector experienced substantial losses in the relative population it employs nationally while the industrial sector's proportion of the national population employed shrank slightly. With most agricultural revenue growth confined to NTE's featuring capital intensive and labor extensive production systems, the amount of agricultural jobs they support is minimal when compared to the traditional Costa Rican crops of sugar, coffee and rice. These new cropping systems that benefited most from structural adjustment policy support where unable to help mitigate the agricultural jobs lost from the structurally adjusted basic grain producing sector. The explosion of FDI channeled into Costa Rican EPZs revitalized national industrial production, especially manufacturing, but failed to generate enough jobs for the sector to act as an outlet for those displaced from agriculture. The disappearance and re-absorption of the basic grain producing peasant sector can be attributed to the opening of new avenues of urban employment in the service sector and more limited opportunities as manufacturing industrial and NTE agrarian proletariat.

Table 3.6. Percentage of total employed population by sector, 1990-2007.
Source (WB 2011).

Sector	**1990**	**1995**	**2000**	**2005**	**2007**
Agriculture	25.9	21.6	20.4	15.2	13.2
Industry	25.9	24.1	22.3	21.5	22.2
Service	47.5	53.5	56.5	62.8	64.2

By the time of the coffee crisis, however, these "sinks" for surplus labor had filled leaving the coffee producing peasantry with far fewer escape valves given that the agricultural frontier had closed and agrarian reform had all but ended. What happens next? Will this once rural labor force reconstitute as a highly mobile, dispossessed peasantry in constant struggle to keep capital from a relentless trend towards further capture of surplus-value at the expense of continuing reductions in the value of labor (Araghi 2009)? The mega-cities in Latin America are filled by disposed agrarian classes as agricultural labor is devalued and the countryside dispossessed. How many shantytown residents or international migrants have origins in the coffee highlands?

Similarly, this has led some observers to claim that livelihoods in the rural south are becoming increasingly delinked from agriculture as "increasing number of rural households have no commitment to farming whatsoever" (Rigg 2005). The author Jonathon Rigg focuses on empirical studies of agrarian transitions in SE Asia, his area of fieldwork. He points to 5 factors influencing the transition 1. Erosion of smallholder farming profitability 2. Emergence of new, non-farm activities and opportunities 3. Environmental degradation 4. Land shortages and 5. Social and cultural change whereby farming becomes a low-status livelihood, especially for the youth. However the jobs that are currently available are minimal. The proletarianization and more likely pauperization as rural livelihoods are increasingly de-coupled from agriculture but there are no good industries nearby.

Together, the dispossession of smallholder basic grain producing farm-households, along with the increasingly capital intensive nature of Costa Rican agriculture, effectively blocked peasant transition into the new agricultural sectors as owner-operators. With dwindling opportunities for rural work, this former peasant class formed a rather large industrial reserve labor force. However, as detailed above, the inability of contemporary international industrialized capital to provide enough jobs for the newly dispossessed basic grain peasants has created tendencies and still unresolved contradictions in the labor market that constrained the wage labor options of coffee producing peasants during the coffee crisis. This vulnerable position is attribute by some analysts to the shift from one world-historical “food regime” to another (McMichael 2008). A food regime is defined as “a historically specific geo-political-economic organization of international agricultural and food relations” that divides the last 130 years into three regimes, each with corresponding dialectical power struggles (McMichael 2004). The three regimes thus far identified are:

1. 1870-1914: British – pivots on the dialectic of colonial and national division of labor
2. 1945-1970s: US- dialectic of global integration and coherence of national farm sectors
3.1970s- Present: Corporate – dialectic of food security and food sovereignty,

The current corporate regime is characterized by processes of increased industrialization of agriculture and the “accumulation by dispossession” of local knowledges and production by the green revolution (Harvey 2003). It features the dialectic of food security, justified in 1986 by U.S. Agriculture Secretary John Block; “the idea that developing countries should feed themselves is an anachronism from a bygone era. They could better ensure their food security by relying on U.S. agricultural products’, which are available in most cases at lower cost” (As quoted in McMichael 2004, pg. 6).

Politics problematic: peasant as vanguard?

The analytical task here is to identify alliances between peasant classes and other societal classes, including the state as an actor, and evaluate when and why or why not this pact succeeds in procuring social, political and agrarian change through deliberate and strategic struggles, whether violent or not.

For McMichael, the corporate food is responsible for the immiseration of peasant and urban peoples, BUT this will unite them around the global politics of food and in the process become the vanguard, a historical subject not only confronting the global politics of food but along with it developmentalism, modernity,

> *It is no longer about agrarian transition via the path dependence of a theory privileging capital, rather it is about agrarian transformation against the accumulation imperative, championed by a transnational coalition of peasants and other social justice movements.* (McMichael 2008; p, 210)

Whether or not this somewhat mechanistic path is real, organized resistance has emerged in the form of transnational movements that organize and articulate the demands of peasants, rural women, indigenous farming communities and farm workers. The resolution of this is an alternative modernity where re-territorialization of the "local" creates ecologically and socially defined sites for sovereignty. A full resolution includes class struggle led by international peasant social movements against the corporate food regime and the WTO, while also reworking multilateral institutions that champion fair trade and social justice. This transnational movement is made up of producer organizations and NGO's around the world. The main political demand of this movement is for the reorientation of agricultural development towards the goal of food sovereignty. Food sovereignty itself is a multi-faceted concept that recognizes food as a key part of culture and a basic human right. With food considered as an inalienable right, demand is then scaled up, proclaiming that each nation has the right 'to maintain and develop its own capacity to produce its basic foods respecting cultural and productive diversity" (Desmarais 2002). By claiming the right of each nation to pursue food sovereignty and self reliance, a line is drawn around the nation state that repositions it as the place for food and agricultural development. This is in direct contestation of the neoliberal phase of capitalist development that had subordinated the role of the state to the interests of transnational corporations.

Discussion: neoliberalism and the classical agrarian question

The three "problematics" of production, accumulation and politics provide an entry point for a deeper and more nuanced analysis in the following chapters of the contingent dynamics present in this case, and will serve to understand the persistence of the Costa Rican coffee producing peasantry amid larger processes of structural adjustment, incomplete industrialization and disarticulated accumulation. The manner in which each of these three problematics is resolved reflects the set of processes of agrarian change at work. The neoliberal production problematic has been intrinsically a class-based project that formed in response to the debt crisis of the 1970's in order to bolster capitalist control of the world economy at the expense of the incremental gains made during the prior quarter-century by peasant and working classes worldwide (Harvey 2005). As argued above, the systemic tendency in capitalist relations of production towards overaccumulation was the ultimate cause of the debt crisis that set the stage for the emergence of structural adjustment policies as the discourse and tool of an opportunistic and predatory class project. Ironically, as shown above, these policies would eventually lead to the failure of both export agriculture and industry to provide a viable source of employment for the peasantry. This contradiction within the newly unharnessed stock of international capital, failing to gainfully employ the objects of its dispossession, set in motion farm-household self-provisioning strategies that have put in jeopardy further extraction of surplus capital from peasant coffee producers. At the same time rates of migration, land-use change and class differentiation are poorly understood at the community level. In order to get a handle on the extent to which these rural restructuring processes have taken place the following chapter presents the results of a case study of the impacts of the coffee crisis on class differentiation, land-use change and livelihood vulnerability in the community of Agua Buena, Costa Rica between 2000-2009.

The accumulation problematic suggests that processes of peasant differentiation generally slow down when agriculture is based in low-external input production. The labor-requirements of a given agroecosystem also structure whether peasant agriculture is advantageous or not – in systems that require more labor peasant families are able to flexibly allocate family labor on-farm as well as derive wage incomes from other farms. As on-farm family labor is mostly un-remunerated, it can greatly subsidize larger-sized peasant households that toil in labor-demanding agroecosystems. However, this advantage begins to disintegrate when productive efficiency becomes strongly coupled with labor-saving, capital intensive and scale dependent external inputs and technologies such as agrochemicals, mechanization and irrigation. The lack of capital, whether liquid or landed, then overshadows any advantage poor peasants may derive from a labor surplus. Thus the high-labor and high external-input requirements in Costa Rican coffee production have historically allowed rich peasants to persist and out-compete poor peasants and purely capitalist enterprises, unlike other Costa Rican agricultural systems such as cattle-ranching banana farming. However, when agrochemical prices increase, agricultural wages swell, or farm-gate prices stagnate or decline, poorer peasants employing low-levels of technology and high levels of labor may possess an advantage. The fluctuating price and efficiency of technologies and inputs in Costa Rica coffee agriculture has thus played an important role in understanding the past experience of peasants in Costa Rica and also informs my analysis of their present and future trajectories (Chapters 5 and 6).

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The politics problematic has been identified by analysts as well as activists as the principal variable or "wild card" that agrarian change turns on because resolution of the previous two problematics are heavily influenced by rural unrest or state politics. Within this framework, national development is understood to be strongly determined by the power of specific political projects and alliances over agrarian class differentiation and rural accumulation. Indeed, the national development trajectory has been re-oriented, first by the international lenders towards the support of novel export crops that are incompatible with the small-scale of the family-farm, with the imperative need to finance the national external debt while in the process solidify the emergence of a vertically integrated, internationalized “modernized” agriculture. Support for smallholder agriculture and the production of basic grains for national food security has been replaced with reliance on the new internationalized food system of comparative advantage and cheap food imports. In the process, rural food security has been compromised and farm-family based livelihoods marginalized.

Throughout this political-economic climate of austerity Costa Rican coffee smallholders have maintained moral economic insistence in the payment of a “fair price” for their product. The locus for this struggle has shifted from a clearly identified national agrarian capitalist class to the more opaque, abstract, multinational corporate-merchant class. These class-conscious politics, combined with traditional ideals about the maintenance of family and community oriented livelihoods, have been successful at establishing interalliances with networks of upper-middle class Fair Trade coffee consumers and international conservation and development organizations in Europe and the United States (Luetchford 2008). Farm-households are represented by their democratic cooperative and most coffee farmers are not yet aligned with the types of more radical social movements described above. Whether or not the struggle waged by peasant producers and their allies in the procurement of higher farm-gate prices is an effective form of political resistance is the inquiry guiding Chapter 5, which presents the results of a case study evaluation of the direct and indirect benefits of membership in a Fair Trade Certified Cooperative.

Conclusions

This chapter identified the features of the post-structural-adjustment Costa Rican economy that help to explain the continued persistence of the coffee peasantry up until the present day. In this chapter I delineated the degree to which state coordination and support for the agricultural and industrial sectors was transformed by neoliberal reforms. A feature of neoliberalism often overstated is the absolute retrenchment of the state. While the nation-state as a scale and actor was certainly reduced by neoliberal reforms, in the case of Costa Rica especially, the state still plays an important role in mediating or exploiting the relationship between the peasantry and agrarian capitals.

Finally, the analytical and conceptual tools used in this analysis were themselves critically evaluated and adapted for the world-historic moment. Following the development of an analytical and conceptual framework grounded in a historically specified deployment of the "agrarian question", this served to contextualize and frame the discussion contained in subsequent chapters focused on identifying present and future trajectories probable and possible for the peasantry as well as evaluating the effectiveness of specific resistance strategies. In addition, the results of this case study provide both theoretical and empirical support to claims that contemporary relations between capitalist agriculture, the peasantry and industrialization in a neoliberal era point to new relations between domestic and global agrarian and industrial capital flows that no longer require, but nor do they preclude, full dispossession and capitalist transformation of national peasant agricultural sectors in order to maintain global accumulation cycles (Bernstein 2001). Neither are contemporary resolutions of the agrarian question completely relative or redundant, as certain issues will gain prominence depending on the historical and material context, establishing the basis for comparative study, evaluation and even prediction.

<u>Chapter 4:</u>
Liberalization and the Coffee Crisis: The Impacts on Land Use Change and Class Differentiation between 2000 and 2009

Introduction and research questions

> *[T]here is a general consensus that the trade agreements, reforms and policies adopted throughout Latin America and the Caribbean within the last ten to fifteen years have had uneven impacts, with many of the benefits concentrated in the hands of the elite few, while the poorest often bear the brunt of the ills wrought by greater exposure to the world market. The fact is that trade liberalization has not reduced poverty nor inequity. And clearly there are winners and losers.*
> (IADB 2006; p.455)

There is an acknowledged general lack of detailed case studies, like the one contained in this chapter, from which to evaluate the results of neoliberal policies on environments and livelihoods in Latin America (Liverman and Vilas 2006). Much of the research is also hard to generalize because highly complex localized and historical factors interact with policies at different scales to produce local level opportunities or challenges. While analysts have pointed out that there are winners as well as losers following the privatization and deregulation of agriculture and trade and that peasants are not necessarily always the most vulnerable (Kitching 1998; Spoor and Visser 2004), there have been few systematic studies of this dynamic in the unique context of coffee. Understanding this uneven distribution of social and environmental impacts following neoliberal supply chain restructuring is a major goal of this chapter's research.

This chapter seeks to understand how Costa Rican national as well as Agua Buena community-level experiences of social, economic and environmental change have proceeded following liberalization and deregulation of the coffee commodity chain. I focus on two impacts of liberalization that have brought major social and environmental consequences to Costa Rica; the rapid conversion of coffee agroforestry systems to extensive cattle ranching systems as well as the transformation of coffee sector agrarian class structures through differentiation, proletarianization and community out-migration.

This chapter's embedded comparative case study design is thus concerned with assessing national-level changes in land-uses and class structures within the Costa Rican coffee sector as well as comparing class differentiation and land-use conversion between two groups of farmers from the particular district of Agua Buena; one a Control Group (CG) of randomly selected farm-households and one a "Sustainable Group" (SG) of farm-households which have adopted strategies of social and agroecological resistance in the face of supply chain deregulation. At both levels this research employs qualitative and quantitative methods to provide a robust and valid rejoinder to the following two research questions:

<u>1. How did processes of Costa Rican coffee sector land-use change advance between the years of 2000 and 2009 and how did experiences differ between the Sustainable Group (SG) and the Control Group (CG) from Agua Buena, Costa Rica?</u>

2. How did processes of Costa Rican coffee sector class differentiation advance between the years of 2000 and 2009 and how did experiences differ between the SG and CG?

Research design and methodology

Datasets from the *Instituto del Café de Costa Rica* (The Costa Rican Coffee Institute-ICAFE), the *Instituto Nacional de Estadística y Censo* (The National Census Bureau-INEC), the *Centro Agronómico Tropical de Investigación y Enseñaza* (Center for Tropical Agronomic Research and Education- CATIE), and the *Comisión Económica para América Latina y el Caribe* (Economic Commission for Latin America and the Caribbean-CEPAL) were used to characterize the national level processes evaluated in these two research questions. More importantly, primary research was conducted to evaluate the Agua Buena level processes of these two research questions. After the presentation and discussion of the results from the first two research questions, I will conclude with two hypotheses that form the basis of the subsequent two chapters of this dissertation.

At the Agua Buena level disproportionate, stratified, random sampling was utilized to assign households to one of the two groups (CG and SG). The sampling frame used to draw the two stratified random samples was the CoopaBuena Cooperative database containing every producer who processed coffee in the year 2000. After eliminating from the database all producers not located within the geographical confines of the district of Agua Buena, the resulting sampling population consisted of 1903 household heads. The 2000 Costa Rican National Census recorded 1702 occupied households in the district of Agua Buena, an indication that the sampling frame utilized was an accurate representation of the district's year 2000 population. The following two stratums were drawn from this frame:

Stratum 1: Sustainable Group (n=50): A randomized sample of 50 of the 61 SG farm-households contained in the CoopaBuena 2000 register. None denied participation.

Stratum 2: Control Group (n=54): 81 farm-households were randomly sampled from the unbiased 1841 remaining in the database.

Fully 27 of these 81 farm-households (35%) had moved out of the district between 2000 and 2009 while each of the remaining 54 participated in the research[28] The date of departure from the community and last known address was recorded for the 27 emigrant households. This 35% emigration rate compares very favorably with the

[28] This sample size is consistent with a 95% confidence level and a (+ or -) 11% margin of error (confidence interval) My choice of an 11% versus 5% confidence interval reflects resource and time constraints as well as the fact that the extensive 6 year experience I have working in the community and the cooperatives will help me interpret the results of a smaller sample than a 5% confidence interval would yield.

rate of population loss reported by the INEC between 1998 and 2010. According to INEC, the population in Agua Buena dropped 34% from 9445 persons prior to the coffee crisis in 1998 to just 6286 persons by 2010.

The principal source of data utilized in this chapter comes from a farm-household survey completed between January and April, 2009 that elicited information on family demography, education, migration, income, savings, employment activities, land-use, labor allocation, household conditions, social networks, food security and vulnerability, coffee management and yields (N=104). Variables from the ethnographic present, the harvest year of 2008-2009, were recorded. Additionally, a targeted subset of the survey questions were used to proxy pretest the year 2000 values of several variables from the survey. See Appendix 1 for the survey instrument used in this research. The proxy pretest data greatly strengthens the evaluative power of this design because understanding initial farm-household conditions prior to the treatments enables the impacts of diversification and alternative markets to be more accurately quantified, as well as provides baseline information crucial for establishing the comparability of these two groups. However, the proxy test could have impacted the internal validity of the research based on the threat of "history confound" (Bernard 2006) because history could have confused the memory-recall of the true year 2000 variables by the survey participants. Additionally history could also confound the results in that the difference in values of the dependent variables between 2000 and 2009 could be due to other explanatory variables and not due to the impact of the coffee crisis.

Regarding the former threat, my nine years of prior experience in Agua Buena has determined that coffee producing farm-households consciously divide pre-crisis (before price crash of the year 2000-2001 harvest) versus the ongoing crisis years. My concern was not with whether the participants would respond with post-crisis values for the actual pre-crisis year estimations, but with the quality of their pre-crisis recall values. To account for this, some of the most difficult recall questions were quantified using scales such as more, less or same and 0%, less than 50% and more than 50%. This reduces substantially the opportunity for error but admittedly reduces the precision of my data. However, the recall accuracy of the most important variables in the study, land-use and labor days, was bolstered by my observation during the entirety of the survey process of a consistent direction in bias, meaning even if recall induced a type of history confound it was consistent in direction and magnitude across responses. Thus, there was minimal impact on the validity of indexes such on-farm versus off-farm labor allocation ratios which were utilized to construct the class typologies discussed below. Likewise, assuming that my contention is true that most informants consistently either over or underreported particular variable values, then the validity of proportional descriptive statistics such a percent change in land use or labor allocation which are dependent on the relative value of variables were not impacted by the recall accuracy of the sample participants.

As for the other mentioned threat to internal validity, there is no possible way to control for everything in most social science research (Bernard 2006). However, based in the fact that coffee production was the primary generator of income as well as designation of land and labor in the district in 2000, combined with my ethnographic insights of a powerful countrywide and Agua Buena community discourse around the severe effect of the coffee crisis on life and labor practices in coffee regions, I am confident that this threat is minimal and that the price crisis is a valid "independent explanatory variable".

Land-use change results

<u>1. How did processes of Costa Rican coffee sector land-use change advance between the years of 2000 and 2009 and how did experiences differ between the Sustainable Group (SG) and the Control Group (CG) from Agua Buena, Costa Rica?</u>

Land-use change (LUC) is one of the major components of global environmental change and the sum of worldwide LUC has a significant impact on biological diversity, climate change, soil conditions, human livelihoods and the ability of ecosystems to support human needs (Vitousek, Mooney et al. 1997). While conservation strategies have been historically focused on the creation of parks to "lock up" tropical forest resources such as carbon and biodiversity, both the land available for parks and enforcement in these parks have proved limiting factors to their success (Terborgh, Schaik et al. 2002). Increasingly, efforts have focused on agricultural lands to provide for the conservation of these resources. Shade coffee agroforestry systems are especially good candidates for conservation because they contain a high amount of biodiversity; it is highly dependent on the system used, but coffee is grown under a shade layer that has been found to locally contain over 261 tree species (Monro, Alexander et al. 2002). In addition, 170 bird species have bean found to frequent Colombian coffee farms, which is similar to numbers in the intact forest (Botero and Baker 2001). Similarly, up to 80 plant species have been found in the ground cover below the coffee bush (Reddy and Reddy 1980). One of the most remarkable examples of coffee agroecosystem biodiversity comes from Costa Rica, where 133 ant species and 126 beetle species were found in one shade tree (Perfecto, Rice et al. 1996). The potential for carbon sequestration and conservation is also large in coffee agroecosystems. A recent study in Costa Rica found amounts of above ground carbon storage that averaged 42.3 ha-1 compared to 197 ha-1 for a nearby intact forest (Polzot 2004).

National-level experiences

The recent experiences of LUC change within Costa Rican coffee agroforestry systems are demonstrative of how vulnerable to major landscape transformation the important multifunctional services listed above actually are. Of the total 113,386 hectares planted in coffee in the year 2001 in Costa Rica, fully 21%, or 23,386 hectares were transformed to other uses by 2007, with the vast majority of these coffee lands replaced by pineapple, pasture and sugar cane agricultural activity or housing developments (Filho 2011).

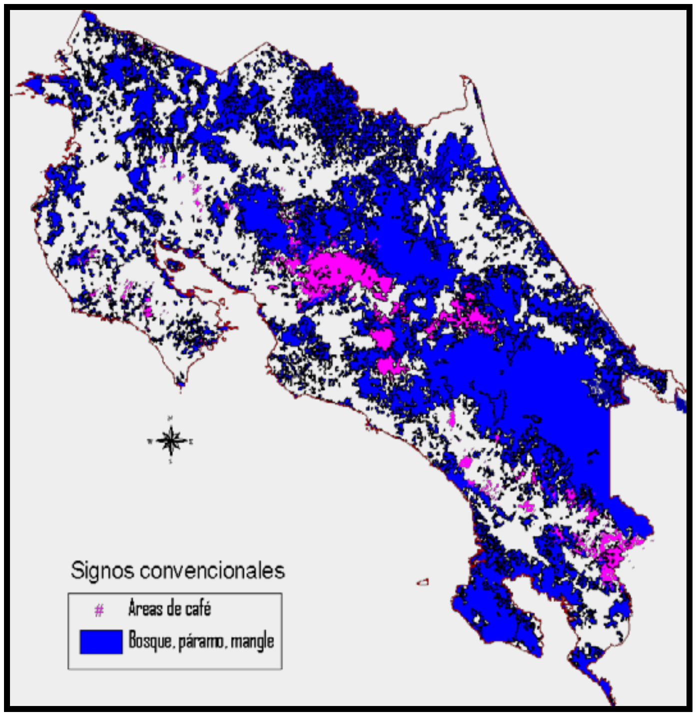

Figure 4.1. Coffee and native ecosystem land-uses. (Source: Filho 2011).

Figure 4.2. Agua Buena pasture landscape. (Photo credit: Author).

A recent CATIE-based investigation claims that of these 23,386 hectares of coffee agriculture removed during that six-year period, 17,539 of the hectares were classified as multi-strata agroforestry systems averaging per-cent shade of at least 75% (Abarca 2008). The same study calculated that between 2001 and 2007, 740,752 metric tons of carbon dioxide were released due to this process of land-use change out of coffee (Abarca 2008). This is roughly equivalent to the amount of carbon dioxide emissions released from the incineration of one and a half billion barrels of oil, or conversely the amount of carbon that can be sequestered by over seventeen million tree seedlings grown for ten years (EPA 2011). Recent rates of land-use change out of coffee are also comparable to primary forest deforestation rates in Costa Rica; between the years of 2000 and 2005 a total of 23,689 hectares of forest were cut down (G.A 2008). In Figure 4.1 areas of major coffee production are classified in pink while areas of primary forest, páramo (high elevation scrub-forest) and mangrove ecosystems are classified as blue (Filho 2011). This is a visual reminder that the majority of Costa Rica's coffee agroecosystems are found adjacent to montane forest systems (mangroves are found at elevations too low and páramo at elevations too high for coffee production) where they can act as biological corridors and buffers within a fragmented landscape of protected preserves as well as agricultural land-uses that differ in their ability to support the movement of native biodiversity throughout the agricultural matrix (Perfecto, Vandermeer et al. 2009). A more fine-grained analysis is necessary in order to understand the relationship between matrix quality and land-use change out of coffee. While the matrix quality of the SG and CG Agua Buena coffee agroecosystems is not evaluated until Chapter 6, this chapter and the next section in particular is concerned with establishing the magnitude of land-use change out of coffee in each group so that more is understood about the above-mentioned relationship.

Agua Buena community-level experiences of land-use change

Table 4.1 displays the total area recorded during the survey for each group across the different land-uses as well as the total percent change in each land-use between 2000 and 2009. Notably, this table indicates that <u>SG farm-household retained 82% of their coffee farmlands between 2000 and 2009 while the CG only retained 24%.</u>

Table 4.2 displays average per farm area in hectares as well as an average per farm percentage of total farm-size dedicated to each land-use. The Sustainable Group's year 2000 mean farm size was 3.47 hectares. By 2009 the SG's average was 3.73 hectares. In 2000 the average CG farm size was 3.04 hectares while the average dropped to 2.78 hectares in 2000. In neither year were the differences in average farm size significant[29]. Even though the CG began with a statistically significant higher average area (SG 2.19 hectares or 63%[30], CG 2.28 hectares or 75%), and both groups experienced statistically significant losses of coffee farmland between 2000

[29] In Table 2, a Welsh's One-way ANOVA test was utilized to compare land-use means between the groups. A Welsh's test was chosen over a standard T-test because it allows the unequal variances as well as non-equal standard variations that characterize this dataset.

[30] Percentages given in this section correspond to the average area per group dedicated to particular land-uses in the given year divided by the average farm-size per group in the given year.

and 2009 (SG -0.4 hectares or -15%[31], CG -1.72 hectares or -55%), SG farm-households had a significantly greater area and proportion of total farmland in coffee by 2009 (SG 1.79 hectares or 48%, CG 0.56 hectares or 20%). The difference was highly statistically significant (See Table 4.2). Both the SG and CG began with statistically similar areas and percentages of total farmland devoted to pasture (SG 0.52 hectares or 15%, CG 0.43 hectares or 14%). While both groups statistically significantly increased their respective areas and percentages of farmland in pasture between 2000 and 2009 (SG +0.49 hectares or +12%, CG +0.6 hectares or +23%), the Control Group had a significantly larger average area and percentage dedicated to pasture by 2009 (SG 1.01 hectares or 27%, CG 1.03 hectares or 37%). Thus for both groups the conversion of coffee was mostly to pasture systems.

The SG had an insignificant increase in farmland dedicated to annuals (+ 0.1 hectares or +2%), while a statistically significant increase was observed in CG farmlands (+ 0.28 hectares or +10%) between 2000 and 2009. SG farms began 2000 with a significantly higher area and percentage of land in fallow but while between 2000 and 2009 they experienced no change in area, CG farmlands significantly increased by an average of 0.28 hectares per farm, or 10%, and were significantly higher than the SG by 2009 (SG stable at 0.18 hectares or 5%; CG 0.03 hectares or 1% to 0.38 hectares or 14%). While there were no significant changes between 2000 and 2009 in the area

[31] Percentages given in this section simply correspond to the 2000 percentages minus the 2009 percentages for each group.

and average percentage of forested/reforested lands within either group, SG farms had significantly more forested/reforested lands in both 2000 (SG 0.24 hectares or 7%, CG 0.06 hectares or 2%) and 2009 (SG 0.34 hectares or 9%, CG 0.06 hectares or 2%). Both groups began with similar areas dedicated to the house and yard (SG 0.17 hectares or 5%, CG 0.18 hectares or 6%). Between 2000 and 2009 the CG experienced a significant increase in the area and proportion dedicated to the house and yard (+0.21 hectares or +9%) and by 2009 the groups had significantly different areas and proportions (SG 0.15 hectares or 4%, CG 0.39 hectares or 15%).

The major finding from this research question was that 82% of the SG's while only 24% of the CG's coffee persisted through the crisis. In addition, the statistical significance ensures that it was not due to just one large reduction or gain but that it was a consistent persistence on the part of the SG and an equally consistent abandonment by the SG.

Table 4.1. Agua Buena total area and % change per land-use, 2000-2009.

Land-use	Sustainable Group (n=50)				Control Group (n=53)			
	2000 he	2009 he	△ He 2000-2009	△% 2000-2009	2000 he	2009 he	△ He 2000-2009	△% 2000-2009
Coffee	109.31	89.52	19.79	-18%	120.84	29.47	91.37	-76%
Pasture	26.03	50.36	-24.33	94%	22.56	54.52	-31.96	142%
Annual Crops §	5.21	9.33	-4.12	79%	1.61	16.21	-14.60	906%
Fallow	8.68	9.33	-0.65	8%	1.61	20.63	-19.02	1180%
Forested/ Reforested	12.15	16.79	-4.64	38%	3.22	2.95	0.28	-9%
House and Yard	8.68	7.46	1.22	-14%	9.67	0.00	9.67	113%

Others	3.47	3.73	-0.26	8%	1.61	2.95	-1.34	83%
Total	173.50	186.50	-13.00	8%	161.12	126.71	34.41	-9%
Coffee Persistence (2009 / 2000) x100	**82%**				**24%**			

Table 4.2. Agua Buena proportion area per land-use, 2000-2009.

Sustainable Group (n=50)						
Land-use	**Mean 2000 He**	**Mean 2009 He**	**△ 2000-2009**	**2000 % of Total**	**2009% of Total**	**% △**
Coffee	**2.19** * *	**1.79** * * *	**- 0.40** # # #	63%	48%	-15%
Pasture	0.52	1.01	**0.49** # # #	15%	27%	12%
Annual Crops §	0.1	0.2	0.1	3%	5%	2%
Fallow	**0.18** * *	**0.18** *	0.01	5%	5%	0%
Forested/ Reforest	**0.24** * *	**0.34** * *	0.09	7%	9%	2%
House and Yard	0.17	**0.15** * *	-0.02	5%	4	-1%
Others	0.06	0.07	0	2%	2	0
Mean Farm Size	**3.47**	**3.73**	**-0.26**	**100%**	**100%**	**N/A**
Control Group (n=53)						
Coffee	2.28	0.56	**-1.72** # # #	75%	20%	-55%
Pasture	0.43	1.03	**0.6** # # #	14%	37%	23%
Annual Crops §	0.03	0.31	**0.28** # #	1%	11%	10%
Fallow	0.03	0.39	**0.36** # # #	1%	14%	13%
Forested/ Reforest	0.06	0.06	0	2%	2%	0%
House and Yard	0.18	0.39	**0.21** # #	6%	14%	8%
Others	0.03	0.06	0.03	1%	2%	1%
Mean Farm Size	**3.04**	**2.78**	**0.26**	**100**	**100**	**N/A**

*Mean values are significantly different than the control group at 10% level.
**Mean values are significantly different than the control group at 5% level.
***Mean values are significantly different than the control group at 1% level.
♯2000-2009 within group means values are significantly different at the 10% level.
♯♯2000-2009 within group means values are significantly different at the 5% level.
♯♯♯2000-2009 within group means values are significantly different at the 1% level.
§ = Corn, Beans and Vegetables

Class differentiation results

2. How did processes of Costa Rican coffee sector class differentiation advance between the years of 2000 and 2009 and how did experiences differ between the SG and CG?

Research on economic class formation in agrarian societies can be characterized methodologically by three core dimensions historically used to operationalize socioeconomic class as a concept; land, labor and demography. The following section reviews the strengths and weaknesses of each dimension, and is followed by the national and then Agua Buena community scale evaluations of class differentiation in the Costa Rican coffee-producing sector between the years of 2000 and 2009.

Land and farm-size class groupings

Agricultural economists and ethnographers in the neoclassical tradition, when attempting to assess rural change processes such as stratification, inequality and land-use conversion, most often aggregate households into socioeconomic class groups based on farm-size (Barlett 1982; Ellis 1988). However, while farm-size is the most easily gathered proxy for agrarian class standing it is widely thought to be the most inaccurate criteria of the three reviewed here to cluster farm-households. It is especially inaccurate in rural societies that have not undergone a full capitalist agrarian transition and where variations in agricultural technology, capital investment, subsistence production and family size often result in vast differences between farm-households located within the same farm-size groupings. For example, in a farm size grouping of under 3 hectares, which is a commonly used threshold used in data collected by Costa Rican agricultural institutions to represent sub-family or semi-proletarianized peasant farms, widely ranging household modes of production and sets of social relations are frequently encountered; from nearly full subsistence oriented to 100% cash-cropped oriented production. If used uncritically, this can result in a categorical black box that doesn't convey much about a given farm and can actually result in the misrepresentation of the whole system of productive relations, including the obfuscation of acts of surplus appropriation, labor exploitation, environmental degradation and eventual class differentiation.

However, when substantial knowledge of the social and agricultural system under study exists, meaningful typologies and representative thresholds for their demarcation that are based on farm size can be chosen and used to compare the proportion of farms in each of several classes at different time intervals. In many circumstances, especially at larger scales such as the province or nation farm size is the only data available. Such is the case with the below analysis of post-coffee crisis Costa Rica, where the national experience of agrarian class differentiation between 2000 and 2009 is explored utilizing a dataset that uses farm-size as a proxy for socioeconomic class.

Labor and agrarian change

First theorized in general terms by Marx, the movement towards partial wage labor within the landed peasantry and the transformation of this wage labor to full labor power through dispossession remains the most important process driving the dynamics of agrarian change under capitalism (Lenin 1964; Marx 1967; Kautsky 1988). Many historical as well as contemporary analyses of peasant differentiation and agrarian change utilize the following tripartite structure of the peasantry proposed by Lenin (1964); Poor peasants: Reproduction of family unit not possible by household production alone so exchange of labor-power occurs on a regular basis. These are the rural proletariat in the making. Middle Peasants: Reproduce the family through household labor on land owned by the unit. The relative stability of this type of organization is dependent upon whether the form of production is commodity based, subsistence based or a mixture of the two. Rich Peasants: Able to accumulate enough to invest in superior technology or labor power. If accumulation advances far enough this sub-class differentiates itself into capitalist farmers.

Lenin theorized that capitalist penetration of the market and the technical advantages of large scale agriculture would lead to the dispossession and transformation of the middle peasantry, which for him was the key first step in transforming an agricultural sector dominated by a peasant mode of production into a sector dominated by a rural proletariat and agrarian capital. In chapter two's historical account of agrarian change in Costa Rica between 1850 and 1980, I recognized this tendency towards waged labor and dispossession but argued that the full dispossession predicted by Lenin's classical agrarian transition was the product of uniquely European class relations and the particular world-historic stage and scale of capitalist accumulation of his day. However, in the case of Costa Rica I found that the structures (class formations) and processes (labor dynamics) remain very useful for conceptualization and evaluation of agrarian change as long as they are seen as tendencies and not mechanistic drivers.

Demography and the peasant mode of production

Alexander V. Chayanov was a Russian agricultural economist whose populist insights have been widely incorporated into the study of peasants. He claimed that the peasantry possessed its own internal stability and logic that conferred upon it a unique mode of production autonomous from capitalism and which, unlike for the Marxists', elevated it above a mere social class to be differentiated (Chayanov 1986). This was attributed to the fact that self-sufficient households, due to their closed family unit and absence of wage labor, focused on returns to land instead of profit. Chayanov claimed that this indicated that peasant households were not capitalist and acquisitive, and hence could play a major role in the development of Soviet socialist agriculture if organized into producer cooperatives (Harrison 1977). Chayanov conceded that stratification could occur within the peasantry as farm-households changed farm-size, labor allocation, and transformed productive activities but this had more to due with internal demographic pressures instead of the Marxist-Leninist focus on social relations and class differentiation (Chayanov 1986). The value of the Chayanovian model of peasant farm-household production lies in its economic explanation for seemingly irrational household production strategies (self-exploitation and agricultural involution) as well as its emphasis on demographic factors as drivers of agrarian change. For Chayanov, the stage in the developmental cycle of a farm family; the number of members, their gender and age, and the consumer to worker ratio [32], have important influences on the level of production and consumption and are the most important variables in determining whether farm-households will stratify through the expansion or contraction of their operations (Chayanov 1986; Netting 1993).

Netting documents scores of empirical works from around the world in different contexts that have consistently employed the consumer to worker index, and while generally sympathetic to the Chayanovian model, he comes to a conclusion similar to many other of Chayanov's fiercest critics, that it's explanatory ability is diminished greatly by it's abstraction from market systems, wage labor, and the everyday reality of the majority of the worlds peasantry, who as petty-commodity producers, straddle two reproductive logics- capitalist and subsistence (1993; p. 318) While I most certainly acknowledge the critique, I find that many parts of Chayanovian theory are useful because they are focused on the micro-economic and attuned to the logics of peasants on their own terms, and not just as capitalists or proletarians in the making.

[32] The consumer/ worker ratio comes from Chayanov's assumption that in self-sufficient and non wage labor hiring farm-households, the level of consumption and the available labor pool is driven by the relationship between the number of laboring members in a farm-household unit and the number of consumers for which they must provide.

After living, working and then studying the peasant coffee farmers of Agua Buena, Costa Rica, it is obvious that the farm-household model of organization is imbued with a labor flexibility and a subsistence logic that allows for adaptations to novel conditions unavailable or unthinkable in a purely capitalist operation. I believe this adaptability is highly influenced by the different stages in a culturally, historically and biogeographically determined development cycle of farm-households that is specific to the bioregion, agroecology and culture of the region.

This development-cycle or life-cycle dimension is evident in the logics by which decisions affecting agrarian change are made in Agua Buena. Families with young household heads, who lack land, capital and experience, are more likely to be the poorest and therefore located in the lowest positions of a class structure. As children are born into this farm-household unit, the producer to consumer ratio constrains the households ability to expand reproduction even further until those offspring become sources of labor (or dowry in other cultures), and then the unit enters a period of prosperity, followed by a twilight era where, based on the inheritance regime of Costa Rica, land is usually split up between the sons and the whole cycle starts anew. It is based on these logics that I believe that household demography can be a factor that contributes to processes of class formation and differentiation. While it is my contention that class formation and differentiation in the coffee-producing sector of Costa Rica are mainly driven by the tension between wage and non-waged labor, demography can serve as a threshold effect that pushes or pulls farm-households one direction or another.

Household head age is one of the most straight-forward and easily operationalized indicators of household demographic change through the developmental cycle and so it is included as a proxy demographic variable in the Agua Buena-level analysis below.

National-level class differentiation following the coffee crisis in Costa Rica

This analysis of class differentiation takes place at two scales, the nation of Costa Rica and the district of Agua Buena. I will briefly recapitulate the history of coffee and agrarian class relations before evaluating national trends following the coffee crisis. This will be followed by the SG and CG comparative case-study of class differentiation in Agua Buena.

In chapters two and three the historical basis for the pre-coffee crisis persistence of the Costa Rican peasantry was analyzed. The following recapitulation is based on those chapters. Contingency, not path-dependency, characterized the Costa Rican transition to capitalism. The movement towards wage labor was indeed swift following the introduction of capitalist social relations, but demographic and technological aspects unique to Costa Rica, discussed in detail in chapter two, led to the consolidation of agrarian capital in the processing, credit, input and export spheres (the agroindustrial sphere of the “coffee barons”) while most landed production was carried out on small, owner operated family farms not characterized by full capitalist social relations of production. The capitalist processors remained untaxed and unregulated throughout the first half of the twentieth century as the Costa Rican government extended virtually no control over any aspect of the nation’s economic development. Tensions between peasant producers and the coffee barons often boiled into political and violent unrest because compared to neighboring countries, Costa Rica’s producers faced higher interest rates as well as lower coffee prices due to the oligopoly over credit and processing held by the tight-knit group of coffee barons. The 1948 revolution was fought in large part over who should control the surplus generated from the nation’s principal export, which until then had been almost exclusively appropriated by the coffee barons at the expense of producers as well as the state.

The ruling junta that emerged from the 1948 revolution had political interests that were aligned much more with the urban middle-class and the smallholding peasantry than the aristocratic and fiscally conservative “coffee barons”. Once in power, the interventionist ruling party set maximum profit margins for the processors and levied a 16% tax on all coffee production, the bulk of it paid by the processors. In chapter two I established the important historical role of the nation-state as mediator of class conflict between producers and capitalist processors. Essentially lacking a landed agrarian class, the tendency towards differentiation within the landed Costa Rican coffee producing sector was not prevalent. This continued access to the means of production by smallholders helped to maintain family-labor regimes that straddle both commodity and self-sufficient modes of production. However, the analysis below of both national and community level data reveals the large impacts that the liberalization of the coffee supply chain in 1989 wielded upon landed coffee producing class configurations.

Reliable longitudinal data on the number of producers and area under production within the Costa Rican coffee sector are regularly collected by ICAFE, which releases a yearly report that includes the total number of producers, millers, roasters and exporters in the domestic sector, but does not disaggregate the data by farm size. Producers are only differentiated by their total annual production, and then only divided between farms with productivity less than or equal to 100 fanegas a year and those with more. This is a problematic indicator for class standing and especially un-useful for tracking differentiation because every annual ICAFE report for the last 15 years reveals roughly the same information, that 90% of Costa Rican coffee farmers produce less than 100 fanegas and about 10% produce more. However, the number of coffee producers in Costa Rica dropped 35%, from 73,707 to 48,256 between 2000-2009 (ICAFE 2009). When the category of metadata that most closely approximates class is based on two groups with unchanging proportions even in the face of a rather large departure (35%) of producers from the activity, you don't need theory to tell you that the category or dimension does not approximate class very well. My requests for disaggregated farm-size data have been denied repeatedly even though I know such data exists. ICAFE, through this omission, thus propagates the "smallholder myth" (Gudmundson 1986) that has been a mischaracterization made by many an analyst of Costa Rican agrarian relations. As we shall see, the censorship of disaggregated data has actually served to obscure a rather intense process of class differentiation within the landed, Costa Rica coffee sector producing sector at the national level[33] .

In 2002 CEPAL commissioned a widely cited report on the impacts of the coffee crisis in Central America. Those authors gained access to the ICAFE database and the report includes a farm-size typology of Costa Rican coffee producers and the population of producers located in each typology based on 2001 data (Flores, Bratescu et al. 2002). In 2007 ICAFE and INEC jointly released the *Censo Cafetalero* (INEC and ICAFE 2007). This report also includes a national farm size typology that is based on 2006 data. However, while the thresholds for size classes do not exactly match in these two reports one threshold is so close, and it's explanatory value so high, that a comparison is justified. In Tables 4.3 and 4.4 below, the 2001 thresholds from the CEPAL report are less than 9.8 hectares and equal to or more than 9.8 hectares. The thresholds for the 2006 data from the *Censo Cafetalero* are less than 10 hectares and equal to or more than 10 hectares. Based

[33] This is not surprising, given that in Costa Rican society as a whole, inequality has been rising in both rural and urban areas faster than any other Central American country (CEPAL 2010).

upon this threshold a longitudinal comparison of the population in these two classes is possible. In the Tables that follow I dub them the lower and upper classes[34].

Table 4.3. Costa Rican total number of farms by size-class, 2001-2006. Sources: Elaborated from reports based on ICAFE database (Flores, Bratescu et al. 2002; INEC and ICAFE 2007)

Farm Size Class (he)	2001 # Farms per Class	2006 # Farms per Class	2001-2006 # Farms Change	2001-2006 % Farms Change	2001 % Farms per Class	2006 % Farms per Class
Lower Class *< 9.8 or 10*	67,455	47,622	-19,833	-29.4%	91.9	83.7
Upper Class *> 9.8 or 10*	5,945	9,274	3,329	56%	8.1	16.3
Total	**73,400**	**56,896**	**-16,504**	**-22.5%**	**100**	**100**

Table 4.4. Costa Rican total coffee area by size of farm, 2001-2006. Sources: Elaborated from reports based on ICAFE database (Flores, Bratescu et al. 2002; INEC and ICAFE 2007)

Farm Size Class (he)	2001 Area per Class (He)	2006 Area per Class (He)	2001-2006 Area Change	2001-2006 % Area Change	2001 % Area per Class	2006 % Area per Class
Lower Class *< 9.8 or 10*	46,852	25,361	-21,491	-45.9%	44.2	25.7
Upper Class *> 9.8 or 10*	59,148	73,320	14,172	24.0%	55.8	74.3
Total	**106,000**	**98,681**	**-7,319**	**-6.9%**	**100**	**100**

Even as the total and lower class number of coffee farms declined by over 15,000 farms, representing a more than 20% reduction of each, the upper class blossomed by 56% as over 3,000 new farm-households were added during the coffee crisis (Table 4.3). However, the overall balance of farms per class was not impacted much, as Lower class farms retained a majority 83.7%. The classes exhibit similar trends

[34] This is without, however, any theoretical specificity given as of yet to the social relations between them.

when change in area, or farm-sizes are considered (Table 4.4). Except here, the shear magnitude of change in both classes tips the balance of the classes substantially, as upper class coffee farms assumed a dominating 74.3% proportion of total area by 2006, even as they made up only 16.3% of all coffee farms.

From these two tables it appears fairly clear that a process of coffee farm size differentiation is taking place at the national level. However, the lack of labor or demographic dynamics limits the depth of the class analysis achievable. However, it is possible to make some tentative assumptions about labor processes based on these two farm-size typologies. Analysts of agrarian change in Mesoamerican coffee research often find that between 0 and 5 hectares familial labor predominates, while between 5 to 10 hectares wage labor becomes important but not dominant while farms over 10 hectares utilize primarily waged labor (Winson 1989; Flores, Bratescu et al. 2002; Bacon 2005; INEC and ICAFE 2007; Méndez 2009). In fact, this is the case in contemporary Coto Brus, the county where Agua Buena is located. Table 4.5 below was elaborated using data from the earlier cited *Censo Cafetalero*, which I disaggregated down to the lowest scale available (INEC and ICAFE 2007). It is unfortunate that 2001 data is not available at the county level as well, but the 2006 data is very revealing.

Table 4.5. Farm size distribution and utilization of wage labor in Coto Brus, Costa Rica, 2006. Source: (INEC and ICAFE 2007).

Farm Size Class (he)	Amnt (#)	Area (he)	% Farms	% Area	Average Farm Size (He)	% Farms Con-tract labor	% Area Con-tract labor
Under 1 hectare	194	107.8	8%	1%	0.6	24%	26%

1 to 5 hectares	1376	3651.3	55%	14%	2.7	32%	34%
5 to 10 hectares	439	3312.7	18%	13%	7.5	43%	45%
10 to 20 hectares	266	3951.2	11%	16%	14.9	57%	58%
20 to 50 hectares	163	5021.2	7%	20%	30.8	80%	82%
50 + hectares	66	8622.3	3%	35%	130.6	89%	92%
Total	**2504**	**24666.5**	**100%**	**100%**	**9.9**	**40%**	**69%**
Lower Class *< 9.8 or 10*	2009	7071.8	80%	29%	3.5	34%	39%
Upper Class *>9.8 or 10*	495	17594.7	20%	71%	35.5	69%	81%

First, note that the distribution of total farms between the lower class and upper class in Coto Brus was 80% to 20% while nationally it was 83.7% to 16.3% (Tables 4.3 and 4.5). Also, the distribution of total area between the lower and upper classes in Coto Brus was 29% to 71% while nationally it was 25.7% and 74.4% (Tables 4.4 and 4.5). This suggests that processes of agrarian change in the coffee producing sector of Coto Brus are fairly representative of national experiences. In addition, consistent with the above typologies, from 0-5 hectares family labor does predominate with only 32% of farms contracting wage labor, then between 5-10 hectares 43% of farms contract wage labor as it becomes more important but not dominant, while 69% of all farms over 10 hectares utilized wage labor (Table 4.5). With this data it is now possible to superimpose labor-based class definitions onto this farm-size based typology. Coffee farms under 10 hectares of size in Coto Brus can be considered either the middle or poor peasants while those farms over 10 hectares can be classified as either rich peasants or capitalist farmers depending on whether petty-commodity production still characterizes the activity[35] (Friedmann 1978; Goodman and Redclift 1985). Either way production is dominated by wage labor.

Between the years of 2001 and 2006 the Costa Rican coffee sector went from one where the area under production dominated by wage laborers was about even with that not dominated by wage labor, to one where about three-quarters of the total area under production is subject to the predominance of the wage-capital relationship. This indicates significant agrarian change and suggests a process of class differentiation where the coffee crisis led to a concentration in landholdings between 2001 and 2006, creating the conditions where 2001 peasant coffee farmers were dispossessed of their farms and were transformed into a class of wage laborers for the commercial farms.

However, recall how I argued in chapter 3 that the uneven, incomplete and job poor export orientated industrialization process of the 1980's and 1990's was incapable of

[35] Petty-commodity production (PCP), as discussed in chapter two, is defined as small-scale production organized at the familial and/or household level, and where there exists ownership or de facto possession over the means of production. Also requisite is the reproductive, <u>not accumulative</u> form of production of goods and/or services sold through the market (commoditization). Wages as well as unpaid family labor relations are both present, but wage-labor cannot be bought or sold on an exclusive basis in PCP as that implies the social relations present in the laborer or capitalist classes

I underline <u>not accumulative</u> in order to point out that Friedmann's characterization of PCP was an attempt at creating a theoretical category or class under capitalism that was separate from capitalist producers in order to show that the persistence of family-farm based agriculture was due to a consistent, internal logic of labor relations that were not acquisitive. However, because the combination of both capital and labor are present in PCP households, it has been convincingly argued by Goodman and Redclift (1985) to be subject to the *tendency* of class differentiation and therefore the *possibility* of dispossession and complete disappearance, making its occurrence historically contingent phenomena. This contingency, however, also opens spaces for the conditions to develop where the consolidation of a peasant class occurs, such as that of the Costa Rican coffee peasantry post revolution and pre-trade liberalization induced coffee crisis (1950-2000).

providing viable livelihood alternatives for the Costa Rican coffee sector peasantry. If that is true than where did the almost twenty thousand peasant farm-households under 10 hectares in size that quit farming coffee between 2001 and 2006 derive their new livelihood? Was the trend towards dispossession and complete reliance on wage labor or instead was farm-level diversification and reorientation towards subsistence production the dominant trend? Or was it a little bit of both? Where did the 56% growth in the 10+ hectare commercial farmer class, consisting of more than 3000 farm-households come from? Did it come directly from the 2001 peasantry, thus suggesting a process of differentiation, or was it from another source, such as the division of existing large coffee plantations or the entrance of new coffee farm-households to the sector? Answering these questions is a critical part of advancing our basic understanding of how liberalization touches down in a time and place and requires the fine-grained focus on labor dynamics that a case study can provide. The following comparative case study allows for an interrogation of the above questions as well as provides the basis for subsequent chapter's assessments of different adaptive strategies advanced by the "Sustainable Group" (SG) in response to the coffee crisis.

Class configuration and differentiation in Agua Buena

While the capitalist coffee estate owner- agrarian proletariat relation does not exist in Agua Buena, agricultural day labor on smallholder farms has historically made up the majority of wage labor opportunities. However, as Table 4.6 indicates, it is now the fastest-shrinking sector of off-farm work in Agua Buena. Within the 104 farm-households surveyed, a total of 48 persons spent 8400 work-days in the year 2000 working off-farm jobs located within the county of Coto Brus. By 2009 this had risen to 98 persons and 18,852 work-days. In order to analyze trends by occupation, off-farm job activity was classified into the 13 categories displayed in Table 7. Commerce experienced the greatest growth between 2000 and 2009 in terms of the proportion of all off-farm labor-days spent in Coto Brus by the farm-households on the sample (+11%). Teacher work-days also grew substantially (+8%), as well as those of receptionists (+5%) and construction workers (+4%). Agricultural laborer work days were the largest proportion of all work days in 2000 (41%) and 2009 (29%) but experienced the greatest fall of any category (-12%). Sales clerks (-10%), drivers (-6%) and police officers (-2%) also all experienced a drop in proportion of all off-farm work days in Coto Brus. There were no changes in the category of crafts and security. In summary, commerce and teaching emerged as important livelihoods while off-farm agricultural labor diminished in its relative importance.

Table 4.6. Changes in Agua Buena off-farm livelihood sources, 2000-2009.

Off-farm Livelihood Sources (N=104)	**2000 Total # Work Days (Total # Working People)**	**2009 Total # Work Days (Total # Working People)**	**2000-2009 % Change Work Days (% Change Working People)**
	8400 (48)	18,852 (98)	224% (204%)
	2000 % Total Work-Days (% Total Persons)	**2008 % Total Work-Days (% Total Persons)**	**2000-2008 % Change**
Commerce	0 (0%)	11% (9%)	+11% (+9%)
Construction	4% (4%)	8% (7%)	+4% (+3%)

Crafts	1% (2%)	1% (2%)	No Change
Domestic	2% (4%)	3% (6%)	+1% (+2%)
Driver	16% (15%)	10% (9%)	-6% (-6%)
Agricultural day-labor	41% (49%)	29% (34%)	-12% (-15%)
Mechanic	4% (2%)	4% (3%)	0% (+1%)
Nurse	0 % (0%)	2% (1%)	+2% (+1%)
Police Officer	6% (4%)	4% (3%)	-2% (-1%)
Receptionist	0% (0%)	5% (3%)	+5% (+3%)
Sales Clerk	13% (10%)	3% (4%)	-10% (-6%)
Security	6% (4%)	6% (4%)	No Change
Teacher	7% (6%)	15% (15%)	+8% (+9%)

With a sense for the level at which wage labor is growing and coffee is disappearing in the district as well as a panorama of the nation-wide differentiation trend, we'll now turn to the analysis of class dynamics in Agua Buena between 2000 and 2009. Three components operationalize economic class for the community case study of Agua Buena. They are the:

1.) Dominant mode of production (MOP)

2.) Form of access to the means of production and

3.) Form of labor-use, either:

A. Labor unremunerated in subsistence and/or commodity production within plots owned and organized at the farm-household level *and/or*

B. Labor purchased from others for a wage *and/or*

C. Labor sold for a wage

The dominant MOP in the highland, coffee regions of Costa Rica is capitalism and more than 90% of the producers and 97% of the land dedicated to coffee in Costa Rica are owner operated, meaning not rented or borrowed (ICAFE 2003). The types of labor-power in Agua Buena as well as Costa Rican coffee production more generally include all three of the above offered criteria. Therefore, this third component, the relative amounts of wage, hired and subsistence labor hours utilized in farm-household's reproduction is the most determinant of a coffee farming farm-household's class position. Based on my experience with Agua Buena, Costa Rica coffee producers I have identified two principal socioeconomic classes: commodity producers and the rural proletariat. The commodity producers can be split into three class positions or fractions; Commodity Producers, Peasant-commodity Producers and the Semi-Proletariat Producers. Notice that there is no capitalist commercial farmer class in this typology. While they do exist in other parts of Costa Rica, particularly in the county of Turrialba, the class relations that typify most of the Costa Rican, as well as all of the Agua Buenan, coffee sector are the relations between peasant famers and the agro-industrial processor to whom they sell their beans.

In order to demarcate the above outlined class structure in Agua Buena, I adopt a labor exploitation criterion developed by Patnaik (1987) which emphasizes the amount of wage, hired and subsistence labor hours utilized in a farm-households reproduction as the most determinant variables defining a farm-household's class position. This labor exploitation is index composed in the following manner:

Class Standing = X/Y ***where***

X=labor days hired worker – family labor days off-farm ***and***

Y= family labor days on-farm

The index produces a range of values between -1 and 1. Threshold values can be set in order to group farm-households into any number of separate economic classes or sub-classes. I utilized Patnaik's (1987) labor exploitation criterion to group farm-households into the following class positions. The abbreviations in parentheses will be used throughout the rest of the chapter.

1. Commodity Producers (CP)

($E \geq 1$**)** x positive and high, y positive, $x \geq y$

Rely predominantly upon hired labor for surplus maximizing, monocropped coffee production. Subsistence crops not prevalent. Analogous to Lenin's rich peasants.

2. Peasant-commodity Producers (PCP**)**

($+1 > E > -1$) $x = 0$ or positive or negative but small, $|x| < Y$

Family labor is dedicated to unremunerated on-farm production of coffee and subsistence crops and wage labor is seldom hired or sold. Highest diversity of crops and land-uses of the four classes. Analogous to Lenin's middle peasants.

3. Semi-proletariat Producers (SP)

($E \leq -1$) x negative and high, y positive, $|x| \geq y$

Relies mainly on off-farm wages for household reproduction but unremunerated family labor is dedicated to on-farm production that focuses on subsistence crops and to a lesser extent coffee. Analogous to Lenin's poor peasants.

4. Rural Proletariat (RP)

(E approaches - infinity)   x negative and very high, y zero.

Rely upon wage labor almost exclusively for an income

The demography dimension and Chayanovian economics

In addition to the labor exploitation class index, two variables, farm-size and household head age are included as proxies for the land and demography dimensions of class construction discussed above in order to 1.) Compare the accuracy and sensitivity of the labor exploitation class model tool with other prominent proxy variables for class standing, 2.) strengthen the analysis of factors influencing the initial year 2000 class distributions within each group and 3.) add depth to the analysis of class compositional changes between 2000 and 2009.

Guiding hypotheses

I have formulated the following hypotheses to guide the organization and analysis of the survey data which follows.

Hypothesis 1: Within the CG for both years 2000 and 2009, the higher the class-position (labor-dimension based) the larger the farm-size (land-dimension based) and the older the household-head age (demographic-dimension based). This prediction is based upon the political economic theorizations discussed above.

Hypothesis 2: Year 2000 farm-household class distributions will not significantly differ between the CG and SG. This prediction is based upon the fact that the coffee crisis had not yet started and the SG had not yet adopted agroecological management and alternative markets as resistance strategies.

Hypothesis 3: Class differentiation will occur within both groups between 2000 and 2009 due to the coffee crisis but the typological distribution of 2009 farm-households will significantly differ between both groups. This is predicted to occur because the SG farm-households will have adopted agroecological management and alternative markets which will improve their resistance to class differentiation.

Hypothesis 4: The PCP class will persist more in the SG versus the CG. This prediction is made because the agroecological transition that the SG undertook required large quantities of family labor not deployed in the CG's response to the crisis. Higher labor needs are also indicated by the relative persistence in coffee of the SG versus the CG that is indicated by the above land-use change results as well as by the fact that they all engaged in alternative coffee marketing networks.

Table 4.7. Control group class distributions, 2000-2009.

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8
Labor CG 2000 Class Typology (n=54)	**Labor** 2000 Class Distribution % (# of households)	**Land** 2000 Farm Size (He) *	**Demography** 2000 Household Head Age *	**Labor** 2009 Class Distribution % (# of households)	**Land** 2009 Farm Size (He) *	**Demography** 2009 Household Head Age *	**Labor** Class Distribution % Change 2000-2009

Commodity Producers (CP)	7% (4)	8.1 A	58 A	2% (1)	1 AB	63 AB	- 5%
Peasant-commodity Producers (PCP)	72% (39)	3.0 B	44.3 B	45% (19)	4.7 A	58.3 A	- 27%
Semi-proletariat-producers (SP)	15% (8)	1.3 B	33.1 C	38% (26)	1.8 B	47.8 B	+ 23%
Rural Proletariat (RP)	6% (3)	0.6 B	40 ABC	15% (8)	1.4 B	45 B	+ 9%
Whole CG Sample	**100% (54)**	**3**	**43.4**	**100% (54)**	**2.8**	**51.4**	**0**

*Within Group ANOVA Model P-value < 0.05 Means followed by letters are reported for variables with an ANOVA P-value <0.05. Means followed by the same letter are not significantly different by Fisher's LSD (p = 0.05)

Table 4.8. Sustainable group class distributions, 2000-2009.

Column 1	**Column 2**	**Column 3**	**Column 4**	**Column 5**	**Column 6**	**Column 7**	**Column 8**
Labor SG 2000 Class Typology (n=50)	**Labor** 2000 Class Distribution % (# of households)	**Land** 2000 Mean Farm Size (He)	**Demography** 2000 Mean Household Head Age	**Labor** 2009 Class Distribution % (# of households)	**Land** 2009 Mean Farm Size (He)	**Demography** 2009 Mean Household Head Age	**Labor** Class Distribution % Change 2000-2009
Commodity Producers (CP)	16% (8)	3.5	44.8	8% (4)	3	55	- 8%
Peasant-commodity Producers(PCP)	68% (34)	3.9	40.6	56% (28)	4.4	50	- 12%
Semi-proletariat-producers (SP)	14% (7)	1.9	38.6	30% (15)	3	46.4	+16%
Rural Proletariat (RP)	2% (1)	1	27	6% (3)	2.5	43.3	+4%
Whole SG Sample	**100% (50)**	**3.5**	**40.7**	**100% (50)**	**3.7**	**48.7**	**0**

The average year 2000 age of the household heads who participated in this survey was 43.4 years old in the CG and 40.7 years old in the SG. This difference was not deemed statistically significantly different following an unpaired T-test. Average year 2000 household size was 3.7 persons in the CG and 4.1 persons in the SG. This difference was also not deemed significantly different and furthermore both average household sizes were very comparable to the 4.0 persons found on average in each household in the district during the 2000 National Census (INEC 2001). The average year 2000 farm size was 3.7 hectares in the SG and 2.8 hectares in the CG, which was also not found to be significantly different. Finally, from the earlier section on land-use detailed above it is also apparent that their year 2000 land-use strategy was very similar overall. This finding, which is found in Table 4.2 above, is compiled and re-presented below in Table 9.

Table 4.9. Comparison of CG and SG year 2000 average percent, per farm land-use allocations.

Year 2000 Land-use	House and Patio	Coffee	Pasture	Annual Crops	Fallow	Forested/ Reforested	Other
SG % of Farm	5	63*	15	3	5*	7*	2
CG % of Farm	6	75	14	1	1	2	1

*Mean values are significantly different than the control group at 5% level.

This overwhelming congruity between SG and CG average farm and household size, along with the similar proportions of land dedicated to the different available land-uses (although note that significant differences do exist between coffee, fallow and forested/ reforested land-uses in the year 2000) is an indication of comparable initial socio-economic conditions between the SG and the CG as well as very similar management strategies at the farm level for the year 2000. When combined with the above mentioned (in the Research Design and Methodology section) similarity between the 34% district-wide population loss between 1998 and 2010, as reported by the Costa Rican Census Bureau, and the CG's loss of 35% of total farm-households between the years of 2000 and 2009, important comparability and validity has been established that lends significant credibility to the statistical comparisons of these two groups which are explored later in this chapter and dissertation, especially in Chapter 6.

Labor, land and demographic dimensions in 2000 and 2009

<u>Hypothesis 1: Within the CG for both years 2000 and 2009, the higher the class-position (labor-dimension based) the larger the farm-size (land-dimension based) and the older the household-head age (demographic-dimension based).</u> This prediction is based upon the political economic theorizations discussed above.

2000 control group

In order to test the CG portion of hypothesis 1, I first examined whether a statistical relationship existed between the year 2000 CG labor dimension based class-positions (Table 4.7, column 2) and the year 2000 CG land dimension based farm-size (Table 7, column 3) as well as with the year 2000 CG demographic-dimension based household-head age (Table 4.7, column 4). Consequently, a one-way ANOVA was calculated comparing class position with the two aforementioned variables[36]. Farm-size and household head age both differed significantly across class categories in the CG. This revealed that year 2000 mean CP farm-size (8.1 hectares) was significantly larger than PCP (3 hectares), SP (1.3 hectares) and RP (0.6 hectares) mean farm-sizes

[36] Post hoc comparisons were performed on the significantly different variables using the Fisher protected least significant difference (LSD) test, with an assumed alpha rate of 0.05. Means followed by letters are reported for variables with an ANOVA P-value <0.05. Means followed by the same letter are not significantly different by Fisher's LSD (p = 0.05).

in the CG but that these three lower class farm-sizes were not statistically different from each-other. The Fisher LSD test also revealed that year 2000 CG mean household head ages in the CP (58 years), PCP (44.3 years) and SP (33.1 years) were all significantly different form each-other, while RP age (40 years) was not significantly different form any of the other class positions.

Summarizing the year 2000 CG results, one-way ANOVA's confirmed that access to the means of production (farm-size) and farm-household location in the demographic cycle (household head age) were both statistically significantly related with year 2000 CG farm-household class standing (labor-based). The post hoc analysis revealed that the magnitude and direction of the relationship matches the year 2000 predictions made for the CG in hypothesis one, which indicates that the labor exploitation criteria was a very robust method of assigning farm-households to one of four class standing categories within the CG in the year 2000.

2009 control group

One-way ANOVA calculations on 2009 CG data again clearly show that class standing (Table 4.7, column 5) is very significantly related with both farm-size (Table 4.7, column 6) and household-head age (Table 4.7, column 7) variables (All P-values < 0.01). This indicates again the relevance of all three dimensions in the composition of socioeconomic class for the CG. Year 2009 post hoc comparisons in the CG using the Fisher protected LSD test revealed that year 2009 PCP farm sizes (4.7 hectares) were significantly larger than the extension of both SP (1.8 hectares) and RP (1.4 hectares) farms but that CP farm sizes were not statistically significantly different from any other class farm-size. PCP household-head age within the CG in 2009 was significantly greater than both SP and RP ages by more than ten years in each case. CP age was not statistically significant. However, as the CP group for the CG in 2009 was composed of only one farm-household, these results are not considered robust and so the overall trend is maintained for the CG in 2009; farm-size and household head age increases in value as you move up the socioeconomic class schema from RP to PCP.

2000 sustainable group

In the SG neither of the variables differed significantly across class standing categories for the year 2000. However, given my prediction in hypothesis one that CP farm-households will tend to have larger farms (Table 4.8, column 3) and older household-heads (Table 4.8, column 4) than PCP, SP and FP farm households; only two farm size predictions did not match the trend; the CP with a mean of 3.5 and the PCP with a slightly larger mean of 3.9. The rest were all upheld, albeit without significant results.

2009 sustainable group

The overall trend is identical to that theoretically predicted, increasing farm size (Table 4.8, column 6) values and household head ages (Table 4.8, column 7) as you move up the labor class schema (Table 4.8, column 5) from RP to CP, except that the average PCP farm-size (4.4 hectares) is larger than any other average, including the CP. This was also the case for the 2009 CG; in fact both the CG and SG follow the exact same trends in 2009. While lacking the statistical significance of the CG relation between the two proxy variables and class standing, the direction and magnitude of the SG distribution supported my hypothesis.

Hypothesis 1 summary

A comparison of mean farm sizes and household-head ages between the entire SG and CG in both 2000 and 2009 revealed that neither of these variables is significantly different in either year. When combined with the fact that both the CG and SG results from 2000 and 2009 followed theoretically deduced trends in the majority of cases, and that within the randomly sampled CG both proxy variables were highly significant in both years, a strong case has been made for the quality, validity and theoretical robustness of both samples. This is quite encouraging for the multiple analyses and comparisons within and between these two groups in this and the chapters to come. Now that the key factors that delineate class position have been identified and scrutinized, we can confidently examine those factors that most impeded or encouraged processes of class differentiation (Table 4.10). First however, I will statistically test whether the overall class distributions differed in 2000 or in 2009, and if so, how they differed so that the possible impact that the SG interventions could have had on class distributional change is known.

Changes in class composition (2000-2009)

Hypothesis 2: Year 2000 farm-household class distributions will not be significantly different between the CG and SG. This prediction is based upon the fact that the coffee crisis had not yet started and the SG had not yet adopted agroecological management and alternative markets as resistance strategies.

Year 2000 initial class standing distributions appear fairly similar in the SG and CG in terms of proportion of farms located in each of the four analytical categories (Tables 4.7 and 4.8, second column). The largest class position in both groups was the PCP (68% of SG and 72% of CG). Because both variables, class position and group membership, are categorical frequency values, a Pearson's chi-square test of independence was performed for the years 2000 and 2009 to test whether class position was independent of farm-household membership in the SG or CG. In the year 2000 the null hypothesis that there was no statistically significant association between class position and group membership cannot be rejected ($x^2(3, N = 104) = 02.59, p = .45$). This indicates that both CG and SG members are equally associated with each class position and that their distributions are not significantly different, confirming hypothesis 2.

Hypothesis 3: Class differentiation will occur within both groups between 2000 and 2009 due to the coffee crisis but the typological distribution of 2009 farm-households will significantly differ between both groups. This is predicted to occur because the SG farm-households will have adopted agroecological management and alternative markets which will improve their resistance to class differentiation.

Between 2000 and 2009 Agua Buena farm-household class distributions underwent a definite shift. The proportion of both CP and PCP classes lowered in the SG (Table 4.8, last column: CP -8%, PCP -12%) and collapsed in the CG (Table 4.7, last column: CP -5%, PCP -27%). Meanwhile, the proportion SP and RP classes increased in both the SG (SP +16%, RP +4%) and the CG (SP +23%, RP +9%) with the SP as the fastest growing class between 2000 and 2009 in both groups.

Even though the class composition of both groups shifted, the 2009 Pearson's chi-square test of independence resulted with a p-value of 0.035 indicating that whether or not farm-households are in one of the four class positions depends on their group membership ($x^2(3, N = 104) = 8.6, p = .035$). Class position is thus statistically related to group membership in 2009, confirming hypothesis 3. This indicates that the two groups of farm-households, which began in 2000 with no statistically detectable difference in the distribution of their class positions, diverged so significantly in the nine subsequent years that their class position distributions were by then highly statistically significantly different.

Class differentiation and persistence

Hypothesis 4: The PCP class will persist more in the SG versus the CG. This prediction is made because the agroecological transition that the SG undertook requires large quantities of family labor not deployed in the CG's response to the crisis. Higher labor needs are also indicated by the relative persistence in coffee of the SG versus the CG that is indicated by the above land-use change results as well as by the fact that they all engaged in alternative coffee marketing networks.

Table 4.10. Class movement categories, 2000-2009.

Row #	Class Movement Category	Control Group			Sustainable Group		
		% Group (# farms)	2000 Mean Farm Size he *	2000 Age Head *	% of Group (# farms)	2000 Mean Farm Size he	2000 Age Head
1	Commodity Producers **PERSISTENT**	2% (1)	4 ABC	55 A	6% (3)	2.7	47.7
2	Peasant-commodity Producers **PERSISTENT**	30% (16)	3.8 B	48.6 AB	48% (24)	3.9	41.2
3	Rural Proletariat or Semi-proletariat-producers **PERSISTENT**	18% (10)	1.1 C	34.2 C	14% (7)	1.7	35.7
4	Commodity Producers **DOWN** to Peasant-commodity Producers or Semi-proletariat-producers	5% (3)	9.4 A	59 A	10% (5)	3.9	43
5	Peasant-commodity Producers **DOWN** to Rural Proletariat or Semi-proletariat-producers	43% (23)	2.4 BC	41.3 BC	18% (9)	3.7	38.7
6	Semi-proletariat-producers **DOWN** to Rural Proletariat	2% (1)	2 BC	43 ABC	2% (1)	2.1	47
7	Peasant-commodity Producers **UP** to Commodity Producers	0% (0)	N/A	N/A	2% (1)	4	45

*ANOVA P-value < 0.05 Means followed by letters are reported for variables with an ANOVA P-value <0.05. Means followed by the same letter are not significantly different between class movement classifications, by Fisher's LSD (p = 0.05).

Seven class movement categories were identified from the previous analysis and were used to quantify, across groups, farm-households that were vulnerable to class-movement or were persistent between 2000 and 2009, as well as analyze the impact of farm-size and household age on persistence or vulnerability. See Table 4.10 for the results. Comparisons of year 2000 farm size and year 2000 farm-household head age between the seven class movement categories were analyzed through multiple, one-way analyses of variance (ANOVA), and post hoc Fisher's protected least significant difference (LSD) tests. I focus on results impacting CP or PCP persistence or vulnerability to class decline.

The ANOVA detected a significant relationship between CG class movement categories and year 2000 farm sizes (P-value < 0.05). The 16 PCP persistent farm-households (Row 2) had significantly larger farms (3.8 He) than those 10 RP or SP persistent (Row 3) farm-households (1.1 He) as well as significantly smaller farms than the 3 CP down (Row 4) households (9.4 He). While not significant itself, the average farm size of the PCP persistent CG farm-households (Row 2) was 1.4 hectares larger than the vulnerable PCP down (Row 5) class movement (3.8 and 2.4 he). Interestingly, the CP persistent farm-household (Row 1) was 5.4 hectares smaller than the CP down-class farms (Row 4) that were vulnerable to a decrease in class standing (4 and 9.4 hectares), although this was not significant.

While the ANOVA did not reveal a significant relationship between SG class movement categories and year 2000 farm size, PCP persistent SG farm-households (Row 2) were slightly larger than those PCP vulnerable (Row 5) in the SG (3.9 and 3.7 He), and much larger than FP or SP persistent (Row 3) farm-households (3.9 and

1.7). Both these trends were apparent in the CG as well. Also like the CG, the average farm-size of CP persistent farm households (Row 1) in the SG was smaller than CP down-class (Row 4) farm-households (2.7 and 3.9 hectares).

The ANOVA detected a significant effect of household-head age and the categories of the CG (P-value < 0.05). The PCP persistent household head age in the CG (Row 2) was significantly older by 14.4 years than the SP or RP persistent (Row 3) farm-households (48.6 and 34.2). PCP persistent farm households were 7.3 years older, although not significantly, than the 23 vulnerable PCP down-class (Row 5) farm-households (48.6 and 41.3). The only significantly different ages from the PCP down-class group were the CP down (59) and CP persistent (55) categories. In the SG, the ANOVA was not significant, but PCP persistent farm-households were slightly older than PCP vulnerable farm-households (41.2 and 38.7). Similarly CP persistent farm-households were more than four years older than the CP vulnerable down-class (47.7 and 43.3).

My forecast for hypothesis 4 was correct: SG farm-households were much more successful at persisting as PCPs (Table 10, Row 2) between 2000 and 2009 (SG 48% CG 30%). Neither group experienced a polarizing process, but rather a downward shift in the class standing of farm-households in both groups. The top two classes of CP and PCP in both the CG and SG reduced in size while the bottom two classes of SP and RP gained members in both groups (Tables 4.7 and 4.8, column 8). PCP farm-households in the CG were also much more vulnerable to drop class position between 2000 and 2009 (Table 4.10, row 5). Fully 43% of CG farm-households moved from PCP to SP or FP, while only 18% of SG farm-households were susceptible to this loss in PCP class standing. Thus the SG's ability to persist as peasant commodity producers was the key difference between these two group's experiences of class differentiation between 2000 and 2009.

Discussion: logics of land-use and class persistence

Identifying the circumstances and strategies that explain the SG's persistence in coffee and as peasant commodity producers will contribute to our understanding of the conditions under which landscape conservation and grassroots rural development are compatible in the coffee highlands of the world. This is the goal of the following discussion section. The section is punctuated by the offering of two clearly framed hypotheses for this persistence that are tested in subsequent chapters of this dissertation.

In places such as Agua Buena where the main alternative land-use to coffee is pasture, the decision to convert to this land-use is a critical one because once converted the land is fairly path-dependent in use as the soil structure often becomes damaged enough that subsequent conversion to another system is difficult, if not impossible. Part of the willingness to stick with coffee throughout the bad times is due to the fact that the culture of coffee production runs deep for many of the SG members. As SG member Maria Eugenia Mendez (2005) put it:

> *The coffee, it's just…I don't know. I've always liked coffee so much. And yes, I'm going to keep having it. It seems to me that coffee is a very brave plant. If one has it…It is, let's say, a plant…that's very, very resistant. It does well without too much care- you can leave it without taking care of it…With vegetables, I don't want to have to grow and sell them, but because of the cost of food…I have to. No what I like most is coffee.*

Table 4.11. Comparison of Agua Buena land-use change research.

Source:	(Rickert 2005)		Author	
Year	**1997**	**2003**	**2000**	**2009**
Mean Size (He)	8	7.9	3.04	2.78
Coffee	48%	21%	75%	20%
Pasture	30%	47%	14%	37%
Other Crops	3%	7%	1%	11%
Fallow	2%	6%	1%	14%
Forested	16%	17%	2%	2%
Others	1%	2%	7%	16%
Total	**100%**	**100%**	**100%**	**100%**

The 1997 and 2003 data in Table 4.11 is from a Master's Thesis carried out in Agua Buena during 2003 (Rickert 2005). The 2000 and 2009 data is from the CG survey I completed (N=54). Like my own '00-'09 research, the '97-'03 research utilized a proxy pretest, in this case for the year 1997. The sample wasn't randomized nor particularly representative as the sampling methodology consisted of walking down the main roads leading out of Agua Buena and interviewing the first 60 persons encountered. This led to a sample with an average farm size of around 8 hectares versus 3 in my study. While the author's main hypothesis was confirmed; that the favored land-use that farmers struck by the coffee crisis were converting to was pasture, this was attributed to the actions of a few very large farms whereas many of the smaller farmers did not convert wholeheartedly to pasture.

As I will now demonstrate, this reflects how capital and especially labor constraints in Agua Buena ensure that large landholdings are associated with extensive-style farming systems, especially pasture, which also offer few of the ecological benefits that accrue from the sustainably managed coffee that persists on smaller farms[37]. This is bolstered by two trends that stand out from the ANOVA class analyses; the first trend is the year 2000 CG farm-size (3.8 he) correlation with the persistence of PCP farm-households (Table 4.10, row 2), as well as also correlated with the vulnerability (9.4 he) of downward class movement in CP farm-households (Table 4.10, row 4). Thus, the more severe class movements among CG PCP farm-households is partially explained by the greater degree of initial farm-size polarization, which manifested as higher year 2000 CG versus SG average CP farm sizes (CG 8.1 he versus SG 3.5 he).

In turn, this can be explained by the fact that as coffee farm sizes increase, they cross a threshold which requires them to regularly invest (not just at the harvest) more labor than can be covered by one family. I have observed that in Agua Buena this threshold is located at approximately 4 hectares. As the crisis hit, the regularly hiring

[37] It possible to see how a self-reinforcing feedback loop could emerge in coffee producing landscapes where land distribution is substantially unequal. However, Agua Buena, and in general the highlands where coffee is produced in Costa Rica, has a relatively equitable distribution of land while the more unequal distributions are located in the lowlands.

of labor became unaffordable so that while larger farms (the year 2000 average CG farm sizes among the CP were 8.1 hectares) had more landed resources at their disposal, at the same time they proved to be more vulnerable to a larger impact on class and land-use change because they are already accustomed to higher inputs of non-family waged-labor than the smaller farm-households. With wage-labor unprofitable and scarcely obtainable, they were thus more likely to abandon or convert most of their farm to a low labor land-use like pasture and more likely to work off-farm because even at the largest farm sizes in my sample, pasture does not provide a sufficient monetary income to secure a family's livelihood. In contrast, the smaller CP farms of the SG were more likely to replace much of the previously hired labor with increased inputs of family labor such as that associated with increased substitution of labor for formerly purchased external-inputs and the more intensive cultivation and intercropping of subsistence crops.

In the case of PCP persistent farm-households, both groups reflected very similar average year 2000 farm-sizes (3.8 CG 3.9SG). As mentioned above, four hectares is an approximate upper threshold for the size of a coffee farm that can be productively managed almost exclusively by family labor alone. While the circumstances of a larger than 4 hectare farm-size were just discussed, conversely, a farm-size of any less than 4 hectares results in the reduction of the labor efficiency per unit of area. Thus when the crisis hit, the PCP farm-households whose farm-areas averaged closer to this optimum level for efficient production were the most prepared to adopt labor and knowledge intensive agroecological practices that helped them persist in coffee such as that associated with multi-strata coffee agroforestry like intercropping, manual weeding, organic compost preparation and construction of soil conservation measures.

Table 4.12. Family labor index, 2000-2009.

Family Labor Index	Family Labor Days/ # Dependents 2000	Family Labor Days/ # Dependents 2009	% Change 2000-2009
SG (n=54)	88.1	137.4	56%
CG (n=50)	106	85.5	- 19%

2009 P value = 0.0013
2000-2009 P value = 0.0032

Table 4.13. On-farm versus off-farm labor days, 2000-2009.

	On-Farm 2009	Off-Farm 2009	Ratio On-Farm/Off-Farm 2009
SG (n=50)	240.2	144.2	1.7
CG (n=54)	90.4	175.8	0.5

2009 On-Farm P value = 0.0001
2009 Off-Farm not significantly different

The family labor index in Table 4.12 is the ratio of annual family labor days to number of household dependents. It is, in effect, an analogue of Chayanov's consumer to worker ratio discussed above. While year 2000 ratios did not differ significantly between the SG and the CG, by 2009 SG farmers had a significantly higher ratio (SG 137.4 CG 85.5; P=0.0013). SG ratios also increased significantly between 2000 and 2009 (88.1 to 137.4; P=0.0032). This could have been due to the fact that CG farm-households simply pursued off-farm wages more than on-farm production and that these wages pay more and therefore they need to work less in general in order to maintain a suitable livelihood. However, the data does not suggest this as 2009 SG farm-households averaged 144.2 off-farm days while the CG averaged 175.8 and the differences were not statistically significant (Table 4.13). The year 2009 ratio of on-farm to off-farm labor days was 0.5 in the CG and 1.7 in the SG, signifying that CG farm-households work on average two labor days off farm for every day on-farm while CP farmers still work primarily on-farm[38]. Additionally, the 2009 average number of dependents was 2.6 in the CG and 2.8 in the SG and not found to be statistically different. Thus it is not possible that the family labor indices' increase was simply a reflection of wide differences in the number of dependents between the groups. Instead, this phenomenon is attributed to "overtime" work on the part of the SG households[39].

In addition, between 2000 and 2009 the number of SG farm-households who grew more than one-half of their food rose from 36 to 40%, while CG farm-households saw their average proportion drop from 57 to 33% (See table 4.14). Additionally, the proportion of CG farm-households who produced none of their food increased from 12 to 19%, while the SG only increased by 2% in this category, from 4 to 6%.

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[38] This move away from dependence on farm production, and a reorientation of livelihoods towards new occupations represents a specific form of de-agrarianization in which peasantries lose their economic capacity and social coherence, and shrink in size. They literally unravel as communities. The mechanism appears to be a variant of the "simple production squeeze".

[39] Chayanov referred to this type of result farm-household self-exploitation.

Table 4.14. Food self-sufficiency, 2000-2009.

N=104	2000 More than 1/2	2000 Less than ½	2000 None	N=104	2009 More than ½	2009 Less than ½	2009 None
CG (n=54)	57%	31%	12%	**CG (n=54)**	33%	48%	19%
SG (n=50)	36%	60%	4%	**SG (n=50)**	40%	54%	6%

Conclusions

Overall there is no evidence for class polarization or between household exploitation due to the coffee crisis among the farm-households in this sample; although within household self-exploitation was observed. Growth within the CP class, what the Leninist models of agrarian change would have forecasted as an accompaniment to the differentiation of the PCP class into the SP and FP classes, was not observed. This is partially due to the world-historical moment of capitalism under which the changes were experienced (Wallerstein 1974; Bernstein 2001). The constant uncertainty surrounding commodity and input markets meant that very few farm-households could have accumulated capital through productive agricultural reinvestment even if they had desired so. While the globalization and deregulation of coffee agriculture rendered many Agua Buena farms uncompetitive, the lack of polarization is to be expected in a globalized neoliberal economy because the Costa Rican peasant's competition is not their immediate geographic neighbors but those Vietnamese smallholders working under different cost structures and regional political economic conditions.

Another explanation for the lack of rural class differentiation is the lack of an absentee landlord class or the existence of land leasing as a practice in Costa Rica. This in turn was due to the orientation towards processing and input markets by agrarian capital (instead of land and production) that was identified in Chapter 2. According to this analysis, the national agrarian capitalist class had little chance to exploit the crisis through the plundering of indebted coffee farms and the hyper-accumulation of land because of a substantially un-leveraged position.

Why did a certain organization of family labor suddenly appear following the collapse of coffee prices in SG farms but not in CG farms? I conclude that it was the result of differences in the overall organization of SG's farm household production towards agroecological coffee management and increased self-provisioning through the diversification of on-farm production to supply direct subsistence as well as alternative cash or barter crops.

Additionally and notably, the results of this research indicate that these two samples did not diverge statistically in terms of year 2000 farm sizes and household head ages. This gives added weight to the proposition that some type of intervention strategy adopted following the onset of the crisis was the explanatory factor for the great differences in 2009 land-uses and class configurations that have been detailed in this chapter. Since farm-size and household head age were found to not significantly differ and can be held constant, the SG's overwhelming persistence in coffee is hereby proposed as either due to different production strategies, higher farm-gate prices, or both[40]. This is the basis for the following two hypotheses explaining the SG's land-use and class persistence:

Hypothesis #1: Higher farm-gate prices resulting from the SG's connection to Fair Trade and direct markets explain their persistence in coffee. This is the hypothesis explored in chapter 5.

Hypothesis #2 The agrobiological and structural diversification of SG coffee agroecosystems led to the emergence of structures and functions that maintained production while heavily reducing or eliminating costly external inputs and providing crucial subsistence food. This hypothesis is tested in Chapter 6 where SG and CG coffee agroecosystems are evaluated for their level of resistance and resilience to the economic and environmental pressures pushing the abandonment of coffee agriculture in Agua Buena.

[40] This is contingent upon the fairly acceptable premise that few farmers, especially those that are resource poor, would continue with a land-use that consistently dealt tangible, financial losses. Here I'm not referring to the Chayanovian "self-exploitation" of labor, a phenomenon which was mentioned above, but instead am referring to an actual loss in currency stocks.

Chapter 5.
Fair Trade and Beyond?
Alternative Marketing, Accountability and Debt

Introduction and research question

> "(T)he depressed coffee market serves as a mechanism of social differentiation in communities by threatening small-scale farmers with the loss of their livelihood and enforced proletarianization as wage laborers… the certification pathways offer livelihood strategies to resist proletarianization"
> (Goodman 2006; p. 10)

There is good reason to agree with David Goodman's above assessment on the impacts of the coffee crisis on social reproduction and class differentiation as well as the potential of certifications as resistance strategies (2006; p. 10). In chapter four I documented at both the national and community level considerable amounts of farm-household class differentiation and land-use change (LUC) out of coffee between the years of 2000 and 2009. At the Agua Buena community level these processes were found to be significantly slowed by membership in the Sustainable Group (SG) versus a Control Group (CG). With both farm-size and household size found not to differ significantly between these groups, the SG's participation in Fair Trade and direct-trading networks, along with the agroecological transformation of their farms, were recognized as the most relevant explanatory differences between the farm-households in each group. Accordingly, two possible hypotheses were levied to explain the divergent experiences of LUC and class differentiation in the SG and the CG, one based on the reduced costs of coffee production resulting from the SG's agroecological transition[41] (evaluated in Chapter 6) and one based on higher farm-gate price earnings resulting from the SG's connection to Fair Trade certified and direct-trade alternative markets. This chapter evaluates the latter of these two hypotheses[42].

<u>Between 2000 and 2009 did the SG's connection to Fair Trade and direct-trade networks lead to higher farm-gate prices than those received by CG farm-households connected to other Agua Buena marketing networks?</u>

Email communications, accounting records, annual reports and board of director meeting minutes from CAN and CoopePueblos were used in combination with the active-participant observations I derived from my role as CAN's Agua Buena community research liaison between 2005 and the present, to assemble the following narrative of the promises and perils surrounding alternative marketing networks. In the following section I briefly review scholarship on the relationship between the coffee crisis, Fair Trade (FT) and resistance to liberalization in order to identify general trends and gaps in the literature more broadly as well as in Costa Rica specifically. Then the results of the investigation into farm-gate price, FT, the SG and resistance to class differentiation and LUC are presented and discussed.

[41] Hypothesis #2 from Chapter 4: The agrobiological and structural diversification of SG coffee agroecosystems led to the emergence of structures and functions that maintained production while heavily reducing or eliminating costly external inputs and providing crucial subsistence food.

[42] Hypothesis #1 from Chapter 4: Higher farm-gate prices resulting from the SG's connection to Fair Trade and direct markets explain their persistence in coffee.

Understanding the coffee crisis paradox: global value chain analysis

Between 1999 and 2005 international trade relations produced both a *coffee crisis*, characterized by the lowest prices ever for coffee farmers in underdeveloped producing countries, as well as a *coffee boom* within consuming countries as "the latte revolution" took shape (Ponte 2002; Daviron and Ponte 2005). Daviron and Ponte understand and explain the paradox evoked by these starkly contrasting experiences by comparing changes in the coffee commodity chains over time (Daviron and Ponte 2005). The commodity chain concept has roots in World-Systems theory where it was defined by Hopkins and Wallerstein as early as 1986 as "a network of labour and production processes whose end result is a finished commodity" (p. 159). This has evolved into Global Commodity or Value Chain analysis (GVC), which has been summarized by Ponte as an approach where:

> *the international structure of production, trade, and consumption of commodities is disaggregated into stages that are embedded in a network of activities controlled by firms and enterprises.*
> (2002; p.1100)

The systematic study of commodity chains explains disparities in chain organization and functioning in terms of differences in their input/output structure, geographical coverage, governance structure and institutional framework. Daviron and Ponte point to important changes in the governance and institutional arrangement of the coffee commodity chain as being reasons explaining the coffee paradox (Daviron and Ponte 2005). Briefly, their argument is that the collapse of price supporting quotas following the institutional disintegration of the International Coffee Agreement in 1989 was combined with retailers and roasters adding more and more value on the consumption end, therefore controlling, or in their words driving governance of the chain. The sum of all these institutional and governance changes have meant that coffee is still treated in many producing countries as solely having material commodity value whereas symbolic values have been added and appropriated by roasters and retailers looking to differentiate their product in consuming countries.

This analysis is useful in that it suggests that producing country governments, farmer organizations and farmers should begin to carve out these symbolic values for themselves wherever and whenever possible. On the governance end, the further development and improvement of existing sustainability certifications as well as the branding of appellations and quality improvement, have all been recognized as important strategies for confronting the coffee crisis. On the institutional end possible strategies include leveraging anti-trust legal action against monopolistic importers, including coffee in the TRIPS protection of the WTO much like wine and spirits are in developed countries, and requiring the use of labeling of origin so that set prices paid to farmers are gradually developed with regards to locale (Daviron and Ponte 2005). However, with a politics of deregulation dominating many national political economies, strategies confronting institutional arrangements have not been extensively employed. In contrast, governance solutions that focus on fortifying producer group capabilities in defining and capturing symbolic values have thrived.

Fair trade coffee networks

The Fair Trade coffee commodity chain reflects a model of alternative trade where licensed roasters and retailers purchase coffee directly from democratically organized smallholder cooperatives at a fixed and higher price than the conventional market. This is also often accompanied by important pre-harvest financing extended by exporters, importers, roasters or retailers located in either producing or importing countries. The terms by which this credit is extended to the local cooperatives, which then channel it to individual farm-households, is also an important aspect of FT coffee network functioning. The most common way that retailers signal to consumers that the final purchased product is Fair Trade certified is through a logo affixed directly on the bag of coffee[43]. The Fair Trade coffee commodity chain is unique in that by its own definition, it confronts both institutional and governance dimensions of change in the global coffee commodity chain. And so Fair Trade coffee is both a differentiated product that earns differentiated product rents and an institutional arrangement that mandates a fixed, minimum price be paid to the democratically organized smallholder cooperatives from where the coffee is sourced. The former characteristic should help make the latter promise attainable and sustainable. Unfortunately this is not at all clear from the body of research, now rapidly accumulating, that is focused on testing this minimum price promise.

[43] Or placed in the signage of a restaurant or café if the retailer sells the coffee prepared.

Research into Fair Trade has rapidly grown in recent years, and is represented in a broad range of fields. The sociology of food tradition focuses on re-theorizing agro-food networks and analyzing the complex institutions, livelihoods and power relations that FT networks both resist and are subsumed by. (Raynolds 2002; Daviron and Ponte 2005; Mutersbaugh 2005). In this approach, specific FT networks are mapped, and a focus on the interconnections amongst farm-household livelihoods, cooperative organizations, as well as NGO networks and consumers often exposes tensions and tendencies within the network. While important, this style of study, which is by far the most common in the growing literature, does not usually rigorously evaluate whether particular purported FT benefits, such as farm-gate price, market access or credit provision, actually reach the farm-household level. As sales of FT coffee grow, so to do the number of potentially robust cases available for the investigation and assessment of material impacts to accompany the above mentioned identification and exploration of internal contradiction. Both are necessary in order to keep FT accountable to its producer and consumer constituencies.

One of the most comprehensive empirical assessments to date of the farm-household impacts of Fair Trade certification came from a 2003 survey of 469 households and 27 cooperatives and estates from Mexico, Guatemala, El Salvador and Nicaragua (Mendez, Bacon, et. al 2006). Focusing on the key indicator of farm-gate price, the authors found an average conventional price of \$0.58 per pound while the Fair Trade farm-gate price averaged \$0.70 per pound. These differences were found to be statistically significantly different. However, both are also substantially lower than the minimum (non-organic) Fair Trade price of $1.26 per pound paid to the cooperative ($1.21 floor price plus a $0.05 social premium). In addition, this study found no impact of FT on either farm-household education level or school attendance. An upsetting 63% of all households in the survey struggled to meet their basic food needs every year and there was no impact of FT certification on this result. The conclusions reached from this as well as other similar studies point to the troubling fact that while FT can provide much needed additional income to cooperatives when commodity prices are especially low (Bacon 2005), the financial benefits often do not trickle down to the farm-household level (Mendez, Bacon et al. 2006) and even when they do are still often not enough to stave off radical changes in the farm-household mode of production such as migration and land-use change out of coffee (Lewis and Runsten 2006).

One reason for these disappointing findings has been the inflexibility of the governing bodies within FT certification over the last ten years to enact price changes needed just to keep the Fair Trade minimum even with inflation. Prices were slightly adjusted in 2007- 2008 following scholar-activist Chris Bacon's calling attention to serious declines in the real value of the fair trade price premium when accounting for recent inflationary pressures[44] (CLAC 2007). However, the increase made was only $0.10, from $1.31 per pound to $1.41 per pound, which is not even close to making

[44] Bacon's study was commissioned by the FT price-setting agency in Latin America, the CLAC (La Coordinadora Latinoamericana y del Caribe de Pequeños Productores de Comercio Justo).

up for the heavy inflation incurred during the last 20 years. For example, as Figure 5.1 clearly demonstrates, minimum real urban wages have increased 41% since 1990, while real Fair Trade coffee prices have lowered 33% in the same period (CLAC 2007). This has made the opportunity cost of FT coffee production very high relative to other smallholder livelihood activities and is deeply problematic because in calls into question the credibility of the institutional arrangement of the entire FT coffee certification system.

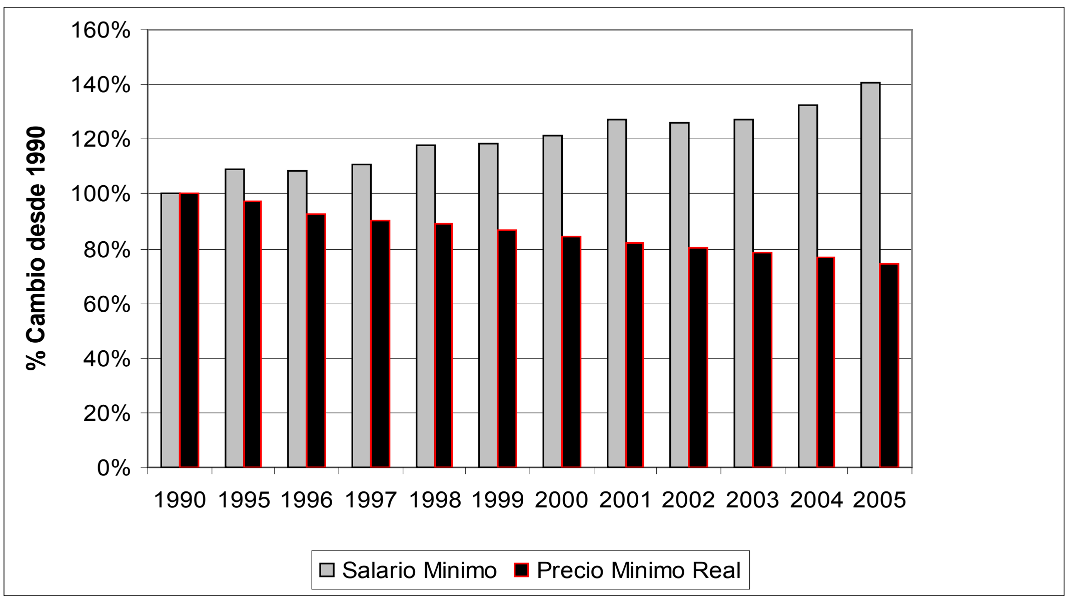

Figure 5.1. Minimum wage versus minimum Fair Trade price in Latin America and the Caribbean, 1990-2005. Source: (CLAC 2007).

This stagnation in the minimum price is further complicated when FT only makes up a relatively small portion of a cooperative's sales. This relatively common occurrence makes impact assessment of FT particularly tricky. It is for this reason that the CoopePueblos cooperative chosen for this case study has sold over 75% of its coffee between the years of 2005 and 2009 to certified FT markets. Another 10% was sold through a direct-marketing channel, the description of which follows the next section on Fair Trade impact assessment in Costa Rica.

Fair Trade networks in Costa Rica

The coffee sector in Costa Rica operates like no other in the world. As discussed in Chapter 2, the state still has a heavy role in either the direct or indirect functioning of nearly every aspect of coffee production or processing. A 1952 amendment to the original 1933 *La Defensa de Café de Costa Rica* law is still in effect in Costa Rica, which among other things, limits the legal maximum proportion of profits that a mill can appropriate at 9%. In addition, ICAFE annually calculates the *precio de liquidación final* (final liquidation price) which sets the *minimum* farm-gate price for each and every mill in the country. These two state-managed aspects of the Costa Rican coffee sector protect smallholder and otherwise vulnerable coffee producers from full exposure to the international commodity market and in the process reduce the opportunity for the domestic agroindustrial and agrarian capitalist classes to exploit peasant producers. This is evidenced by the data in the fourth column of Table 5.1 below as the proportion received by Costa Rican producers has held steady throughout the last decade, even as the farm-gate price was more than halved. One of the purposes of the international FT model is to organize production at not-for-profit cooperatively organized mills in order to avoid the callous profiteering of mill owners common throughout the world. In Costa Rica, this benefit has been, in essence, extended to the whole national productive sector due to the limits placed on mill profitability.

Table 5.1. Costa Rican average real coffee prices, 1999-2009. Source: (ICAFE 2010).

Coffee Harvest Year	**Final Price Exportation (US$/46 kg)**	**Producer Price (US$/fan)**	**% Export Producer**
1999-2000	102.2	77.98	76.30%
2000-2001	66.12	48.45	73.27%
2001-2002	64.06	45.8	71.50%
2002-2003	71.43	52.45	73.42%
2003-2004	81.4	60.73	74.60%
2004-2005	109.73	84.58	77.08%
2005-2006	118.46	89.02	75.15%
2006-2007	126.38	95.84	75.83%
2007-2008	140.74	109.73	77.96%
2008-2009	138.89	107.28	77.24%
Average 1999-2009	101.94	77.19	75.72%

Costa Rican coffee mills, especially cooperatively operated ones, make at least two main annual payments to growers. The first payment only partially cancels an account, and is made when a farmer brings the mill coffee. This happens anytime that the mill receives coffee from a farmer during the relatively lengthy five-month long harvest season (August till December). The volume of coffee submitted is recorded so that a second payment can be made after the *precio de liquidación final* is published in January. This final liquidation oftentimes doesn't take place until April or May when the mill sells the last of that year's harvest. Several smaller, incremental payments are often utilized if this is the case.

More recently, the capital and resource intensive, large-scale wet processing mills historically predominant in Costa Rica have been challenged by a large influx of resource-sparing “ecological” mini-mills. This is due to a convergence of factors including technological advancements and a sectoral reorientation towards the production of differentiated quality and craft coffees. This technology is also affordable and feasible for smallholder cooperatives. Quality coffee such as the type demanded in a differentiated market is also best obtained by the processing of small lots that mini-mills are perfect for. Almost all Costa Rican coffee mills, whether large or small, require annual influxes of credit in order to make the initial payments to farmers. The availability of relatively large amounts of year-to year credit is absolutely necessary for these emerging small-sized, resource poor and non-capitalized mini-mill coops. The terms by which these loans are extended, their rates of interest, the length of time extension and their collateral policies, are of key analytical importance.

The Consorcio de Cooperativas Cafetaleras, or COOCAFE, is a second level, Fair Trade certified marketing cooperative founded in 1988. It was the first, and for a while only, entity able to export certified Fair Trade (FT) coffee from Costa Rica. CooCafe purchases coffee directly from nine certified 1st level smallholder cooperatives, including CoopePueblos, the cooperative where the Sustainable Group’s coffee has been sold since 2005. They brand, market and export coffee to both conventional and Fair Trade certified markets as well as allocate FT premiums, manage large capital funds used for loans on projects, give pre-harvest financing, as well as offer some technical support and social programs. The overwhelming majority of studies that have evaluated FT in Costa Rica have evaluated the second-level CooCafe primarily and have for the most part overlooked the first level cooperatives experiences of FT. I can only speculate that this is what explains the mainly positive reviews, while I primarily examined a second-level coop and instead have, as demonstrated below, an overwhelmingly negative assessment of CooCafe's ability to effectively channel the benefits of FT to smallholder farm-households. The most cited paper surrounding Costa Rican FT coffee is based on fieldwork conducted at CooCafe in 1999 (Ronchi 2002). The author makes the important but rather common methodological distinction between direct and indirect benefits derived from FT. Fair Trade's direct impact on producers as a result of the farm-gate price premium is a decidedly crucial variable to evaluate early on in any analysis and is definitely necessary before any speculation should be made on the secondary and/or organizational level impacts. This is the impact that FT explicitly promises to deliver and yet the most-cited Costa Rican FT impact study fails to adequately and rigorously evaluate direct benefits and so cannot answer whether CooCafe affiliates received higher farm-gate prices than other farm-households which differed only in their mill affiliation (Ronchi 2002).

A second ethnographic account of Costa Rican cooperative culture and coffee-farmer livelihoods that also sets out to evaluate FT was published in 2008 but is based almost exclusively on fieldwork conducted in 1998 (Luetchford 2008). This study also focuses on CooCafe as well as two other coops, one FT and one not, finding that FT coops associated with CooCafe have steadily gained power and prestige within rural peasant society and built a substantial bureaucracy of non-peasant, elite status, white-collar coop personal that are simultaneously envied and resented by their peasant membership. While finding no specific evidence of corruption within these coops, the author documents the widespread suspicions about the division of FT profits among the cooperatives (Luetchford 2008).

Deborah Sick provides a much more recent and sobering look at FT in Costa Rica with her 2008 study, which examined the perceptions of FT by farmers and leaders in three FT cooperatives located in three different regions of the country (Sick 2008). It is clear from Sick's research that the findings of Ronchi in 1999 differ substantially and problematically from her own assessment of Costa Rican FT in the year 2008, especially the claim that all farmers in the nine first-level coops of CooCafe had benefitted both financially and organizationally from FT. Instead Sick finds concerns within all first-level coops studied regarding both the level of FT demand, which saw each coop selling less than half their production to FT markets, and the FT minimum price, which was claimed to be not a sustainable price because of Costa Rica's relatively high-costs of production, and of living in general, compared to most other producing countries. From the cooperative that has been affiliated with CooCafe since the first ever export of Costa Rican FT coffee she quotes one farmer's experience and claims it representative of the experiences of the cooperatives she evaluated more generally:

> *Fair Trade has not brought us a better income. It is still the same: those who really make money from our coffee are those who sell it cup-by-cup in the coffee shops in the North. That is where the profit is. We don't see it here* (2008; p.202).

This farmer's reaction points out the limitations of FT coffee at challenging the institutional and governance aspects of the coffee commodity chain in Costa Rica. There is at once a statement that the FT price minimum has not been enough to provide a better income and the recognition that this was because the commodity chain was still governed by the profits of companies in "the north". Sick claims that to the farmers and cooperatives of her study, FT formed only one response strategy among the many levied in the face of the coffee crisis. She admits that this was a "pilot study" and not rigorously designed but has not published anything since 2008 on the subject. There thus remains a serious gap in scholarship, which this chapter aims to fill, surrounding the impacts of FT in the face of the coffee crisis in Costa Rica.

Direct-marketing

Partly in response to the decline in real value returned to producers (CLAC 2007) and partly in recognition of the limitations pointed out just above of FT actually fulfilling it's promise to reform both governance and institutional structures of the commodity chain, some Alternative Trade Organizations (ATO's) have embarked on more progressive direct-trade initiatives. ATO's are usually non-governmental organizations (NGOs) but are also occasionally mission oriented businesses or social entrepreneurships. Direct-trade coffee initiatives are a diverse and by definition, un-standardized bunch. However, it is possible to make a broad distinction between them and conventional FT certification in that they "take certification as a starting point instead of a finish line" (Bacon and Jaffe 2008; p. 311). The level of commitment to this axiom structures the type of relationship they maintain with the FT certification process. Some direct-trade initiatives are hardly distinguishable from conventional FT certification, for example when a FT certified roaster purchases coffee directly from a FT certified cooperative and continues to pay the FT minimum price but advertizes it as directly-traded coffee. More radical are direct-trade initiatives in which consuming country roasters and producer cooperatives agree to long-term contracts that pay substantially more than the FT minimum. The impact of these higher prices is often assessed by ongoing NGO-led or in-house coop research projects monitoring farm-household livelihoods and farm-gate prices. This is often accompanied by roaster commitments to fund programs of social development and environmental stewardship which benefit the communities from where they source their coffee. While these arrangements offer obvious benefits for producers and are a clear improvement over conventional FT certification, I argue that they still only, like FT, address the post ICA institutional vacuum of the coffee commodity chain by guaranteeing (and this is not even always the case with conventional FT) that a minimum price is received by producer cooperatives.

More radical variations of the direct-market initiative, such as the one featured in this chapter's case study, actually change the direction of governance in the supply chain. Beginning in 2003, the Sustainable Group (SG) within CoopaBuena began an innovative direct marketing program with the Community Agroecology Network (CAN), an NGO affiliated with the University of California at Santa Cruz (UCSC). Under this direct-marketing scheme, coffee travelled from producing farm-households to the cooperative mill where processing occurred, then from the cooperative level to a local roaster for toasting and bagging and return to the cooperative, followed by delivery directly to North American (mostly) consumers via international mail. The removal of many intermediaries in the commodity chain (local middlemen, exporters, importers, distributors, importing country roasters, and retailers), combined with CAN's not for profit organizational status, should have left the cooperative with enough income to pay their members a higher farm-gate price than would have been possible with FT or conventional coffee sales alone. As you can see from figure 5.2 the net income received by the Costa Rican (CoopePueblos) cooperative was assessed, by CAN staff, prior to this research at $2.97 per pound. The verification of this assessment also contributes to fulfilling this chapter's goal of evaluating the role of alternative markets in reducing SG farm-household vulnerability to class differentiation and LUC due to the coffee crisis.

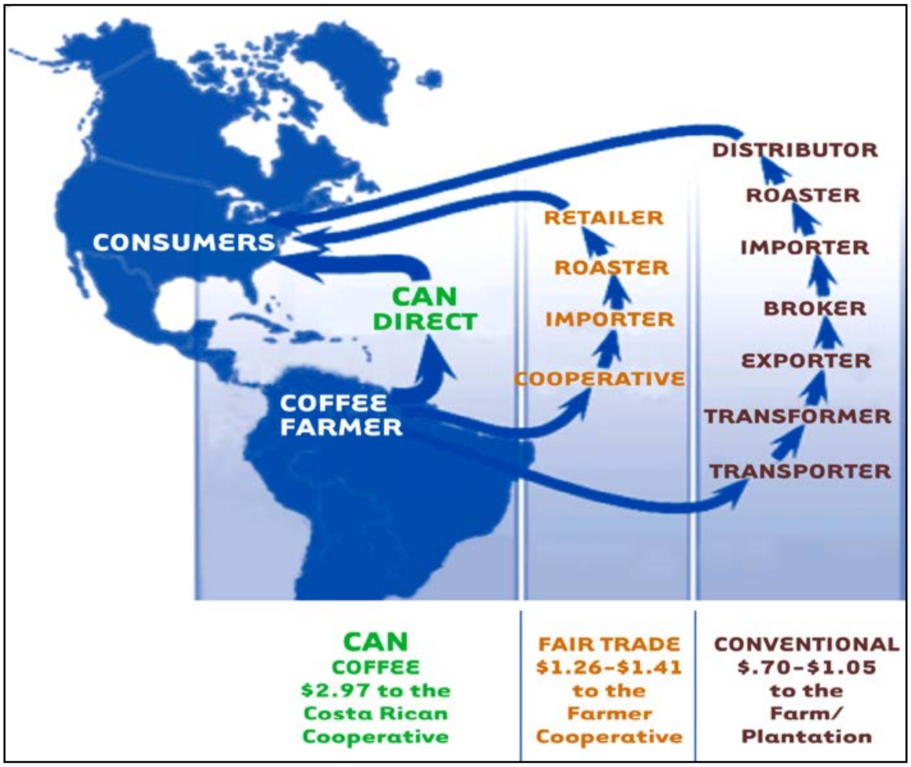

Figure 5.2. The CAN DT, FT and Conventional Commodity Chains. Source: (CAN 2010).

Results

Table 5.2 below contains information on the farm-gate price paid by CB between the years 2000 and 2004. This is compared to one of the two other prominent area marketing networks where Control Group (CG) farm-households could have sold their coffee; the CooproSanVito Producer Cooperative R.L. The CoopeSabalito Producer Cooperative R.L. is the other; however comparative data wasn't attainable for this period. Table 5.2 indicates that although the final farm-gate price paid by CB in the harvests of 2000/2001 and 2001/2002 was only $0.52 and $0.50 respectively, this was $0.10 greater than the final farm-gate price of CooproSanVito in both years, and $0.04 higher than the Costa Rican average farm-gate price paid by all mills for both years. FT only accounted for 25% and 13% of total CB sales in 2000/2001 and 2001/2002 respectfully. During the harvests of 2002/2003 and 2003/2004 the CB farm-gate prices were $0.43 and $0.59 respectively. There was no data available for a comparison with CooproSanVito for these two harvest years but the CB price was $0.09 lower in 2002/2003 and exactly equal to the national average farm-gate price in 2003/2004. FT only accounted for 13% and 20% of total sales for those two consecutive harvests.

As detailed in Chapter 1, CB went bankrupt in May of 2004 and almost immediately following this CoopePueblos R.L. (*Cooperativa Agroecológica y de Servicios Múltiples*) was founded by members of the SG in CB who were motivated by the quantity of direct-market sales made during CB's final year in existence as well as the idea that the benefits would be shared amongst a much smaller membership. Over the five CoopePueblos harvest years studied, 315,968 pounds were sold in all, 66% to certified Fair Trade (FT), 10% through direct-trade and 24% to conventional markets. In five of the seven years that comparative data exists between 2000 and 2009 the SG received higher farm-gate prices than any other competing marketing network in Agua Buena (Tables 5.2 and 5.3). Final farm-gate prices were found to be higher in at least one of the other Agua Buena marketing networks in the last two years under analysis, for both the 2007/2008 and 2008/2009 harvests. In summary, I find that the farm-gate price received by the SG was higher than that paid in other competing local marketing networks in just three of these five years.

Table 5.2. CoopaBuena farm-gate prices and select indicator prices, 2000-2004.

Harvest Year	CB Farm-gate Price (US$/pound) △ *	CooproSanVito Vito (US$/pound) #	National Average (US$/pound) # *	Fair Trade % Total CB Sales △	Exchange Rate Utilized ₡ / $
2000/2001	0.52	+0.10	+ 0.04	25%	323
2001/2002	0.50	+0.10	+ 0.04	13%	336
2002/2003	0.43	~	- 0.09	13%	377
2003/2004	0.59	~	0.00	20%	418

Sources: (ICAFE 2000; ICAFE 2001; ICAFE 2002; ICAFE 2003; ICAFE 2004)
△ Data from Internal CoopaBuena documents
* Assuming 97 pounds of unroasted beans per fanegas

Table 5.3. CoopePueblos farm-gate price and select indicator prices , 2004-2009.

Harvest Year ◆	CP Farm-gate Price (US$/pnd) △	CooproSa nVito (US$/pnd) #	CoopeSaba lito (US$/pnd) #	National Average (US$/pnd) #	Average Production Costs (US$/pnd) △ ♠	Exchang e Rate Utilized ₡ / $
2004 2005	1.07	+ 0.38	+ 0.25	+ 0.22	+ 0.07	468
2005 2006	0.93	+ 0.11	+ 0.02	+ 0.04	+ 0.05	485
2006 2007	1.00	+ 0.11	+ 0.09	+ 0.04	+ 0.18	501
2007 2008	0.97	+ 0.04	**-0.04**	**-0.13**	+ 0.01	484
2008 2009	0.91	+ 0.07	**-0.05**	**-0.17**	**-0.16**	552

Table 5.4. Proportion of total coop sales and estimated coop price received per pound; FT and DT, 2000-2009.

Year	Total CP Sales (pnd) △	Direct Trade (DT) Total Pnds (%) △	FT Total Pnds (%) △	DT to CP by CAN (US$/pnd) +++	DT Net Profit Pnd to CP (US$) **	FT to CP by CooCafe (US$ /pnd) +++	FT Net Profit Pound to CP (US$) **	DT Net Profits (US$)	FT Net Profits (US$)
2004 2005	7,869	5203 (66%)	0% (0)	8.15	2.97	N/A	N/A	15,453	N/A
2005 2006	14,509	5375 (37%)	0% (0)	6.63	1.59	N/A	N/A	8,546	N/A
2006 2007	76,500	4214 (6%)	31,574 (41%)	7.70	1.00	1.18	0.18	4,214	5,683
2007 2008	113,000	6443 (6%)	95,460 (84%)	7.23	0.97	0.73	-0.24	6,250	-22,910
2008 2009	103,700	11,591 (11%)	80,000 (77%)	5.10	0.09	1.28	0.37	1,043	29,600

♠ Sources: (CICAFE 2005; CICAFE 2006; CICAFE 2007; CICAFE 2008; CICAFE 2009)
Sources: (ICAFE 2005; ICAFE 2006; ICAFE 2007; ICAFE 2008; ICAFE 2009)
△ Sources: (CoopePueblos 2005; CoopePueblos 2006; CoopePueblos 2007; CoopePueblos 2008; CoopePueblos 2009)
◆ All US$/pound weight measurements are converted from fanegas. A fanega is equal to 400 liters of ripe coffee berries, and when processed yields an assumed 101.4 pounds of unroasted coffee beans per fanega.
** Equal to DT or FT average price minus variable costs of DT or FT
+++ CAN and CoopePueblos Budgets and Annual Reports

Table 5.5. Per pound average variable costs of CoopePueblos direct-market, 2005-2009. Source: (Elaborated from Biddle 2006)

Table 5.6. CoopePueblos average monthly and annual fixed costs, 2005-2009. Source: (Elaborated from Biddle 2006)

5.5 Item	Dollars
Washing, processing and transportation	$0.17
Roasting	0.23
Bags	0.38
Labels	0.22
Shipping	3.11
Sub-Total	**$4.11**

5.6 Item	Dollars
Salaries	$939.81
Social Security	106.8
Transport	87.38
Electricity	48.54
Rent	38.83
Telephone	29.13
Office Supplies	29.13
Water	19.42
Other	97.09
Total Monthly	$1,396.13
Total Annual	**$16,753.56**

Table 5.3 indicates that in the harvest of 2004/2005 the CP farm-gate price of $1.07 was $0.38 greater than CooproSanVito farm-gate price, $0.25 higher than the CoopeSabalito farm-gate price, $0.22 greater than the national average farm-gate price, and $0.07 greater than average production costs for that harvest year. This strongly confirms the motivation for SG farmers to stay in coffee production if they sold to CP versus the other networks during this first harvest year. If they had sold to the other two markets the price received would have been far below average production costs and the higher the probability that this would have encouraged abandonment of coffee, class differentiation and the abandonment of farm-based livelihoods.

This price premium received by the SG from CP was severely eroded in the next two harvests; 2005/2006 and 2006/2007. However, the price offered by CP was still higher than the two other competing local mills and was also higher than both the national average farm-gate price as well as the national average costs of production. The 2007/2008 CP farm-gate price was $0.97 per pound, falling $0.04 below CoopeSabalito farm-gate price and $0.13 below the national average farm-gate price. However, the CP farm-gate price still remained above the CooproSanVito farm-gate price (by $0.04) and just above average national production costs (by $0.01). By the 2008-2009 harvest the CP farm-gate price of $0.91 reflected a lower value than that obtained in three of the four comparison markets including $0.05 below CoopeSabalito farm-gate price, $0.17 below the national farm-gate average, $0.16

below average production costs, and only higher than CooproSanVito farm-gate price, this time by $0.07. In all four of these comparison markets CP demonstrated much higher farm-gate prices in 2004/2005. What happened between CP's inaugural harvest of 2004/2005 and the 2008/2009 harvest? The answer is that two principal components had changed, the proportion of total sales derived from FT and DT as well as the net profit per-pound received by the cooperative from each of these markets. These components are compared in Table 5.4.

In Table 5.4 the average net price per pound profit was calculated by subtracting the average per pound variable costs of the DT market from the average per pound sent to CP by CAN for the DT market that year. The average variable costs per pound between 2005 and 2009 is calculated for each year by adding the sub-total found in Table 5.5 of $4.11 per pound with the final farm-gate price paid by CP for each year found in Table 5.3. This unique variable cost for each year is then subtracted from the average per pound sent to CP for the DT market that year, which is found in the column to the left of the net price per pound profit received from the DT market. The FT net price per pound profit received by CP is calculated in the same way except the per pound variable costs are just equal to the farm-gate price per pound paid by CP found in Table 5.3. This is subtracted from the average FT price per pound sent to CP by CooCafe. Finally, the annual net total profits derived from both the DT and FT markets was calculated by multiplying the net per pound profit of each market in each year by the number of pounds total sold to that market for a given year.

Table 5.4 reveals that the proportion of total CP coffee sales filled by the direct-trade (DT) program was 66% for the harvest of 2005/2005; the highest proportion of DT sales to total CP sales by far during the five years studied. The average net price per pound profit that CP received as well as the net annual total profit from the DT market was also highest that year at $2.97 per pound net profit and $15,453 total net profit. However, in every subsequent year the profitability of this market declined so that by the 2008/ 2009 harvests a record low, but still positive annual net total profit of $1,043 was registered from the DT market, even though sales volumes to the DT were their highest in the entire period under study.

FT sales were first registered during the 2006/2007 harvest; in that year they comprised 41% of total CP sales with a volume of 31,574 pounds (Table 5.4). During the subsequent harvest of 2007/2008 they comprised a record high 84% of all CP sales through the sale of 95,460 pounds to CooCafe. However, CP went into debt $22,910 as a result of the FT market during the 2007/2008 harvest year. This was due to the fact that CoopePueblos paid $0.97 a pound to their members, even though their sales to CooCafe, which formed the majority of their total sales that year, only netted $0.73 a pound.

This data sparks a set of questions that serve to guide the discussion section that follows; Why did the DT market's profitability collapse so quickly following the harvest of 2004/2005? Also, why was the FT price for the harvest of 2007/2008 so low and why did this translate into a loss of so much money for CP? Finally where did the substantial DT profits earned in the 2004/ 2005 through 2007/ 2008 harvests go to and similarly, what was the destination for the $29,600 in profits earned from the 2008/2009 FT harvest?

Discussion

The first inquiry mentioned above seeks to understand why the DT market's profitability collapsed so rapidly and steadily in the harvest years subsequent to 2004/2005. The answer is found in the average price per pound that CP received from the DT market, which peaked at $8.15 per pound for the 2004/2005 harvest and bottomed out at $5.10 a pound for the final 2008/2009 harvest (Table 5.4). The shifting pay-structure of the DT market resulted from the type of clientele responsible for the majority of the market's growth between the harvests of 2004/2005 and 2008/2009. During the 2004/2005 harvest the DT market was comprised almost exclusively of direct-to-consumer sales from which the coop earned $8.50 per pound for that year's harvest. However, inconsistencies in the processing, roasting, packaging, and mailing of the product led to a relatively high number of cancelled subscriptions starting after 2004. In order to grow the market, CAN and CoopePueblos decided to pursue the bigger volumes and smaller margins earned from direct to institutional sales. These institutional sales are characterized by the direct mailing of coffee to universities and corporate cafeterias; the first of which was at UC Santa Cruz, which in 2004 began purchasing 50% of the universities total annual coffee utilized in the campus's coffee carts and dining halls directly from CP as well as from the cooperatives located in CAN partner communities in Nicaragua and El Salvador (Jaffe, Sampson et al. 2008). This campus conversion was due to the hard work of CAN affiliated student-activists pushing for the conversion first to FT, and then to DT sourced coffee. This conversion was well-timed, dovetailing efforts of a broader campus campaign that led to UC Santa Cruz "dumping" Sodexho as their food provider of more than thirty years. By 2008/2009 the majority of the 11,591 pounds sold through the direct market were classified as institutional accounts such as UCSC. But profit margins on these accounts varied from just covering Costa Rican average farm-gate prices to plus $1.50 per pound above Costa Rican average price in these institutional accounts. This had the effect of reducing the DT market net profitability from the $2.97 netted in 2004/2005 to $0.09 a pound for the 2008/2009 harvest.

I will now detail the reasons why the 2007/2008 FT price received by CP was so low ($0.73), as well as how this translated into $22,910 in losses for CP. First off, due to intensifying competition amongst area mills, the CP management found it prudent to offer a $0.97 first payment to members for the 2007/2008 harvest in order to ensure that mill volume levels reached the targets needed for profitable operation. However a series of mishaps and misplaced assumptions made this initial price an overly optimistic and ultimately irresponsible and egregious miscalculation. Chief among these was a 30% overestimation of the final total volume processed at the CP mill, about 13% of which was due to unusually high numbers of underdeveloped and undeveloped bean formations brought out by neglected coffee plants (CoopePueblos 2009). This overestimation meant that the amount of coffee processed and sold by CP was much less than that needed to pay for the financing solicited from CooCafe. Capital investment needs in the mill as well as inefficiencies in the mill's operation led to very high processing costs, which also swallowed large parts of the surplus credit allocated by CooCafe. This was combined with a quality control issue that left a large proportion of the harvest slightly water-damaged (much like the CoopaBuena harvest of 2003/2004), leading CooCafe to revise and reduce their offering price for this damaged portion of the 2007/2008 harvest. This confluence of factors left CP with a price per-pound from FT coffee sales to CooCafe that averaged $0.73, well below even their initial member farm-gate payment of $0.97.

All of this resulted in a $23,000 debt to CooCafe, which was financed at a 16% annual interest rate with the mill's machinery as well as the properties of the CP board of directors serving as collateral. This then began a cycle of debt service payments which further handicapped the CP's ability to provide competitive farm-gate prices for the 2008/2009 harvest. Usurious interest rates are at the center of CooCafe's business model. In 2008, CooCafe earned over half of their total profits from financial services offered to the nine first-level cooperatives that had grown dependent upon this so-called FT institution as a credit provider of first and last resort[45] (COOCAFE 2009). This dependence was exacerbated by the disappearance of financing aimed at smallholders that became the norm following the privatization of the formerly nationalized banking sector during the structural adjustments of the early 1990's (See chapter 3 for more details). In 2008, CooCafe earned a total of $175,000 in profits from the predatory brokering of just $170,000 in cheaply acquired international credit, a more than 100% rate of profit that is by far the highest rate earned in any COOCAFE activity (COOCAFE 2009).

Despite CooCafe's usurious practices, FT markets were effective at generating profits for CP in the years studied, as a balance of almost $48,000 in profits was generated during these five harvests. However, the substantial profits earned by the DT market for each harvest from 2004/ 2005 through 2007/ 2008 as well by the FT market during the 2008/2009 harvest were not used by the management of CP to pay for higher farm-gate prices to SG farm-households in the year the profits were recorded. Over $35,000 in profits that were the result of DT market sales were never redistributed to CP member farm-households. This is because:

El mercado directo es…para pagar los costos del venta asociados y para financiar los costos administrativos producto de la operación de la cooperative (The direct market exists…in order to pay for the sales costs and in order to finance the administrative costs of the cooperative)
(CoopePueblos 2009; p. 11).

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[45] This was clearly identified in the legally mandated annual external audits performed on CooCafe's finances which I obtained from CP.

Figure 5.3. Photo from the 26th general assembly of CooCafe, 2009.
Source: (Author May 2009)

By the year 2009 the cooperative administration was completely forthright about the fact that the profit from DT sales was then and always had been used to cover the fixed month to month operating costs of the cooperative. In Table 5.6 above the average monthly fixed operating costs of CP such as salaries, rent and utilities have been calculated and also extrapolated out to calculate annual fixed operating costs of almost 17 thousand dollars a year. This means that if all profits derived from the DT market were applied exclusively to the fixed costs detailed in Table 5.6 they would cover a little less than half of them. While perhaps not as satisfying as the knowledge that they were being dedicated to directly improving SG incomes, this premium played a crucial role as a subsidy for the benefit of the organization. The then current manger and entire board of directors admitted that without this subsidy CP would have gone bankrupt almost as soon as it was founded due to a lack in the economies of scale especially important in the agroindustrial processing sector of Costa Rican coffee. Thus much of the profit from DT sales were utilized to subsidize a cooperative that very-well might have folded otherwise due to these inefficiencies.

Unfortunately the exceptional $29,600 in profits earned by the FT market in the harvest year of 2008/2009 has been thrown under a long shadow of suspicion. In March of 2008 Alexis, the CP accountant and cousin to both the hired manager and elected secretary on the board of directors of CP, who as the CP accountant had full insider knowledge that the cooperative's board was seeking to purchase property where they could permanently install the processing mill machinery, made the following offer: Alexis would purchase 0.4 hectares of land for $20,000 which he had personally identified and suggested to the board as a prime candidate for the mill's location, and then immediately handed it over to the cooperative for their permanent use. CP paid would pay nothing in March of 2008 when the offer was agreed to by the CP board of directors, but one year later the first payment of $20,000 was then due to Alexis. Then, a final payment on which Alexis earned his profit was flexibly set for between one and two years later. At the minimum length of one year, the final payment and Alexis's profit stood at a staggering $22,000, increasing to $26,000 after two years. See Appendix 3 for supporting documentation- excerpts from CP board of director meeting minutes as well as CP watchdog committee meeting minutes.

Conclusions

The dissertation goal for this chapter was to connect these experiences with alternative markets with farm-household resistances to class differentiation and land-use change (LUC) out of coffee. Possible reasons for these resistances were hypothesized in chapter 4 and were also restated at the beginning of this chapter. After incorporating the findings from this chapter I can now express this hypothesis through the following inquiry; How did SG coffee farmers persist so much more in coffee land-uses and the peasant commodity producer class without receiving a substantial premium in any year but the first year of CP's existence? This is perhaps even more of a mystery if we recall from chapter 4 that 82% of year 2000 SG farm-household coffee land-use was still persistent in coffee in the year 2009 and only 24% of CG farm-household coffee land-use persisted as coffee over this same time period, whereas 48% of SG farm-households persisted as peasant commodity producers while only 30% of the CG persisted. I close the chapter with a couple of ideas regarding this phenomenon.

I find instrumental the SG's affiliation with the direct-marketing network organized by CAN. Coffee sales to the direct market were the main motivation behind the establishment of CoopePueblos immediately following the bankruptcy of

CoopaBuena in 2004. As I have shown, the earnings from this market were utilized almost exclusively to pay for Coopepueblos's fixed monthly costs. While the direct market accounted for just 10% of total CP sales (32,826 pounds) between 2004 and 2009 and had little impact on farm-gate prices in all years subsequent to 2004/2005, the frequent visits made by board-members, staff and interns of CAN fostered genuine hope that sales would increase to a level where they could do more than merely subsidize the salaries and operations of the infant cooperative, and begin to strongly influence yearly farm-gate prices.

The combination of the direct market's potential for future impacts and it's year in, year out, actual impacts were thus probably a part of the SG's post 2002 persistence in family labor reliant coffee production (relative to the CG), even in the face of extremely low international coffee prices and the 2004 collapse of Agua Buena's main producer organization and only coffee processor CoopaBuena. It is helpful to consider that farm-household persistence in coffee was only critical through the 2007/2008 harvests, after which the international coffee commodity price finally rose well enough above average local production costs.

In conclusion, it is important that that we not lose sight of the fact that this decay in profitability meant that by the 2008/2009 harvest, the CoopePueblos farm-gate price return was more than fifteen dollars less than the national average coffee production costs per fanega. As smallholder farm-household coffee production rarely eclipses forty fanegas and is often the only source of cash income, it serves as a poignant reminder of the vulnerability present in any cash-cropping production system. One of the most sustainable ways to reduce this vulnerability, as well as to explain SG persistence in coffee when farm-gate prices didn't differ substantially between the groups, is through the agroecological transformation of production, especially when this transformation is accompanied by a reduced need for formerly purchased external inputs, as well as a heightened ability to provide necessary food, fiber and stimulation for the farm- households managing them. The following, final chapter of this dissertation confirms that these mechanisms do in fact explain the comparative persistence of the SG's peasant family-farmers through the years of coffee crisis evaluated in this dissertation.

Chapter 6.
Agroecosystem Resistance and Resilience Following Economic Crisis: Coffee Homegardens and Intercropping in Southern Costa Rica

Introduction

The "green revolution" technologies consisted of a package of high yielding seeds, chemical fertilizers and pesticides applied to monoculture arrangements of grain crops. While in the short term yields for most crops increased, this was accompanied by a deterioration of the natural ecological processes necessary for sustainable production as well as forced reliance on expensive external inputs. It is a prime example of the concept of appropriationism, defined by Goodman, Sorj and Wilkinson as the "undermining of discrete elements of the agricultural process, their transformation into industrial activities, and their re-incorporation into agriculture as inputs" (1987; p. 2).

Similar to the green revolution of grain crops, the biophysical processes that formed the basis of the coffee agroecosystem in Costa Rica underwent significant transformations at the hands of the U.S. Agency for International Development (USAID). In the late 1970's, USAID began a program that involved technology transfer to small coffee growers throughout Central America. The technology included heavy inputs of chemical fertilizers, herbicides, nematocides and fungicides (Rice and Ward 1996). Throughout the coffee technification period, more than $80 million was directed to small coffee farmers in Meso and Central America with the majority managed through the Costa Rican *Programa de Mejoramiento del Café*, or PROMECAFE (Rice and Ward 1996). The use of these heavily subsidized, U.S. manufactured chemical inputs increased rapidly with the promise of boosted yields and by 1985 yields reached 42 fanegas per hectare in Costa Rica, the highest in the world (Romero 2006). Along with the high yields came the likelihood of increased vulnerability to both agrochemical and coffee commodity prices. In July of 1989 this likelihood was tested as the International Coffee Agreement (ICA) collapsed and ushered in a new era of coffee price volatility.

After the ICA's dissolution and following ten years of price volatility, year 2000 prices fell to their lowest real amounts in over one hundred years (Ponte 2002). The average Costa Rican farm-gate price was $0.48 in the year 2000, dropping to an all time low of $0.46 in 2001 before increasing slightly to $0.53 in 2002, $0.61 in 2003, $0.85 in 2004 and $0.89 in 2005 (ICAFE 2010). This translated to an average loss of over $1100 per hectare for Costa Rican farmers employing the technified management during the 2001 harvest (Varangis, Siegel et al. 2003). As indicated in Figure 6.1, just as coffee commodity prices began to rebound in 2005, fertilizer prices jumped to 4.5 times higher than 2000 prices. This price squeeze caused the number of coffee producers to drop 35% between 2000 and 2009 in Costa Rica, from 73,707 to 48,256 (ICAFE 2010). With coffee volumes also declining over 30% between 1999 and 2008, Costa Rica had earned the dubious honor of being the hardest hit Latin American nation by the coffee crisis if measured in terms of the proportion of total production and producers lost (ICO 2011). While coffee landscapes and livelihoods within Costa Rica have been hit hard by this coffee "crisis" of low farm-gate prices, the coffee sector of Agua Buena was hit especially hard. At the time the coffee crisis hit, Agua Buena itself was completely dominated by open-sun or monoculture shaded production systems that could produce high-yields but were heavily dependent on external-inputs.

The high amount of precipitation throughout the district makes agriculture, including coffee, difficult to pursue without the use of some sort of fungal control. It also limits the use of agroforested systems that employ closed canopies as the humidity reaches levels optimal for the outbreak of several fungal pathogens that can severely reduce coffee yields. Agua Buena has an equatorial climate and variation in temperature over the course of a year is slight. It is distinguished by two seasons, dry and wet, but the dry season is often interrupted by rain. The distinct dry season is from December to March. The high levels of rainfall and humidity contribute to the practice of completely pruning the shade layer back to a stump two meters off of the ground several times a year. This type of pruning often favors increased system humidity as the grow-back is almost always in close vicinity to the coffee plants due to the low height of the stump it is pruned back to. This style of pruning also greatly limits the varieties of shade-trees available for use as the "backbone" species to those few that can tolerate drastic and frequent pruning such as *Erythrina* and *Inga spp.* This complex of interrelated soil deficiencies, fungal diseases, pruning regimes and agrochemical usages has had a significant impact on the biodiversity, nutrient cycling, energy flow and overall sustainability of Agua Buena coffee agroforestry system.

The system also required large amounts of labor for the hand picked harvest and was an expensive necessity even on the smallholder plots which characterized the majority of Agua Buena production. When coffee prices collapsed, the rhythm of labor and harvest was disrupted and the hiring of workers, both local and migrant, that had been an essential part of the harvest in this high-yielding, intensive monoculture of coffee was no longer economically feasible. The first two harvest-years following the price collapse, 2000 and 2001 saw many in Agua Buena remove their coffee.

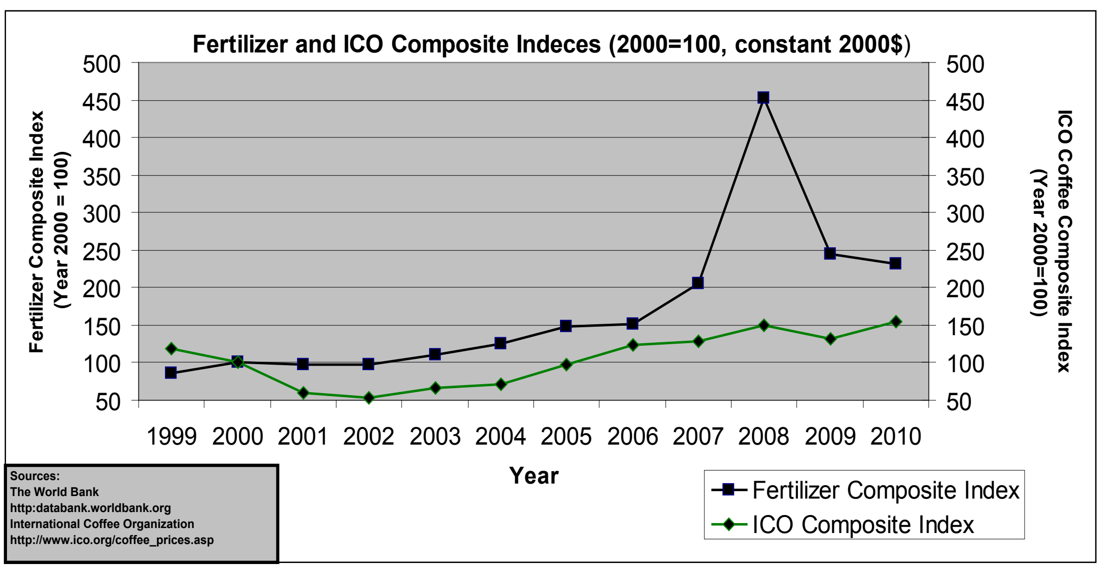

Figure 6.1. Fertilizer and ICO composite indices, year 2000 = 100 in constant 2000$. Sources: (WB 2011) and (ICO 2011).

The common adaptations that served smallholders in many other parts of Central America, external-input reduction, diversified production, as well as the earning of price premiums from alternative marketing networks like Fair Trade, did not easily or widely emerge from the types of specialized commodity production and intensive monoculture systems that characterized Agua Buena before the coffee crisis. However, the following excerpt from the March 17, 2001 *CoopaBuena Asamblea General Ordinaria de Asociados* (CoopaBuena's Annual Cooperative Membership Meeting) foreshadows the character of a then nascent resistance strategy while also conveying the extent to which Agua Buena livelihoods would be forever altered by the price crisis.

> *It is necessary to focus in on the problematic issues that characterize coffee production in Agua Buena and develop consciousness of the reasons for the crisis we are living through. With the resources we have, we must become dedicated to alternative ways of making a living off of our parcels. One strategy among the alternatives that we have considered stands out; that we should grow much more of our food crops. That is why the cooperative has requested training from INA[46], CNP[47] and MAG[48] with the idea of finding a solution to coffee production…with the goal of encountering a diversification alternative for the district…we now have confirmed by INA various trainings and courses to support the farmers of this cooperative and god willing, to establish organic agriculture.*
> (General Manager's Report, 2001 Annual Meeting of CoopaBuena)

This statement is extraordinary coming from the General Manager, a man whose job as head of operations at a large (700+) member cooperative coffee mill, was to

[46] *El Instituto Nacional de Aprendizaje (*The Institute for Adult Training*)*

[47] *Consejo Nacional de Produccion* (The National Agricultural Production Board)

[48] *El Ministerio de Agricultura y Ganadería*, (The Ministry of Agriculture and Cattle Ranching)

process as much coffee as cheaply, safely and legally as possible. It reveals that not only was the conventional form of coffee production increasingly unviable but so too was the conventional form of processing and marketing it. True to his word that same year courses from INA began, and by the end of the year had inspired the official formation of the Sustainable Group (SG), a 61 member farmers association within the CoopaBuena cooperative that adopted practices of sustainable agriculture which became their most important resistance strategy guaranteeing livelihood and land-use persistence and resilience in uncertain economic times. It was during these darkest days of the coffee price crisis, which was for Costa Rican producers the worst ever seen in terms of the final prices paid out by producer cooperatives and private wet processing mills alike, that the SG joined a program launched by the MAG that would turn out to be a critically important and very well timed. The program provided structure, leadership and resources to guide the transition to sustainable coffee agriculture and exemplifies the Costa Rican government's crucial role in instigating the transition process. The importance of this particular program and the Costa Rican state more generally was well documented in a 2005 case study of the SG (Garcia 2005). The following borrows from this work as well as a collaborative project that the author and I worked on shortly after (Garcia and Babin 2006).

The MAG program was called *Caficultura Sostenible en Pequenas Fincas* (Sustainable Coffee Production in Small Farms), and the model was simple and effective, featuring outreach, extension and the provision of needed materials to organized producer groups in order to promote sustainable agricultural practices. This included financial support, technical advisors, farm-extension as well as a set of certification standards and trained certifiers. The standards were based on policies of the United Nation's Food and Agriculture Organization, the Smithsonian Institute, and the International Coffee Organization. The certification program was legally established by MAG via a 2002 congressionally approved law and government decree (Obando Jimenez 2004). As an organized producer group within the 700+ member CoopaBuena, the 61 members of the sustainable group voluntary signed agreements committing themselves to the MAG's Café Sostenible program and the transformation of their coffee agroecosystems such that by 2004 they would be found in fulfillment with the following five core principles:

1) Maintenance of between thirty and fifty percent shade level.

2) Erosion control and soil conservation measures established throughout the farm.

3) A minimum of 10 different species of shade-tree per hectare of coffee.

4) The protection of natural water sources.

5) An at least fifty percent reduction of chemical fertilizer use.

(MAG 2002)

Starting in 2004 annual inspections were conducted in a random sample of five of the group's members. If all five passed the inspection then the group received Café Sostenible Certification, with the Costa Rican government acting as certifier. While all necessary material and certification costs would be covered by MAG, the potential of increased revenue from this "sustainable" market was initially unclear and never directly led to any contracts or price premiums for the SG or CoopePueblos. The farmers themselves perceived this but realized that the potential to earn a sustainable certification for their coffee was much less important then the acquisition of new management strategies that would enable them to continue production and reduce or eliminate purchased inputs. Immediately following their written commitment, MAG organizers began an eleven-day orientation course outlining the above main principles of the program and creating action plans with each farmer. This was followed by a two-year suite of courses; in 2003 and then again in 2004 a three-week organic vegetable production course was facilitated by MAG instructors. This was followed by a 15-day farm-accounting class given by INA, which also offered a two-week *Buenas Praticas Agricolas* (Best Agricultural Practices) course in 2004. Also in 2004, MAG offered two different 15-day organic compost courses along with an agroforestry design, shade management and soil conservation module. While the sub-segment briefly mentioned here comprised less than half of the full array of courses offered by INA and MAG between the years of 2001 and 2008, by 2005 the group had already achieved two major accomplishments that contributed to their persistence in coffee following the price crisis. One was the certification of every member of the SG following the first successful audit by MAG. The other was the rapid and ambitious formation of an entirely new cooperative committed to agroecological principles, CoopePueblos, following the collapse of CoopaBuena.

The fieldwork undertaken during the course of this chapter's research also grew out of the *Caficultura Sostenible en Pequenas Fincas* program as the SG and CAN both expressed a need for more information about where member's farm stood along what was believed by both organizations to be a fairly broad continuum representing different levels of commitment to the new sustainable agricultural practices. However, because of the somewhat lax sampling methodology utilized in the certification process and the relatively limited and narrow set of indicators measured, CAN lacked hard data on whether the SG's coffee truly was in transition, which became problematic given that the coffee was promoted as such. Equally as lacking was the management of Coopepueblos's knowledge about the strengths, vulnerabilities and needs of their membership. This study was designed in order to fill these information gaps. The results contributed to the development of a database from which CAN and the cooperative designed and implemented additional outreach and support campaigns to those farmers in need.

This chapter showcases those farm-households, mostly from the SG but also from the CG, that have remained agrarian-based in their livelihood strategies and agroecological in their agricultural management strategies. The following section provides the conceptual and analytical frameworks used to understand and evaluate change processes in SG and CG production strategies and agroecosystems, which is then followed by a detailed description of the specific research design and methodologies employed in this chapter's research. After the subsequent presentation and discussion of the investigation's key findings I conclude with some thoughts regarding their relevancy in explaining how coffee producing peasantries have been able to persist through the coffee crisis in Costa Rica as well as within the world at large.

Conceptual Framework

The interdisciplinary field of agroecology has emerged as the principle scientific approach to understanding, evaluating and promoting sustainable agriculture. Agroecology applies ecological concepts and principals to the design and management of sustainable food systems (Gliessman 2007). An agroecologist views an agricultural field as a managed ecosystem, and applies some of the same concepts that ecologists use to understand natural ecosystems, such as resistance and resilience in agroecosystem analysis (Holt-Gimenez 2002; Gliessman 2007). Agroecological resistance and resilience are different but related concepts that have been used to understand how agroecosystems respond to disturbances and to evaluate the sustainability of particular management practices (Holt-Gimenez 2002). Agroecological resistance is a static measure of the ease or difficulty of changing an agroecosystem out of its latent state while agroecological resilience is a more dynamic measure that evaluates the capacity of an agroecosystem to withstand a disturbance and reorganize while still retaining similar structures and functions

(Holling 1973)[49]. Systems exhibiting low levels of resistance change a great deal due to small disturbances. Some empirical data from ecological studies suggests an inverse relationship between resistance and resilience (Herbert, Fownes et al. 1999). On an evolutionary level it seems to make sense; the more resistant to change a system is, the less resilient the system will have evolved to be if we think of the concepts as substitutable. The opposite often holds as well; the more resilient the system is the more capable it is of accepting and absorbing change, hence the system has evolved towards lower resistance and bigger disturbances. Building-in resistance and resilience to agroecosystems promotes the long-term sustainability, or persistence of the system, which is the overarching goal of agroecological management (Gliessman 2007).

Conceptually, resistance is much more easily operationalized and measured than resilience because it can be assessed through a single examination of the magnitude of change inflicted upon key indicators of sustainability or persistence following a disturbance event (Holt-Gimenez 2002). A principal task for agroecology has been to identify both direct and proxy measures for these properties, so that once assessed, such measures can be used to transcend mere system characterization and become a useful tool in the design and evaluation of agroecosystems that are resilient and resistant to shocks and stressors (Holt-Gimenez 2002; Gliessman 2007).

[49] Implicit in this definition is the idea that in the process of absorbing disturbances, the system will undergo small changes but will have the capacity to reorganize. Resilience is thus related to a dynamic interpretation of stability.

Natural disasters such as hurricanes give the agroecologist a natural experiment to appraise the effectiveness of particular agroecological management practices on overall agroecosystem persistence (Holt-Gimenez 2002). While research has shown that agroecological practices, including diversification, bolster the resistance of farms to natural disasters, little research has evaluated the role of agroecological diversification in building resistance to economic disturbances such as the recent supply chain restructuring in coffee (Méndez 2007). Thus, an overarching goal of this research is to identify the emergent qualities within coffee agroforestry systems that confer stability and persistence onto coffee land-uses and peasant forms of household production in the face of severe economic system shocks.

The persistence in coffee and resistance to class differentiation of the SG documented in Chapter 4 led to the formulation of two hypotheses explaining these drastically different experiences. This chapter tests one of these hypotheses, that <u>the agrobiological and structural diversification of SG coffee agroecosystems led to the emergence of structures and functions that maintained production while heavily reducing or eliminating costly external inputs and providing crucial subsistence food.</u>

Thus the level of class differentiation and land-use change out of coffee in the CG and SG farm-households serves as an indicator of the comparative resistance of SG farm-households to the economic shock of the multi-year coffee-crisis. Identifying the agroecological basis for this resistance is the goal of this chapter. While the relationship between resistance and resilience is not consistent across ecosystems, diversity has been identified as a key factor in their configurations (Herbert, Fownes et al. 1999). The exploration and comparison of many different forms of agroecosystem diversity is thus the primary methodological approach utilized in this research and is primarily focused on identifying how overall system agrobiodiversity, defined by Brookfield as the assemblage of plants, animals and how they are organized in time and space, has allowed resistant agroecosystems to remain stable while also allowing resilient agroecosystems to reorganize and adapt (Brookfield 2001). However the great variety of farm-households management regimes, market conditions and available stock of plant and animal agrobiodiversity requires the narrowing of focus to what <u>types</u> of diversity yield what <u>kind</u> of stability (Barlett 1982; Altieri and Hecht 1990; Netting 1993; Brookfield 2001; Nair 2001; Perreault 2005). The stability evaluated in this case study is best expressed by the concept of sustainability, especially in the context of agroecosystem analysis. The diversity based sustainability indicators used in this chapter included the measurement of tree and crop species richness, evenness and overall diversity. This will be complimented by documentation of the level of native biodiversity conserved in these agroforestry systems, as well as the different functional and structural components found within these systems.

Research design

The sampling frame utilized in this chapter's investigation was derived from the sample drawn in Chapter 4's comparative case study of class differentiation and land-use change out of coffee. This is thus the second stage of a two-staged sampling methodology. The sampling frame used in Chapter 4 consisted of the year 2000 CoopaBuena Cooperative database containing every Agua Buena producer who processed coffee in that year. Following the elimination from the database of all producers not located within the geographic confines of the district of Agua Buena, the resulting sampling population consisted of 1903 household heads. As mentioned in Chapter 4, the 2000 Costa Rican National Census recorded 1702 occupied households in the district of Agua Buena. This suggests that the sampling frame utilized was a highly accurate representation of the year 2000 population Disproportionate stratified random sampling was utilized in Chapter 4, based on the key independent variable of farm-household membership in the Sustainable Group of farmers. It resulted in the following two stratums:

Stratum 1: Sustainable Group (n=50): A randomized sample of 50 of the 61 SG farm-households contained in the CoopaBuena 2000 register. None denied participation.

Stratum 2: Control Group (n=54): 81 farm-households were randomly sampled from the unbiased 1841 remaining in the database. 27 of these 81 (35%) had moved out of the district between 2000 and 2009. All of the remaining 54 participated in the research. This sample size is consistent with a 95% confidence level and a (+ or -) 11% margin of error (confidence interval)[50]. For the purposes of this chapter's investigation, the following two stratums were drawn from the first sample drawn during this first stage.

Stratum 1: Sustainable Group (n=32) A random sample of 32 of the 50 Sustainable Group farm-households sampled during the first stage. All continued to produce coffee and each agreed to participation in the study.

Stratum 2: Control Group (n=40) Of the 54 farm-households that remained in the district out of 81 sampled during stage one of the sampling process, 40 farm-households (74%) continued to produce coffee in 2009. Each agreed to participate in the study.

The agroecosystem inventory conducted within each sampled farm-household had a posttest-only control group design with random assignment (Campbell and Stanley 1963 pg. 27). Agroecosystems were post-tested in 2009 for observed differences between the Sustainable and Control Groups that are assumed to have been the result of participation in the SG's transition to agroecological management, which began in the year 2001. These differences will then be assessed for their contribution to the

[50] My choice of 11% versus 5% confidence interval reflects resource and time constraints as well as the fact that the extensive 8 year experience I have working in the community and the cooperatives will help me interpret the results of a smaller sample than a 5% confidence interval would yield.

relative persistence of the SG (82% of land in coffee remaining between the years of 2000-2008) compared with other coffee farmers in Agua Buena (24% of area remaining). I recognize that there are threats to validity in a design like this because there is no way to determine whether these were comparable groups in the year 2000 (INEC 2000). However, based upon the results of Chapter 4, I am confident that the randomization employed during the sampling process was sufficient enough to guarantee sample independence and the added leverage gained in my analysis justifies this choice in design.

The survey utilized in Chapter 4's investigation revealed that the year 2000 average household head age was 43.4 years old in the CG and 40.7 in the SG, while average household size was 3.7 persons in the CG and 4.1 in the SG, with neither of these differences deemed statistically significantly different following an unpaired T-test. The 2000 Costa Rican National Census reported an average of 4.0 persons per household in the district of Agua Buena, which is very similar to the survey's year 2000 average household size within each group (INEC 2001). Likewise, the 35% farm-household emigration rate recorded in the survey for the CG between 2000 and 2009 is also remarkably similar to the 34% loss in total population recorded by the Costa Rica Census Bureau within Agua Buena between 1998 and 2010 (INEC 1998 ; INEC 2000; INEC 2011; INEC 2011). The survey also found that in the year 2000 the average farm size was 2.8 hectares in the CG and 3.7 hectares in the SG, which although somewhat different in overall magnitude, were not found to be statistically significantly different. Also, every farm within both groups was a member of the CoopaBuena coffee cooperative in the year 2000, where they sold all of their production. Based on the amount of coffee each farm sold to the cooperative in the year 2000, their average yields were 32.5 fanegas a hectare in the SG and 34 fanegas a hectare in the CG. This level of comparable production indicates a similar technified coffee management regime. This, combined with the overwhelming predominance in the year 2000 of shaded monoculture and open sun systems among the farmers of the cooperative, makes the results of this research's post-test only sampling and research design, if significant, very likely attributable to the SG's program of transition that began in 2001, and not to any sampling biases.

Methodology

The agroecosystem inventory took place between March and June 2009. A 1000 meter² plot was randomly established in the area determined most representative of the shade management of the whole coffee parcel in each individual farm (Kleinn and Morales). The center point of the plot was recorded with a Garmin GPS unit, along with the altitude of the plot. All trees with a diameter at breast height (DBH) of over 5 cm were included in the study. Voucher specimens were obtained of unidentifiable specimens. Identification of genus and species were recorded as well as the height and DBH of each individual. The number of diverse vertical strata formed by the shade-layer was also recorded. All food crops located within the quadrants were identified and counted. Average coffee planting density was obtained by counting individual coffee plants in a 50 meter² subsample plot. Slope and percent shade were measured at 4 randomly chosen points in the quadrant and averaged. The horizontal arrangement of the tree and crop species were sketched and soil conservation works such as contour planting, terracing and drainage canals were noted. See Appendix 2 for the agroecological inventory instrument used to record this data.

Agrobiodiversity results and discussion

Table 6.1. Summary of key agrobiodiversity results.

Variable	Sustainable Group (n=32)	Control Group (n=40)	p-value*
Number Of 1000m2 Quadrants	32	40	N/A
Observed Tree Species Richness per Group	61	58	
Total Tree Species Richness per Group ☼	61.2 (±13)	57.5 (±12)	Non-Overlapping Error Bars
Maximum Expected Tree Richness (Michaelis Menten)	74.72	73.75	N/A
Mean Tree Species Richness per Quadrant	8.4 (±3.27)	5.6 (±2.98)	p=0.001*
Mean Tree Abundance per Quadrant ☼	80.3 (±32.4)	67.1 (±33.7)	p=0.136
Mean abundance Shade trees (He)	803	671	p=0.136
Observed Crop Species Richness per Group	17	16	
Total Crop Species Richness per Group ☼	17.91 (±4.25)	15.95 (±3.98)	Non-Overlapping Error Bars
Maximum Expected Crop Richness (Michaelis Menten)	- 21.38	20.11	N/A
Mean Crop Species Richness per Quadrant	2.41 (±2.38)	1.78 (±1.97)	p=0.403
Mean Crop Abundance per Quadrant ☼	35.66 (±13.44)	26.7 (±14.06)	p=0.85
Mean Abundance Intercrops(He)	356	267	N/A

Mean Tree Simpson Index of Diversity (1-D)	0.71	0.56	p=0.0061*
Mean Tree Fisher Alpha Diversity Index	2.57	1.68	p=0.009*
Mean Crop Fisher Alpha Diversity Index	1.25	0.66	p=0.008*
Mean Coffee Density (plants/hectare)	8379 (±2278)	7469 (±1790)	p=0.45
Mean Percent Plot Slope	25.13 (±19.96)	17.14 (±17.44)	p=0.29
Mean Tree Diameter at Breast Height (cm)	6.5 (±2.6)	6.1 (±2.48)	p=0.41
Mean Tree Height (m)	1.67 (±0.38)	1.58 (±0.39)	p=0.31
Mean Percent Shade Rainy Season	29.22 (±18.57)	25.64 (±18.82)	p=0.07

☼ Data were transformed for comparison using Coleman individual-based rarefaction calculated with the software package EstimateS version 8.2.
* Differences statistically significant at p-value < 0.05 in a two-tailed unpaired t-test
(±) Standard deviation

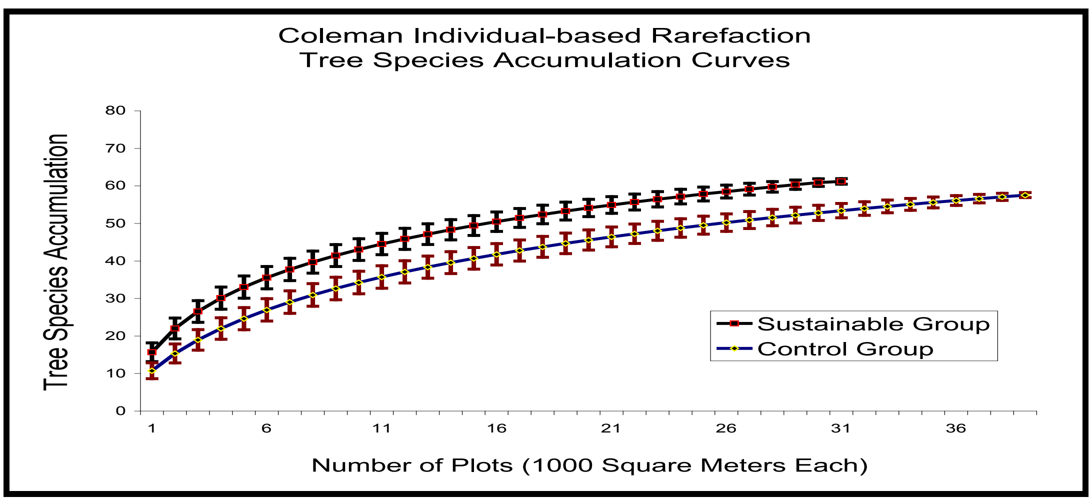

Figure 6.2. Individual-based tree species accumulation curves elaborated by EstimateS. Non-overlapping bars indicating statistical differences (1 SD).

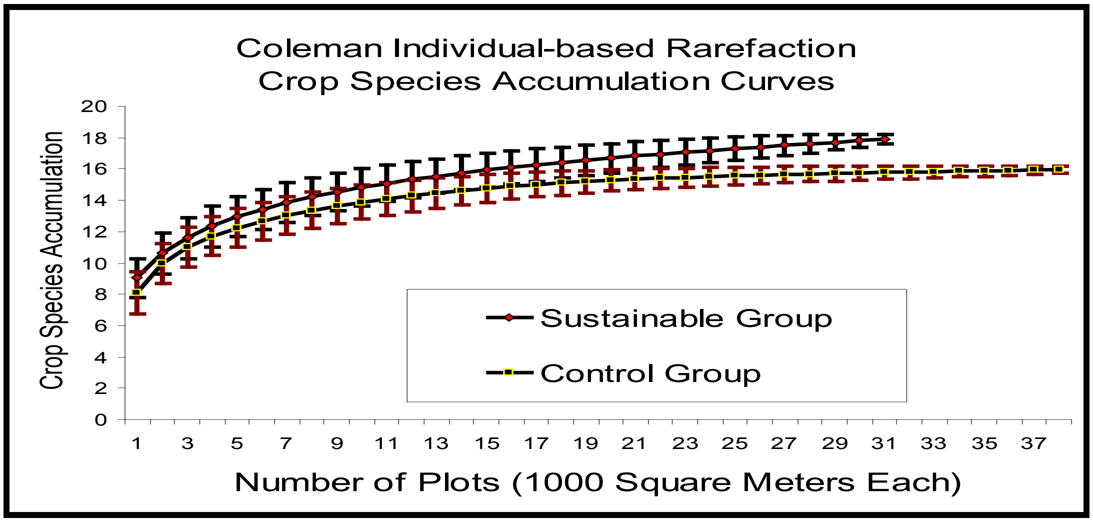

Figure 6.3. Individual-based crop species accumulation curves elaborated by EstimateS. Non-overlapping bars indicating statistical differences (1 SD).

Species richness and abundance

In the 72 total plots (40 CG and 32 SG), 81 tree species (5234 individuals) belonging to 41 botanical families and 21 crop species (2278 individuals) belonging to 14 botanical families were identified. See Appendix 4 for complete species lists per group.

See Table 6.1 above for the below mentioned results[51]. Average plot tree richness was 8.41 (±3.27) species in the SG and 5.6 (±2.98) in the CG, and highly significantly different (p=0.001). Average quadrant tree abundance was also greater in the SG with 80.3 (±32.4) stems in the SG and 67.1 (±33.7) stems in the CG, but the difference was not significant. The standard deviation was greater than 30 for each

[51] Tests of statistical significance and calculations of standard errors were performed by JMP (JMP®, Version 9. SAS Institute Inc., Cary, NC, 1989-2010). All tables and graphs were produced in MS Excel.

group, which indicates substantial variation in tree stem density per quadrant among the coffee agroecosystems within each group. When extrapolated to average abundance per hectare the SG averages 803 trees and the CG averages 671 trees per hectare[52]. Average quadrant crop species richness was 2.41 in the SG and 1.78 in the CG, but these values were not significantly different (p=0.403). The average number of crop stems per SG plot was 36 (±13.44) while in the CG 27 (±14.06). Again the relatively high standard deviation indicates high variation in crop density among the quadrants in each group. When extrapolated to density per hectare the crop stem abundance plus tree stem abundance results in 1159 and 938 managed tree and crop species per hectare in SG and CG farms respectively.

Total species richness

The total observed number of tree species was 61 in the SG and 58 in the CG. Sample-based tree and crop species accumulation curves from each group were transformed into individual based accumulation curves (Figures 6.2 and 6.3) using the Coleman rarefaction function of EstimateS 8.2[53] (Gotelli and Colwell 2001; Colwell

[52] Average per hectare abundances extrapolated by multiplying average quadrant abundances for each group by 10 as the quadrant sample area was exactly 1/10th of a hectare.

[53] Sample based species accumulation curves were generated using the Sobs (Mao Tau) function of EstimateS 8.2 and can be found in Appendix C. Bias introduced by the unequal sample sizes of the Sustainable (n=32) and Control (n=40) groups as well as the potential prejudice introduced by the quadrant-based sampling regime utilized in this study required some form of standardization so an unbiased comparison could be made (Gotelli and Colwell 2001). Additionally, variation in tree and crop stem-densities within and between each group rendered the sample based species accumulation curves as measures of species density instead of species richness because of the stem density differences between the groups. In contrast to the quadrant-based sampling utilized in this study, inventories of a fixed number of trees sampled at random and in order within a plot results in species accumulation curve that feature individuals instead of quadrants as the unit of measure along the x-

2009). The total tree species richness per group when corrected for by the individual based rarefaction curves was greater in the SG: 61.2 versus 57.5 total species (Figure 6.2). Total crop species richness was also significantly greater in the SG following rarefaction and construction of individual based species accumulation curves with 17.91 crop species in the SG and 15.95 CG crop species (Figure 6.3). The error bars, representing one standard deviation, do not overlap by the terminus of either the tree or crop accumulation curves. This indicates that the transformation to individual-based accumulation curves resulted in the difference in total tree and crop species as being statistically significantly greater in the SG.

The maximum expected richness of each community was extrapolated by the Michaelis Menten (MM) richness estimator function, also using EstimateS 8.2, for comparison with the observed total crop and tree species richness calculated by the individual-based curves. The Michaelis Menten (MM) richness estimator predicted a maximum total of 74 SG total tree species and 73.5 CG total tree species along with a maximum 21.38 SG and 20.11 CG intercrop species (Table 6.1). Comparing the total species richness corrected for by individual-based rarefaction with the predicted values of the MM function, fully 83% of the SG and 78% of the estimated maximum CG shade-tree agrobiodiversity was encountered in their respective quadrants. Similarly, 84% of the SG and 79% of the CG’s estimated maximum amount of intercrop species were encountered in the course of the agroecosystem inventories.

axis. These individual-based accumulation curves *can* be used to accurately calculate and compare species richness.

These results suggest that the tree and crop sampling effort was fairly comprehensive In addition, both tree and crop individual-based species accumulation curves reach a near asymptote, indicating that the sample-size was adequate. Overall, these results reveal that while total tree and crop species richness was statistically significantly greater in the SG, the magnitude of this effect was minimal.

Rank-abundance curves

In order to assess overall diversity species richness and abundance must be considered simultaneously. Both rank-abundance curves and species diversity indices are commonly utilized to accomplish this. Rank-abundance curves graphically represent the richness and evenness of a particular distribution (Danoff-Burg and Chen 2005). The community species richness is the number of total species additions made by the end of the curve. Evenness is determined by the slope of the curve with the steeper the slope; the less evenly distributed the agrobiodiversity within the group and vice versa. A completely horizontal rank-abundance curve represents maximum evenness. Using the species distribution data each tree and crop community were visually compared and then statistically tested for adherence to the four predominant models of biodiversity distribution; geometric, log series, log-normal and broken stick. These models have been historically used in ecology to match relative species distribution with niche apportionment models based on biological assumptions (Mac Arthur 1957). Species distributions that conform to different models can be said to differ significantly in terms of abundance and evenness and each model is best suited to different diversity indices used by agroecologists. It is important to know if any of these distributions under analysis fits with model distributions so that the correct indices are chosen. Rank-abundance curves were elaborated and evaluated using a spreadsheet-based abundance curve calculator tool[54]. This tool was also used for a chi squared goodness of fit test conducted between the group's resulting rank abundance curves and each of the four most common biological distribution models.

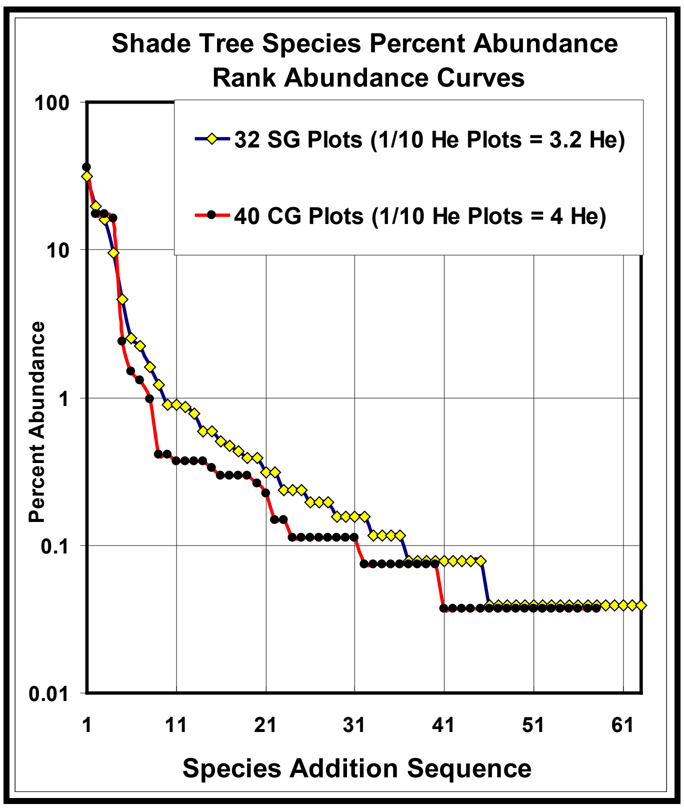

Figure 6.4. Shade-tree rank abundance curves.

The shade-tree rank-abundance curves for each group overlapped for the first four species additions, with each of these species making up more than 10% of their

[54]Developed by Dr. James A. Danoff-Burg and X. Chen from Columbia University downloaded from: http://www.columbia.edu/itc/cerc/danoffburg/Biodiversity%20Calculator.xls.

communities total abundance (Figure 6.4). However, between the additions of the species ranked fifth and 37th, the slope of the CG curve steepens and separates from the SG curve, signifying a less even distribution of tree species in the CG over the majority of the sample. The curves then rejoin at the thirty-seventh species addition, where each remaining species, 26 in the SG and 21 in the CG, are relatively rare species with each comprising between only 0.1 and 0.01% of their groups total tree abundance. This resulted in fully 40.3% and 46.6% of the species in the SG and CG being found in only one plot and with only one or two stems.

A goodness of fit Chi Square test performed on each of the four most common species distribution models, (geometric, log series, log-normal and broken stick), revealed that while the SG assemblage is significantly different from all except the log normal distribution and thus conforms to this model, the CG assemblage is significantly different from all except the log series distribution and thus conforms to this model. While the curves demonstrate the similar aspects noted above, enough difference exists in their distributions that the two groups each adhere to separate models of biological distribution. Both groups' intercrop curves matched a log series distribution model and so did not differ substantially from each-other. The results of the goodness of fit Chi Square test confirmed this.

Diversity indices

Diversity indices take into account both species richness and abundance making them the most common tool for comparing the overall diversity of a particular set of species distributions. However, the accuracy of a particular index in comparing overall diversity between two or more distributions varies, with some indices suited for some comparisons better than others based on the shape or model of the distributions being compared. A log series distribution suggests the existence of many rare species, such as that of the shade-tree CG and both intercrop groups, and is best measured by the parametric index[55] of diversity Fisher's alpha. It is also not heavily impacted by the relative distribution of the sample, and does not require a log series model in all distributions for an unbiased measure (Colwell 2009). It is advised that at least one of the distributions fit the log-series model. These characteristics made it an excellent candidate as an index for comparing diversity between the shade-tree CG and SG, which differ both in sample size and model fit, as well as between the intercrop CG and SG, whose differing sample sizes and shared log series distribution make Fisher's alpha the least biased index for comparison. It should be noted that because all that is required to calculate the index is the number of taxa in the sample and the number of individuals sampled, it focuses more on richness than evenness as the abundance per species is not accounted for[56].

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[55] Parametric means that the value of the index is based on a parameter within a species abundance model, in this case within the log series model

[56] $S = \alpha \ln\left(1 + \frac{N}{\alpha}\right)$ S = the number of taxa in the sample and N = the number of individuals sampled, and the parameter α = Fisher's alpha index of diversity.

In a log normal distribution the relative abundances of the species are more even than the log series, often with fewer rare species. The Simpson's Index of Diversity 1 – D is best suited to the log normal distribution that characterizes the SG's tree distribution. Simpson's 1 – D[57] is an index of diversity that is much more concerned with evenness than Fisher's alpha, as it represents the probability that two individuals randomly selected from a sample will belong to different species. The value of this index ranges between 0 and 1, with a value of zero representing an assemblage completely dominated by one species and a value of one representing completely equal abundances of all species. It is heavily weighted towards the most abundant species and is relatively insensitive to changes in species richness by the addition of rare species. This makes it an effective and accurate index when the samples are from systems that are characterized by a backbone species or suite of species in high abundance. This combination of its fit with the SG shade tree distribution and the existence in both group's shade tree distributions of four distinct back bone species, makes the index attractive for utilization in the comparison of the shade-tree distributions.

These were the two most appropriate indices of diversity to utilize for this dataset, and each captures a different dimension of diversity, with Fisher's alpha focusing

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[57] 1-($D = \sum (n / N)^2$) where n = total abundance of a particular tree species and N = the total sample abundance

more on richness at the expense of evenness and vice versa for the Simpson Index of Diversity (1-D). Within each plot of the two groups I calculated the shade-tree Simpson Index of Diversity (1-D) and the Fisher's alpha index for both shade trees and crops. I then calculated average scores and tested the difference between the SG and CG averages for statistical significance. Species diversity indices were calculated with the software package R2.12.2 (Team 2011). The mean shade-tree Simpson Index of Diversity (1-D) averaged 0.71 in the SG and 0.56 in the CG (Table 1). A two-tailed unpaired t-test found these scores to be highly significantly different (p=0.0061). The mean shade-tree Fisher's alpha index was 2.57 for the SG and 1.68 for the CG and highly significantly different (p=0.009). The intercrop mean Fisher's alpha index was 1.25 in the SG and 0.66 in the CG and was also highly significantly different (p=0.008).

The highly statistically significant and substantially larger Fisher's alpha index scores for the SG's shade-tree distributions, combined with the highly statistically significant and substantially larger SG shade-tree Simpson Index of Diversity (1-D), confirm that the distribution of shade tree species in the SG is substantially more diverse than in the CG. However, while overall tree richness (SG 61.2 versus 57.5 CG total tree species; significance indicated by Figure 2's non-overlapping error bars) was statistically significantly greater in the SG, this difference is not very substantial in magnitude, with a less than three species difference in total tree species. With diversity encompassing both the dimensions of richness and evenness, this indicates that the substantially different measured overall diversity according to the indices was due not so much to higher species richness but to higher species evenness and a more equitable distribution of species. The rank-abundance curves and average tree species per plot support this finding. The average number of tree species per plot was both statistically significantly different and of a significant enough magnitude (SG 8.4 versus CG 5.6; p=0.0001) to suggest that while overall species richness was similar between groups, the SG harbored much more tree diversity per quadrant and thus the diversity in that group was spread more widely amongst it's members than in the CG. In addition the abundance of each species was different enough so that the shade tree rank-abundance curves belonged to distinct statistical models of distribution.

But how much closer are we to answering the question of why the SG's agroecosystems were more persistent? We can say that they are more diverse, when diversity accounts for both richness and evenness. But how much can these index values really say about agroecosystem persistence? Experience tells us that species richness, abundance, evenness and overall diversity are measures that alone cannot capture the mechanisms by which agrobiodiversity is able to reduce the vulnerability of an agroecosystem to economic crises. To examine the relations between the indicators of diversity taken above and the functional and structural properties of the agroecosystem, closer attention to the impact of individual species or groups of species becomes important. The analysis of whether agroecological diversification catalyzed emergent qualities of agrobiodiversity such as resistance to economic and ecological disturbances thus requires a focus on higher levels of organization in the agroecosystem. Accordingly the next sections move scales to evaluate system level functional (shade-tree) diversity, native biodiversity conservation (shade-tree), as well as structural (crop) diversity.

Shade-tree functional diversity

The steep slope at the very beginning of both shade-tree rank-abundance curves confirmed field observations that these systems feature a few species at very high abundances with potential effects that might dominate agroecosystem functioning. Indeed, the five most abundant tree taxa in each group account for 5% of the species richness and 81% of all individuals and 9% of the species richness and 89% of all individuals in the SG and CG respectively[58]. Thus while the SG is less dominated by the top five species, the difference here is slight and an examination of the individual characteristics of these species is in order. This is better known as an analysis of functional diversity. Functional diversity is understood agroecologically as emerging from the interactions, energy flows, and recycling of material between the different components of the agroecosystem (Gliessman 2007; p. 220). These emergent system qualities have been conceptualized utilizing the concept of functional effect groups, which are groups of species that have similar effects on the functioning of these higher level system attributes (Gitay and Noble 1997; Lavorela, McIntyreb et al. 1997

[58] Similarly, the top 10 tree species in each group make up 10% of the richness and 90% of the abundance and 18% of the richness and 94% of the abundance in the SG and CG respectively.

; Gliessman 2008). This analytical strategy has roots in theoretical ecology, where it has been used to unravel and understand the types and arrangements of diversity behind emergent kinds of ecosystem qualities such as resistance, resilience and stability (Hooper and Vitousek 1998; Naeem 1998; Symstad 2000).

Table 6.2. Top 5 most abundant shade-tree species by group.

Sustainable Group				Control Group			
Species Name	**Local Name**	**Use**	**% Total Abund**	**Species Name**	**Local Name**	**Use**	**% Total Abund**
Erythrina poeppigian a	Poró gigante	N/O	31.3	*Musa X paradisiaca*	Plátano	Fr	35.8
Musa acuminata	Banano	Fr	19.7	*Erythrina poeppigiana*	Poró gigante	N/O	17.4
Musa X paradisiaca	Plátano	Fr	15.9	*Erythrina berteroana*	Poró pequeno	N/O	17.3
Erythrina berteroana	Poró pequeno	N/O	9.6	*Musa acuminata*	Banano	Fr	16.4
Fr= Fruit N/O= Nitrogen Fixing Legume/ Organic Matter Incorporating							

Table 6.3. Functional effect groups.

Functional Effect Group	**1. Nutrient Extracting/ Productive Biota**			**2. Nutrient Cycling / Resource Biota**	**Total Average Trees per Quadrant (Total %)**
Tree Category	**1A *Musa* Fruit Trees**	**1.B Other Woody Fruit Trees**	**1.C Timber/ Living Fence Trees**	**Leguminous Service Trees**	
SG (n=32)	28.5 (35%)	4.4 (5%)	4.8 (6%)	40.9 (51%)	80.3 (100%)
NG/C (n=40)	35.1 (52%)	5.5 (8%)	3.9 (5%)	22.3 (33%)	67.1 (100%)

Nutrient Extracting Number of Trees Per Quadrant not Significantly Different
Nutrient Providing Number of Trees Per Quadrant P value = 0.007

In the demarcation of which species present in the SG and CG species distributions belong to which functional effect groups, every species present was apprised for their principal effect on agroecosystem functional properties and processes. The determination of the groups was thus the result of a systematic review and assignment of each species from each group's species list (see appendix 4 and 5) to one of two functional effect groups [59]. The principle backbone species utilized in each group were identified and are listed in Table 6.2, with the top four backbone species identical across the two groups; *Erythrina poeppigiana, Musa acuminata, Musa X paradisiaca* and *Erythrina berteroana*. The functional effect of each of these four key species on the structure and function of the coffee agroecosystem is either as a fruit bearing/nutrient extracting (*Musa spp.)* or nitrogen fixing and organic matter incorporating/ nutrient cycling (*Erythrina spp.*.) species. Ninety-eight percent of all tree species encountered in both groups belong to these two following principal functional effect groups that also presented themselves in the top four backbone species:

Functional Effect Group #1: Nutrient Extracting/ Productive Biota

This group is characterized by fruit, timber and living fence trees. They provide for *household reproduction* in the form of animal feed, market sales, gifting and household consumption.

Functional Effect Group #2: Nutrient Cycling / Resource Biota

[59] This type of analysis requires site specific knowledge much like that of a natural historian or farmer in their home biogeographic zone about the important functional effects of particular species within the system.

This group is characterized by fast growing leguminous tree species such as those from both the *Erythrina* and *Inga* genera. The species in this group provide ecological services such as the rapid accumulation of soil organic material by way of natural litter dispersion and farmer management of regular pruning's, as well as increased efficiency of nutrient cycling processes and soil fertility subsidies from the fixation of atmospheric nitrogen.

The distribution of species has been tallied in Table 6.3 in terms of average total number of tree stems per functional group in both the SG and the CG. In parenthesis is given the relative proportion of the SG and CG total tree stems that have been dedicated to each of the three functional effect groups. The SG has a statistically significantly higher average total number of nutrient cycling/resource biota stems per quadrant than the CG (SG 40.9 versus CG 22.3; p=0.007). While the average total number of nutrient extracting/productive biota stems per quadrant is not statistically different between the SG and the CG, the proportion of total stems from the *Musa* genera is of a much higher magnitude in the CG (52%) than the SG (35%).

Both of the above discussed functional effect groups are strongly related to the emergence of either resistance or vulnerability to external shocks such as the coffee crisis. Following the collapse of coffee prices in the year 2000, external labor and agrochemical inputs were no longer affordable to many farmers, causing the conversion of their land-uses out of coffee. When oil prices skyrocketed in 2007, fertilizer prices were more impacted than herbicide and fungicide prices, leading to costs of fertilization in Costa Rican technified systems to more than double on a cost per hectare basis (see Figure 6.5 below). The statistically significantly higher quantity of shade trees per quadrant dedicated to the provision of soil fertility in the SG helped substitute for the formerly purchased off-farm agrochemical inputs. In addition, in Agua Buena the heavy inclusion of *Musa spp.* within coffee agroecosystems, such as that suggested by the CG's distribution of individuals to functional effect groups, requires even more soil amendments to maintain the level of fertility needed to support both coffee and fruit production. Thus this combination of increased on-farm, shade-tree based production of formerly purchased external inputs and avoidance of intensified *Musa spp.* based production systems that required additional soil fertility amendments, provides a partial explanation for the persistence of the SG in coffee production following the price crises that characterized the first decade of the 2000's.

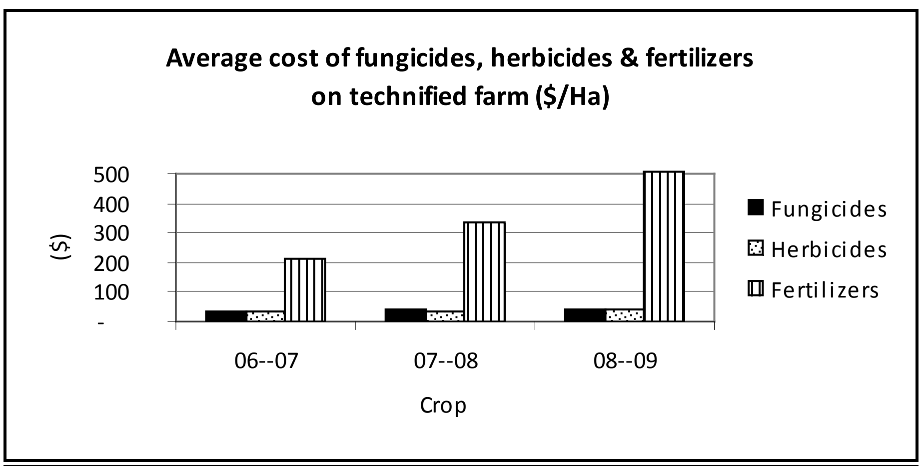


Figure 6.5. Average cost of agrochemicals in Costa Rica, 2006-2008. Source: (ICAFE 2010).

Conservation of native tree biodiversity

Native biodiversity is defined as those species that occur naturally in a given biogeographic region. Coffee agroecosystems are often presented as one of the cases in point of smallholder managed agroecosystems that can support the survival of native biodiversity within fragmented landscapes (Perfecto, Rice et al. 1996; Monro, Alexander et al. 2002; Méndez 2007; Gliessman 2008; Méndez, Bacon et al. 2010). Small-scale farmers and by extension, their rural social movements, are increasingly presented as the key to conservation in tropical landscapes because of their potential to create "high-quality" agricultural matrices around tropical forest fragments or reserves due to smallholder peasants higher ease of adapting agroecological practices that increase the amount of native biodiversity conserved on-farm. In some cases, the agroecological matrix can provide certain species their principal habitat for forage, shelter and breeding (Pefecto, Vandermeer et al. 2009). This has the related effect of lowering extinction rates by supporting the survival of metapopulations through the provision of a relatively friendly corridor that these populations can pass through when moving between fragments. This analysis proceeds by comparing the overall level of tree diversity in the two groups of coffee agroecosystems with that encountered during the inventory of nearby primary forest fragments. In order to do this the results of the seventy two 1000 meter^2 agroecosystem inventories I completed in 2009 will be compared with six 2500 meter^2 primary forest fragment inventories collected by researchers from the Las Cruces Biological Station in 2007 (Zahawi and

Oviedo 2007). The location of these sampled fragments is represented by red stars in Figure 6.6.

In the six, 2500 m^2 primary forest fragment plots 158 woody species over 5 cm DBH were observed, which after construction of individual-based rarefaction was adjusted to 148.57 species (see Table 6.4). The resulting curves (Figure 6.8) show that the distribution resulting from the forest fragment inventory is, not surprisingly, statistically significantly greater than both the SG and CG distributions. This is in spite of the fact that only 1.5 total hectares were sampled compared to the 7.2 hectares sampled during the 72 agroecological inventories. Indeed the Michaelis Menten (MM) richness estimator predicted a maximum total of 243.4 species for the primary forest fragments which indicates only 61% of the total estimated trees species richness was encountered during this inventory.

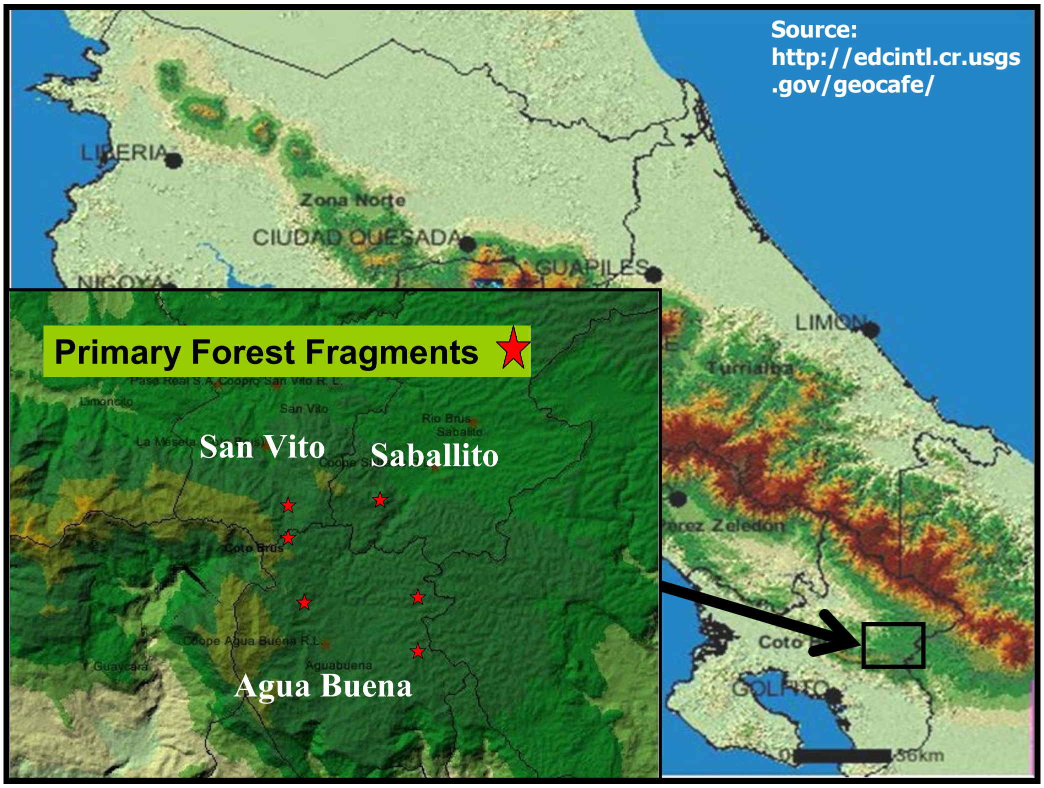


Figure 6.6. Location of the six primary forest fragments. Source: Elaborated from (USGS 2012).

Table 6.4. Key native tree biodiversity results.

Variable	Sustainable Group (n=32)	Control Group (n=40)	Primary Forest Fragments (n=6)
Number and Size of Quadrants	32 – 1000 meter² quadrants (3.2 he)	40 – 1000 meter² quadrants (4.0 he)	6 - 2500 meter² quadrants (1.5 he)*
Observed Species	61	58	158
Total Tree Species Richness ☼	61.2	57.54	148.57
Maximum Expected Tree Richness (Michaelis Menten)	74.72	73.75	243.4
# in Forest Fragments/ Las Cruces Spp. List (# of Individuals) (% of Total Species) (% of Total Individuals)	32 (1238) (52.5%) (48.4%)	23 (633) (39.7%) (23.6%)	SG = 32 spp = 20.3% CG = 23 spp = 14.6%
# Spp. Native to Costa Rica % of Total Species	43 70.5%	45 78%	N/A
Mean abundance Shade trees (He)	800	671	555.33

☼ Based on individual-based rarefaction calculated with the software package EstimateS 8.2.
*(Zahawi and Oviedo 2007; unpublished data) (±) Standard deviation

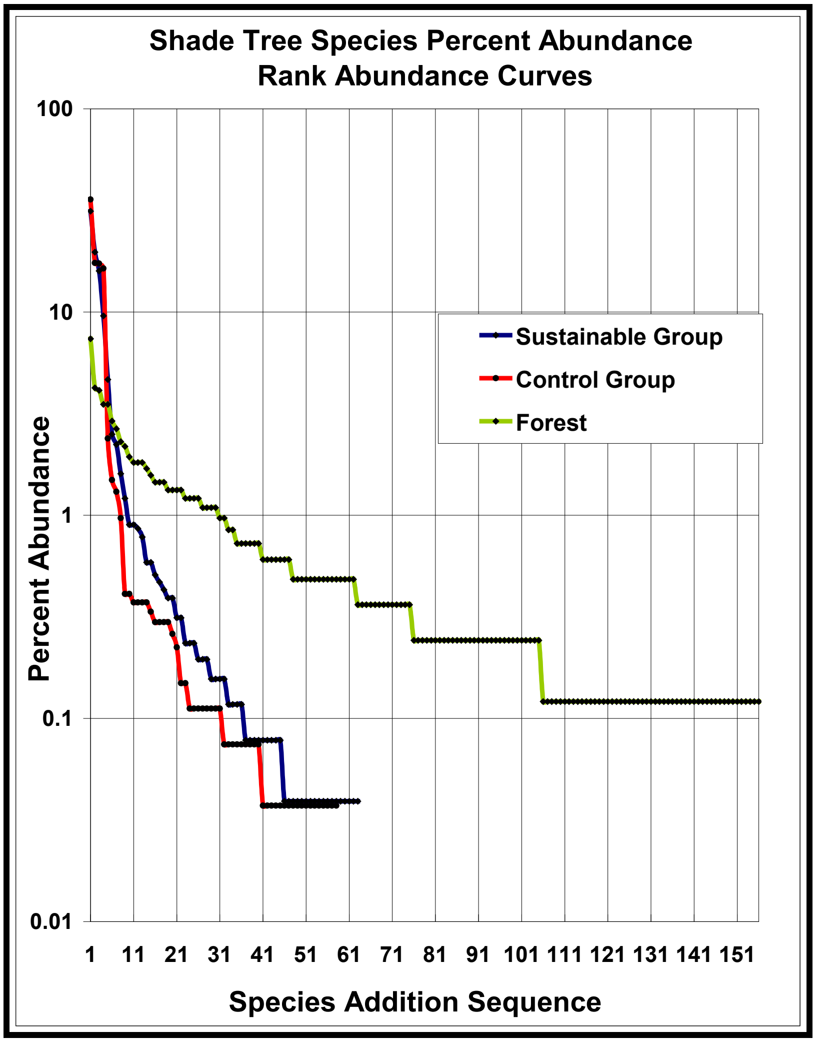


Figure 6.7. Primary forest fragment rank abundance curve compared with SG and CG shade-tree rank abundance curves.

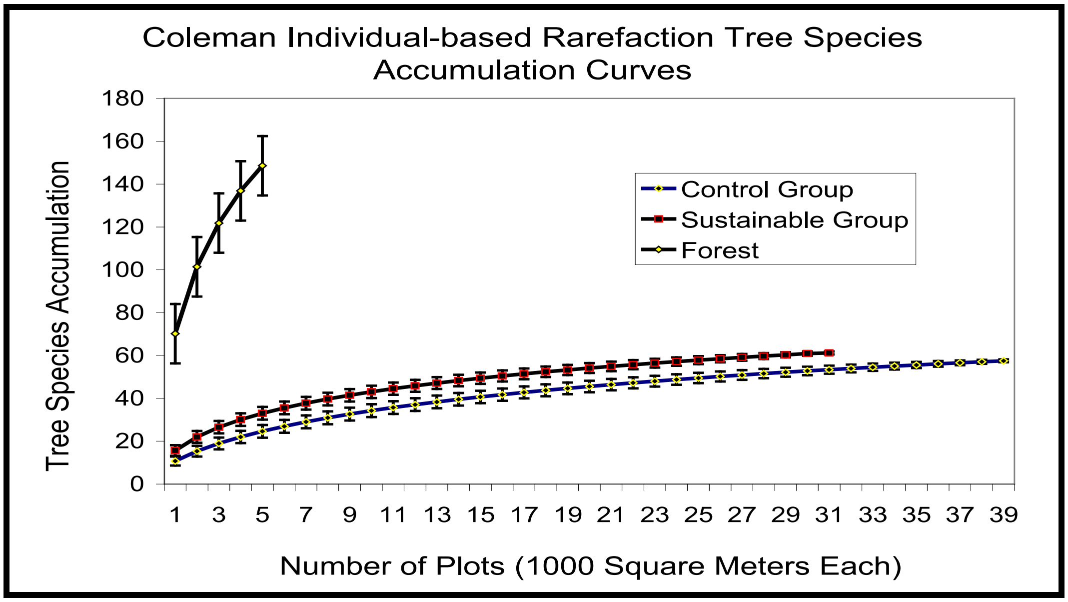


Figure 6.8. Primary forest and shade-tree individual-based tree species accumulation curves elaborated by EstimateS. Non-overlapping bars indicating statistical differences (1 SD).

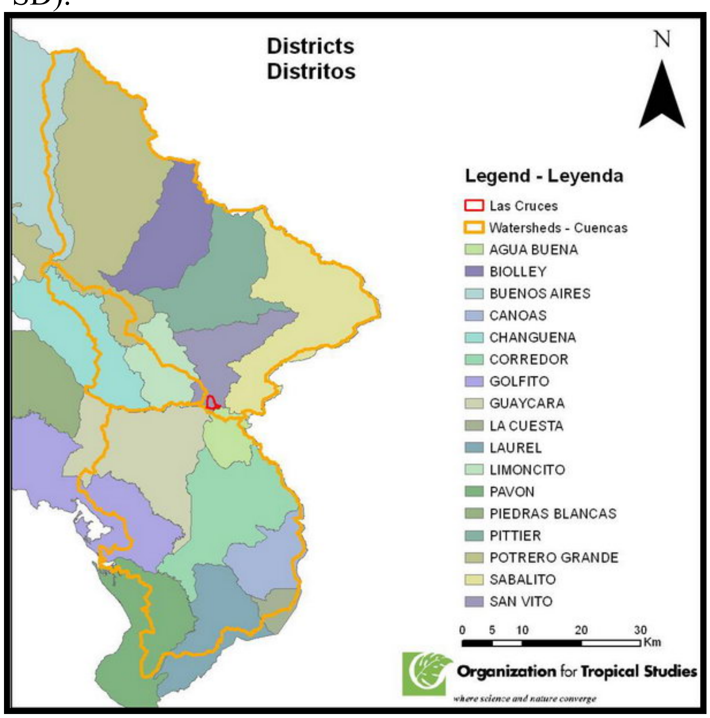


Figure 6.9. Districts of southern Costa Rica. Source: (OTS 2012).

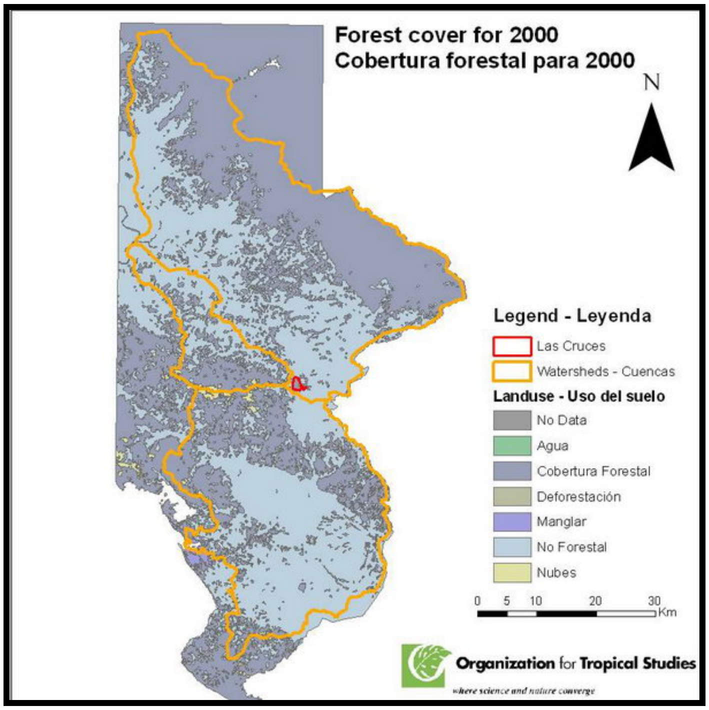


Figure 6.10. Southern Costa Rican forest cover, year 2000. Source: (OTS 2012)

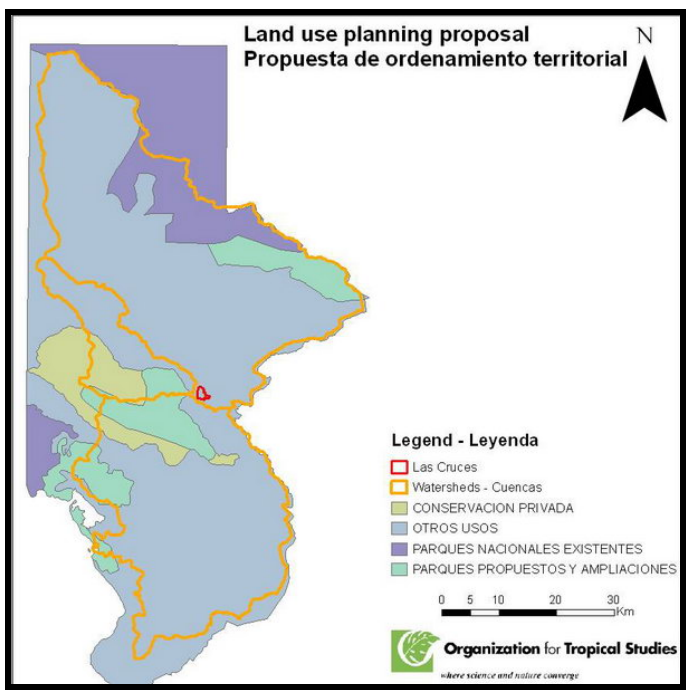


Figure 6.11. OTS land-use planning proposal. Source (OTS 2012)

Because of the incomplete nature of this inventory, the species list of woody vegetation from the Las Cruces Biological Reserve (noted by the red circle in Figures 9-11 above) was combined with that obtained from the six primary forest fragments[60] in order to compare with the species lists of both the CG and SG (Oviedo 2011). Large differences were observed between the amounts of native woody vegetation conserved by each group; these are recorded in Table 6.4. The CG shared 23 species or 39.7% of the total richness found in the CG with the nearby primary forests while the SG shared 32 species, signifying that over half (52.5%) of the total species encountered in the SG are native trees found in nearby primary forests. These 32 SG shared species represent just over 20% of the area's total known primary forest tree species, while the 23 shared CG species accounted for 14.6% of the total known tree species richness encountered in the primary forests of the region. Within the SG's 32 quadrants, 1238 individual tree stems were from known native forest species. These stems comprise nearly 50% of the SG's total stems inventoried. In contrast, in the CG only 633 stems were from species identified in the primary forest plots, which corresponded to just 23.6% of the CG's total stems.

The highly fragmented nature of the landscape in Agua Buena meant that by the year 2000 almost all of the remaining primary forest had been felled in order to establish agricultural production (Figures 6.9 and 6.10). This was followed by a post-crisis trend towards extensive cattle production (Chapter 4). Considering the very high tree

[60] These species are indicated in Appendix 4 by an asterisk placed next to their name.

biodiversity of the remnant primary forest fragments of the region, along with the planned future acquisition of lands adjacent to Agua Buena for the construction of a biological corridor (Figure 6.11), the fact that SG farms support conservation of many more individuals and species of native trees indicates that the SG coffee agroecosystems contribute much more than CG coffee agroecosystems to the conservation of native biodiversity as well as provide a higher quality agricultural matrix. Finally, in terms of supporting the resistance and resilience of diversified shade farms in the region, it has been proposed that rare and native species can provide insurance and stability when agroecosystems are confronted by stressors because they can become important substitutes for the functions and services of other more common species that might be more adversely impacted by the stress (Pate and Hopper 1994).

Structural diversity

Following Gliessman (2007; p.220), structural diversity is conceptualized as the ecological arrangement of niche, habitat and trophic levels within an agroecosystem. In operationalizing this concept for the characterization carried out in this research, I drew on Nair's (1985) classification system and documented the spatial assemblage of tree and crop vegetation, their vertical stratification as well as their temporal occurrence. This resulted in a typology of structural diversity in post-crisis Agua Buena coffee agroecosystems that was also influenced by the typological system in Figure 6.12 below (Toledo and Moguel 2012). Although just published in this fullcolor version, the typology has otherwise remained identical to that the same author's published in their highly-cited 1999 article (Moguel and Toledo 1999). It utilizes vegetation and structural complexity, along with management intensity as the classification criteria.

The criteria and nomenclature of this particular typology is often extended to represent the range of coffee agroecosystems present throughout Mesoamerica. However, the results of recent research rightfully caution against adopting typologies of structural diversity created in different social and ecological contexts. This is because taxonomic diversity can drastically change from one context to the next, and with it the range of systemic responses to interventions and disturbances as qualitative differences between the specific taxonomic groups found in different regions can cause agroecosystems to react in an unpredictable manner (Philpott 2008). For example, the impact on total species richness of a standardized treatment of increased management intensity within "rustic" coffee agroecosystems in two different locations can be very divergent. This means that for analysts working in novel bioregions or even with under-sampled groups in well-studied regions, a unique typology should be elaborated. This was the methodology adopted in this research.

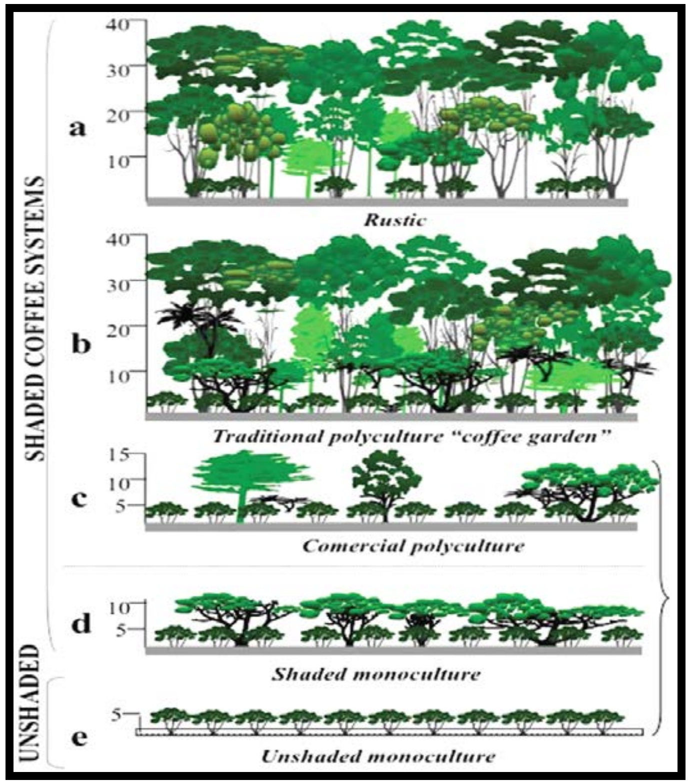


Figure 6.12. Typology of Mexican coffee agroecosystems. Source: (Toledo and Moguel 2012)

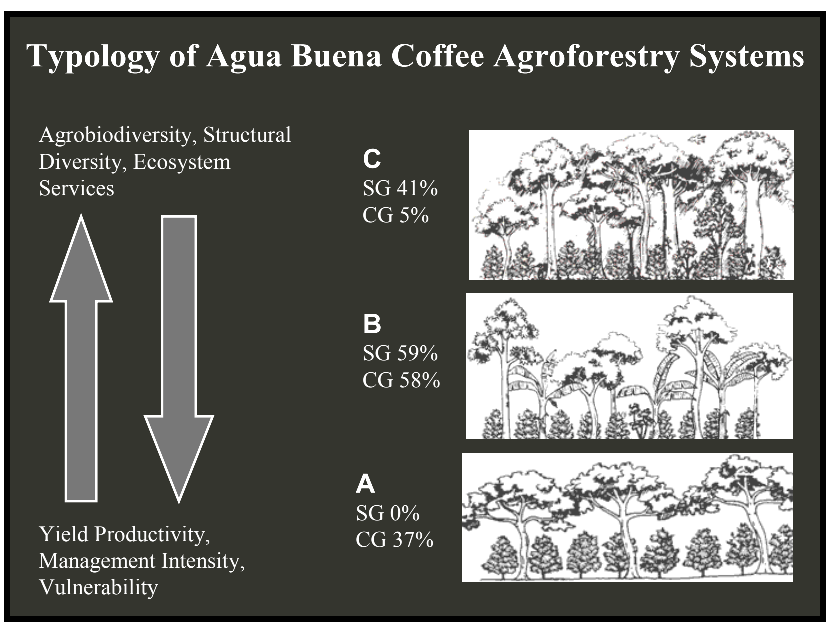


Figure 6.13. Typology of Agua Buena coffee agroecosystems.

Post-crisis Agua Buena featured three principle coffee-based agroforestry production systems. The structural differences between these systems are graphically represented in Figure 6.13 above where A = simplified shade, B = intercropped polyculture and C: intercropped homegarden. The percentages given under each letter are the proportion of year 2009 farm households from each group classified within a given system. As you move down from intercropped homegarden to simplified shade, the intensity of the management, as well as productivity increases while biodiversity and structural complexity decreases and along with it the potential for conservation and ecosystem service provision. In the following descriptions given for each system effort is directed to clearly outline the range of defining values for the key indicators used in this typology.

A. Simplified Shade: 0% of SG, 37% of CG in '09

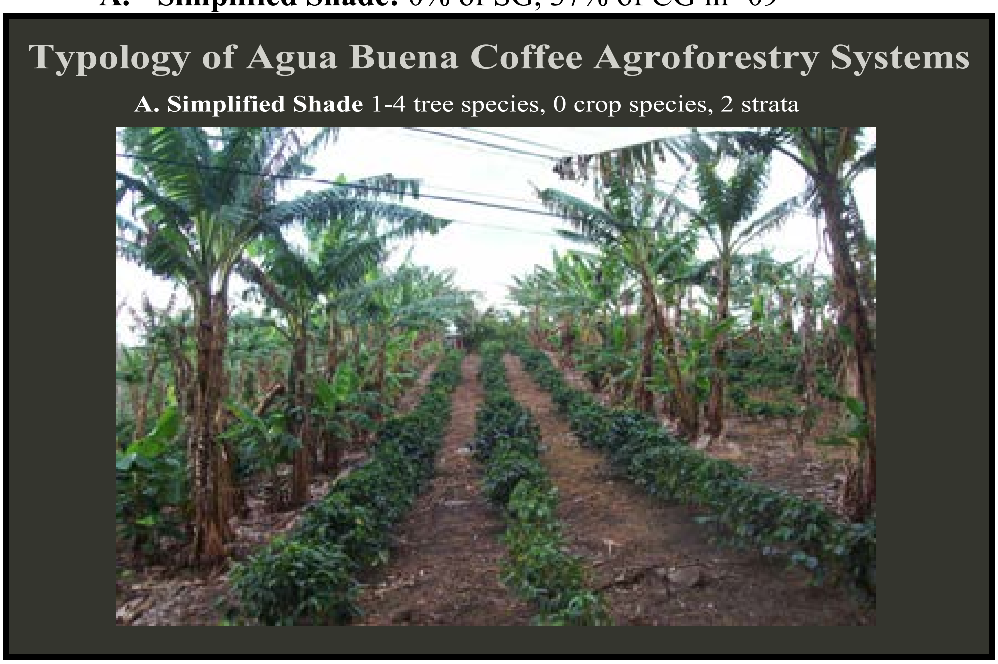


Figure 6.14. Characteristics of Simplified Shade.

Table 6.5. Characteristics of Simplified Shade

Structural Diversity and Vegetative Composition	Shade Management	Functional Diversity and Agrochemical Use
2. Understory Stratum: Features a single dominant species (>90%) from either the *Erythrina, Inga* or *Musa* genera. **1. Shrub Stratum**: *Coffea arabica* **NO ANNUAL INTERCROPS**	**<u>Less than 20% Shade</u>** **Stratum 2:** Heavily pruned if Erythrina or Inga, less so if *Musa.* **Stratum 1**: Pruned annually following harvest.	Almost 100% of these systems are reliant on chemical fertilizers, herbicides and fungicides ubiquitous. Majority (80%>) of production for the market. Highest coffee yielding AND most vulnerable to output and external input and price volatility.

The simplified shade system was the predominant pre-crisis coffee agroecosystem in Agua Buena. It was the least prominent system in 2009 of the three identified, with 37% of the total quadrants sampled from the CG corresponding to this system while none of the SG quadrants corresponded to it. As indicated above, the simplified shade system is characterized by two vertical strata of shade. The shorter of the two is a lower shrub stratum of *Coffea arabica,* which is this market oriented system's main crop. The taller of the two is an understory stratum of a single dominant shade species (>90%) from either the *Erythrina, Inga* or *Musa* genera.

This system generally corresponds with the shaded monoculture of Figure 6.12 above. However, in Agua Buena, rather than a true monoculture of shade there is instead a hyper-dominant species that is accompanied by several other much rarer species. This results in a system with a total tree richness of between one and four species. The total crop richness of zero species indicates the absence of intercropping. The understory stratum is highly managed through thrice a year pruning if *Erythrina* or *Inga* are the dominant genera, and through annual fruit harvesting and replanting if *Musa* is the dominant genera. This system requires heavy agrochemical inputs to maintain stability and is therefore the most productive and most vulnerable to price volatilities such as those encountered during the coffee crisis.

B. **Intercropped Polyculture:** 59% of SG, 58% of CG in '09

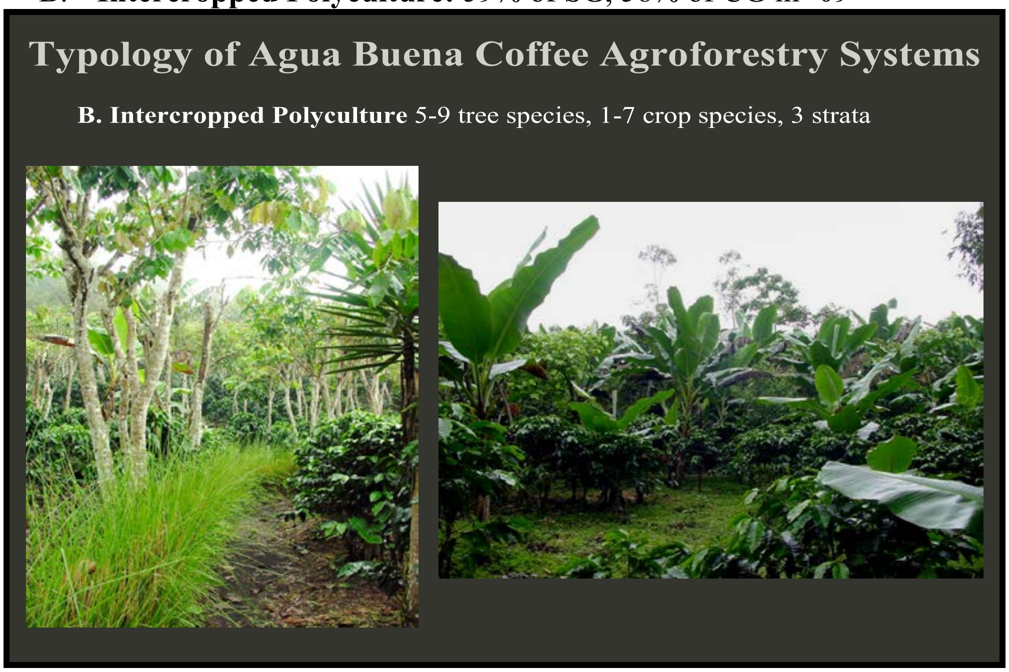


Figure 6.15. Characteristics of Intercropped Polyculture.

Table 6.6. Characteristics of Intercropped Polyculture.

Structural Diversity and Vegetative Composition	Shade Management	Functional Diversity and Agrochemical Use
3. Understory Stratum: A backbone species exists (Either *Inga* or *Erythrina)* BUT it does not make up more than 70% of the total individuals inventoried. The rest are trees with market or household uses like *Persea americana*, *Psidium guajava* and any of a number of species from the *Citrus* genera. **2. Shrub Stratum**: *Coffea arabica* **1. Intercropped Stratum:** Annual, bi-annual and short-lived perennial crop species arraigned either in permanent alley cropping systems or swidden successional systems.	**21-40% Shade** **Stratum 3**: Pruned less than simplified shade system **Stratum 2:** Pruned annually following harvest. **Stratum 1:** Weeded, harvested and replanted	**3 Systems:** **1B.** *Erythrina-Musa* equal mix **2B.** *Inga* Dominated **3B**. *Erythrina* Dominated Weeds are managed by mulch of organic material as well as the increasing shade level. Fertilizers still employed.

The intercropped polyculture system was the most predominant post-crisis system of the three identified in this research with over half of both the SG's (59%) and CG's (58%) quadrants corresponding to it. It is characterized by three distinct shade strata, the shortest of which is an intercropped stratum of between one and seven annual, bi-annual and short-lived perennial crop species arraigned either in semi-permanent alley cropping systems or swidden managed successional systems, the full features and details of which will be explored following the description of the intercropped homegarden as both systems share this identical annual intercrop stratum. The middle stratum is the lower shrub stratum of *Coffea arabica,* which in this market oriented system is still the crop of most importance. The tallest understory stratum features a backbone system of either an *Erythrina-Musa spp.* equal mix that together comprises no more than 70% of the total species in this stratum (1B in the third column of Table 6.6), an *Inga spp.* dominated system that comprises no more than 70% of the total species in this stratum (2B in the third column of Table 6.6), or an *Erythrina spp.* dominated system that comprises no more than 70% of the total species in this stratum (3B in the third column of Table 6.6). Thus in terms of species composition and number of structural strata the main differences between the simplified shade system and the intercropped polyculture system are 1. the existence of an intercropped stratum in the latter and 2. the reduced dominance of the backbone species in the understory stratum from ~ 90% in the former system to <70% in the latter system, and a corresponding increased diversity of trees with market or household uses in the latter such as *Persea americana*, *Psidium guajava* and any of a number of species from the *Citrus* genus.

This system is most similar to the commercial polyculture of Figure 6.12 above. However, the principal difference is the existence of an intercropped stratum. The understory stratum is less heavily pruned than in the simplified shade system, leading to an average percent shade of between 21 and 40% in this system. This level of shade and the addition of a green mulch of organic material following pruning effectively suppresses weed growth and when combined with manual methods of weed control has led to the elimination of herbicides in this system. While soil conservation measures are often extensive, ensuring that nutrient cycling is efficient, inorganic fertilizers are often still employed once a year, usually just after the fertilization of the coffee cherries in the epoch of greatest nutritional need within the system.

C. **Intercropped Homegarden:** 41% of SG, 5% of CG in '09

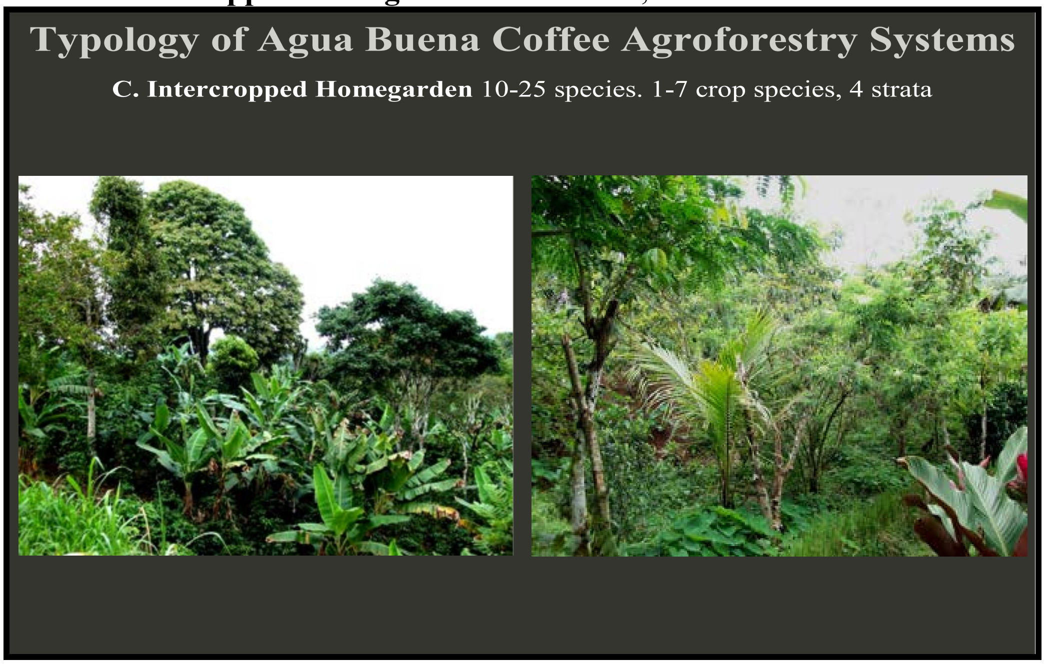


Figure 6.16. Characteristics of Intercropped Homegarden.

Table 6.7. Characteristics of Intercropped Homegarden.

Structural Diversity and Vegetative Composition	Shade Manage-ment	Functional Diversity and Agrochemical Use
4. Native Canopy Stratum: Emerging canopy of native forest tree species that have volunteered/ been planted since the onset of the coffee crisis. **3. Understory Stratum:** A backbone species exists (Either *Inga* or *Erythrina)* BUT it does not make up more than 70% of the total individuals inventoried. The rest are trees with market or household uses like *Persea americana*, *Psidium guajava* and any of a number of species from the *Citrus* genus. **2: Shrub Stratum**: *Coffea arabica* **1. Intercropped Stratum:** Annual, bi-annual, short-lived perennial and slash and mulch swidden agroforestry managed succession.	**41-70% Shade** **Stratum 4:** never pruned. **Stratum 3:** Irregular prune **Stratum 2:** Pruned	Does not feature original remnant forest canopy trees like the traditional polyculture it corresponds to in Figure 9. Instead natives are in the process of re-establishment via volunteer and planted individuals. Heightened nutrient cycling, increased use of renewable sources of energy, more biodiversity, more ecosystem functioning.

The intercropped homegarden is the second most prevalent post-crisis Agua Buena coffee agroforestry system with 41% of the SG's and 5% of the CG's quadrants corresponding to it according to my 2009 agroecosystem inventory. It is similar to the intercropped polyculture system except for the existence of a native canopy stratum made up of several native forest tree species that have volunteered or been purposefully planted since the onset of the coffee crisis. This translates to an overall richness of tree diversity of between 10 and 25 species per quadrant. Vertically speaking this stratum is either located above the understory stratum or is within the understory stratum but as it is not normally pruned, will eventually emerge above the understory stratum.

This system most closely resembles the traditional polyculture system of Figure 6.12 above except it does not feature the original remnant forest canopy trees. Instead natives are in the process of re-establishment via volunteering and planted individuals. The addition of this native canopy stratum leads to heightened nutrient cycling, more biodiversity and improved overall ecosystem functioning as compared to the other two Agua Buena systems. Because of the highly diverse, ethnobotanically useful, structurally complex suite of woody agrobiodiversity present, along with the mixed market-subsistence orientation, this system is dubbed a coffee "homegarden". Like in the intercropped polyculture described above, when combined with an annual, bi-annual and short-lived perennial intercropped stratum a landscape mosaic is formed, the ecological structure and function of which is discussed next.

Unpacking the agroecological dynamics of the intercropped stratum

Fully 100% of the SG's and 63% of the CG's post-crisis quadrants corresponded to either the intercropped polyculture or intercropped homegarden systems of Agua Buena coffee agroforestry. Thirty percent of both the SG and CG's total stems recorded during this study were taken from this stratum and were classified as annual and biannual food crops. The most abundant intercropped taxa in both the SG and the CG were *Manihot esculenta, Colocasia esculenta, Xanthosoma sagittifolium*, *Ananas comosus, Sacharum officinarum* and *Zea mays*. See Appendix 5 for the full crop species list for each group. The majority of these intercrops come in one of three different biological, spatial and temporal arrangements: 1. permanent alley cropping, 2. improved fallow slash/mulch frijol tapado swidden or 3.improved fallow biannual or annual intercrop swidden cultivation. These three arrangements can be distinguished by the manner in which the tree and crop components interact spatially and temporally. Table 6.8, adopted from Torquebiau (2000), demonstrates this for an assortment of agroforestry intercropping techniques including the three mentioned above.

Table 6.8. Agroforestry techniques classified according to prevailing ecological interactions. Adapted from (Torquebiau 2000; p. 1015)

Tree–crop arrangement	Temporal Simultaneous/Permanent	Temporal Sequential/ Shifting
Spatial-Separated	Hedges	Taungya
	Alley cropping	Relay planting
	Living fences	
	Boundary planting	
	Windbreaks	
	Shade trees	

Spatial Mixed	Homegardens	Improved fallow
	Village forests gardens	Swidden cultivation
	Agroforests	
	Scattered trees	

Permanent alley cropping

Alley cropping is the simultaneous planting of spatially separated hedgerows of woody species alongside companion crops which are grown in regularly spaced alleyways between the rows. It has been found that with the right choice and management of hedgerow and crop species, crop yields can be sustained with little to no fertilizer inputs, soil erosion can be reduced, soil fertility maintained and weedy species controlled (Kang 1993). *Inga* and *Erythrina* are the two most common backbone shade-tree genera used in the understory shade layer of Agua Buena coffee agroecosystems and are also two of the most widely utilized hedgerow species in Central American corn and bean alley cropping systems. Both of these genera have been extensively evaluated for their performance as ecological service providers in alley cropping as well as in coffee and cacao perennial systems (Beer, Muschler et al. 1998). As noted above in the functional diversity section, the impact of these genera on a given system is to both provide organic matter and a green mulch layer as well as fix atmospheric nitrogen. Because of this, one of the most common arrangements in the intercropped stratum of Agua Buena coffee agroforestry systems is a permanent corn alley cropping system (See Figure 6.17).

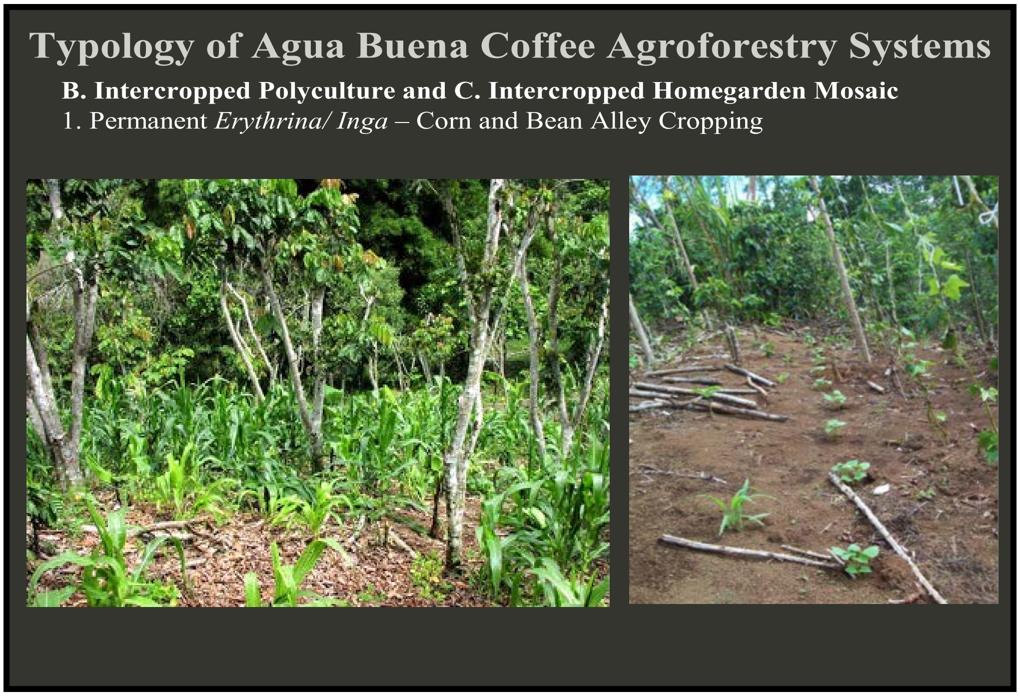


Figure 6.17. Permanent *Erythrina/ Inga* – corn and bean alley cropping.

Improved fallow slash/mulch *frijol tapado*

In the unimproved pre-Columbian *frijol tapado* system farmers utilize a parcel that has been abandoned for between an average of 3-5 years (Rosemeyer and Gliessman 1992). The secondary growth, or *monte*, is usually between waist and head high by this time. Trails are established throughout the parcel in order to *regar,* or scatter the *Phaseolus vulgaris* seeds by throwing them until the plot is evenly saturated with seed. Then all the *monte* is slashed to the ground with a machete until the bean seeds are *tapado*, or covered. The particular fields chosen for *frijol tapado* are often dominated by certain weeds that do not grow after cut and the entire process of field selection relies extensively on local agroecological knowledge. The layer of cut vegetation forms a green mulch that simultaneously retains the moisture necessary for germination while inhibiting competitive weed growth. The beans, which are of a semi-determinant climbing variety, are often grown without any additional inputs except for the labor required to harvest them three months later. The beginning of November is time to *tapar frijoles* in southern Costa Rica, including Agua Buena. By planting with 6 weeks of the rainy season left, the beans can be grown without irrigation. Then, the dry season begins halfway through the maturation of the plants, which leads to successful flowering and fruiting. This is how the system works in theory but in practice if the rains don't continue to fall long enough the crop never takes off and if they continue too long the plants succumb to disease, usually a fungus. Perhaps even more limiting to the success of this system is the availability of approrpiate land. However, a combination of two related factors have made *frijol tapado* one of the three most common arrangments within the intercropped stratum of Agua Buena coffee agroecosystems; 1. the development of improved fallow *frijol tapado* systems and 2. the availability of extensive swaths of land formerly planted with *Erythrina* and *Inga* shade trees following the coffee crisis.

The idea behind the improved fallow is that frijol tapado could be grown under a spatially mixed arrangement of service trees that would reduce the number of fallow years in this shifting/ sequential system to only a biannual system instead of having to wait every 3-5 years with the unimproved system. A two-year experiment located in the district of Agua Buena (at Finca Loma Linda) assessed which of four common service trees; *Erythrina poeppigiana, Calliandra calothrysus*, *Gliricidia sepium* and *Inga edulis*, worked best in an improved fallow *frijol tapado* system (Kettler 1997). This investigation did this by determining the tree whose biomass contained more total as well as bio-available nutrient inputs. The results of this experiment indicated that *Inga edulis* was, out of the four tree species tested, the greatest biomass producer as well as the best provider of both total and bio-available nutrient inputs. The study found that compared to a control, *Erythrina poeppigiana,* also provided a substantial amount of tree biomass with bio-available nutrients, although less so than *Inga edulis.* The location of this study at the Finca Loma Linda Research Station and the origin of the tested tree and crop germplasm makes these results are highly applicable to the analysis of coffee agroecosystem inventories from Agua Buena[61].

This ability to improve the fallow of Agua Buena frijol tapado systems coincided with the sudden large-scale availability of lands formerly planted with the backbone shade-tree species tested in the above experiment. This has led to the appearance of the improved fallow slash/mulch frijol tapado system as one of the top three arrangements with the intercrop strartum of Agua Buena cofee agroecosystems. As you can see in photo 2 within Figure 6.18, this improved fallow system would not

[61] Finca Loma Linda is located at 1185 meters of elevation above sea-level, on Andisol soils and receives 3265 mm of rain a year with an average annual temperature of between 68 and 75 degrees F (Kettler 1997).

count as a coffee agroecosystem *per se* due to the lack of a *Coffea arabica* shrub stratum and this accounts for the lack of *Phaseolus vulgaris* on the species lists of either the CG or SG. However, these systems are found interspersed within the coffee and so form an integral part of the landscape mosaic that is formed by the coffee agroforestry complex of intercropped polyculture and homegarden systems.

Improved fallow biannual/annual intercrop

The same idea behind improved fallow *frijol tapado* has also been increasingly applied in Agua Buena to the intercropped cultivation of biannuals and short lived perennials such as *Xanthosoma violaceum, Manihot esculenta, Sacharum officinarum, Colocasia esculenta* and several species of *Dioscorea* (see Figure 6.18; photos under section 3).

Both the improved fallow *frijol tapado* and biannual/annual intercrop are swidden cultivation systems and so mimic the structure and function of traditional agroecosystems by introducing a disturbance into specific sections of the coffee agroecosystem, thus taking full advantage of the intermediate disturbance hypothesis, which posits that the patchiness resulting form a disturbance regime that is not too regular or too rare can result in high productivity alongside high diversity (Gliessman 2007; p.239). This is due to the productivity of early succession growth and the dynamic stability that results from successional patchiness.

> *Intercropping, agroforestry, shifting cultivation and other traditional farming methods mimic natural ecological processes,*

and their sustainability lies in the ecological models they follow. …The study of these systems is now offering important guidelines for water-use efficiency, pest control, soil conservation and fertility management of the kind that subsistence farmers can afford. (Altieri 1999; p. 21)

Figure 6.18. Improved fallow shifting cultivation.

Discussion

There is great possibility in managing coffee agroecosystems as coffee homegardens where annual and fast-growing, short-lived perennial crop, shrub and tree species are located in patches of the farm-household's coffee parcel. The prevalence of an intercropped stratum in the majority of Agua Buena coffee agroecosystems demonstrates a large abundance and diversity of crops being incorporated into all of the coffee agroecosystems of the SG, and to a much lesser extent those of the CG.

This is not a surplus generating, cash cropping response to the coffee crisis. The intercropped yuca, sugar cane, corn, beans, taro, and yams are for the household's direct consumption alone; this is unlike many of the *Musa spp.* dominated systems of the CG. In these systems plantain production dominates and the majority is sold (beyond a small amount reserved for household consumption). Banana production, a much less common component, is almost exclusively utilized as animal feed.

There are a number of intertwined factors that are pushing coffee smallholders towards this response. First, the small size of many farms in the area, ~75% of coffee farms are under 3 hectares in size and many much smaller than that, has prevented the adoption of pasture, which is not usually profitable on farm-holdings under 5 hectares. The region has few non-agricultural opportunities, and remaining farmers are interested in reducing the historical overreliance of the Agua Buena rural economy on a boom and bust-prone, non-edible cash crop. In this setting, the cultivation of subsistence crops for household need is a logical and probably critical survival strategy for the smallholder coffee producing peasantry of both groups.

Farm-household economic risk was reduced in the SG and to a lesser extent the CG through the planting of rare and sought after native hardwood trees and an assortment of fruit bearing trees, as well as the incorporation of vegetable, basic grain, root and tuber production in the aisles between the rows of coffee. The nutrient management regime adopted by the majority of the SG substituted formerly purchased chemical fertilizers inputs with the by-products and biological processes of nitrogen fixing and organic matter incorporating leguminous service trees. This array of design and management changes that characterized the post-coffee crisis SG agroecosystems demonstrates the socio-ecological resiliency of these farm-households. This intensification of native, structural, functional and species diversity was promoted because of its potential to fuel the emergence of system-level qualities of internal nutrient cycling, energy usage, and farm-household stability. These qualities, in turn are clearly linked with developing resistance to coffee land-use change and class differentiation as a result of past, present and future economic crises. The possibility of this linkage is what led to the generation of Hypothesis #2 at the conclusion of Chapter 4:

The agrobiological and structural diversification of SG coffee agroecosystems led to the emergence of structures and functions that maintained production while heavily reducing or eliminating costly external inputs and providing crucial subsistence food.

This research confirms this hypothesis as true. The puzzle of why there was such high levels of SG persistence in coffee, with fully 82% of SG coffee lands persistent between 2000 and 2009 versus 24% in the CG, is explained by very distinct differences in the overall level and type of structural, native, and functional diversity found within the coffee systems of the CG and SG. This diversity has conferred both resistance and resilience onto farm-households. This confirms that a significant agroecological transformation had occurred, although not of the type legible to simple indicators (i.e. total species richness) and indices of diversity (i.e. Shannon, Simpson and Fisher) that many analysts and investigations of coffee agroforestry rely upon. Instead, the state/NGO-led program of agroecological transformation focused diversification almost exclusively on the reduction of external-inputs which was only apparent after analysis of the functional, structural and vertical differences in diversity between the two groups.

This compliments other findings made by analysts who have evaluated the impacts of liberalization upon the persistence of the worldwide peasantry. These findings have been eloquently summarized by Jan Douwe Van Der Ploeg:

> *The less commoditized parts of agriculture that are able to distantiate decision-making from the "logic of the market" are the ones that are best placed to face the current crisis; this is in line with historical precedents …(O)ver the last fifty years peasantries have experienced massive and multi-faceted processes of agrarian modernization. During this period it has become increasingly clear that this particular form of modernization not only excludes the majority of farmers, but that in the end, it also tends to destroy those farmers who have followed the modernization script and converted themselves into agrarian entrepreneurs…In this respect the most telling reversal is that at present (due to the financial and economic crises) relatively small-scale, peasant-like farms are generating incomes that are often superior to those of far larger, entrepreneurial farms* (Van Der Ploeg; pgs. 2 and 11).

I find that the most notable feature of the post-crisis Agua Buena coffee agroecosystems was the adoption of coffee agroforestry systems modeled after alley cropping, improved fallowing swidden cultivation, and traditional homegarden agroforestry systems and so incorporated a wide array of annual and pluri-annual as well as perennial food crops which diminished the amount of off-farm food purchases and thus reversed historic vulnerabilities in Agua Buena created by overdependence on a single cash crop.

However, the conversion of the formerly high-risk, toxic and unsustainable technified systems into complex successional mosaics of coffee agroforests featuring high levels of native tree and annual crop diversity was not just the product of a transition principally directed by external actors their resources- actors such as MAG, CAN and INA. Instead, the resilience and the resistance of the SG coffee agroecosystems was due to a combination of this broader external support along with several locally contingent factors, one of which was related to the existence of several highly skilled, quick learning and always experimenting leaders within the SG that successfully developed a locally adapted suite of transition practices and strategies that were openly shared and taught to the rest of the SG. All five members of the 2001 CoopaBuena board off directors happened to be among the small group of eloquent, visionary and hardworking farmers that would eventually provide this intellectual leadership that was an integral part of the SG's success. In 2001, prior to the beginning of the conversion process, this Board of Directors prepared an especially prescient statement that was read at that year's CoopaBuena Asamblea.

> *(T)he consequences of the crisis are more painful due to the fact that coffee has remained a monoculture for many years in our region…(F)ellow members, in the most respectful manner, but with the best of intentions this board of directors insists that we re-establish the homegardens that once played an integral role in maintaining self-sufficiency*

> *and food security within our household economies; by growing our own food we can drastically reduce our expenses* (Board of Directors Report, 2001 Annual Meeting of CoopaBuena).

However, the more generalizeable result of this study is that of the pivotal role played by Costa Rican governmental institutions in the SG transition process through their financial, technical and logistical support. This is important because the process took place amidst the backdrop of "roll-back neoliberalism" characterized by privatization and declining state involvement in the provision of services (Brenner 2002). With no market, not even a "fair" one, able or willing to provide the training and unique resources these smallholders needed (Chapter 5), the state not only stepped in, but was successful according to the results of this study. With innumerable environmental, social and economic spillover effects of this transition process accruing at several scales, the results of this study argue for the creation or redirection of state-led institutions with the power and support to conduct agroecological research and training, especially in the de-technification transitional process to low-external input agriculture.

Conclusion

The preceding dissertation research was interdisciplinary: It combined economic history, political economy and agroecology. In addition it was multi-scalar, analyzing change at the nation-state and community level. It was also temporally extensive, analyzing agrarian change from the introduction of coffee commodity production in Costa Rica up to the year 2009. The wide ranging nature of this inquiry makes it both a challenge and a necessity to identify common themes, conclusions and topics for further research and action.

The results of this research clearly show that the single greatest contribution to the persistence of the Agua Buena coffee producing peasantry between the years of 2000 and 2009 was the adoption of sustainable agricultural practices, especially those that reduced the amount of external inputs needed to maintain coffee production. One conclusion of this dissertation is that continued research into and extension of these methods is important and should be supported by governments and development organizations.

It is also clear from the results of this research that the State played a key role in the maintenance of the Agua Buena peasantry by establishing a sustainable coffee conversion program targeted at resource poor smallholders as the coffee crisis deepened. This finding highlights the continuing importance of many of the vestiges of once monolithic state-run agricultural institutions, like the INA and MAG, following rollback neoliberalism. In doing so, it also contradicts the notion that the Costa Rican state has been emasculated by neoliberalism. Instead we see that the importance of the state has been a theme throughout the history of Costa Rican coffee production. As discussed in Chapter 2, the Costa Rican government's support of peasant coffee production played a key role in raising the standard of living in this tiny Central American backwater to levels equal to Western Europe and North America. This serves to empirically show that, unlike in the theories of classical agrarian change, peasant agricultural sectors can be an important, persistent factor in the economic development of resource-poor nations without being liquidated in the transition to full agrarian capitalist relations in the countryside. This case study of Costa Rica reveals that peasants have historically, currently do, and in the future potentially may have a vital role in sustainable development.

In light of these results, it would be easy to conclude that maintaining a peasant agricultural sector that can in turn continue to support these positive aspects of economic development is simply a matter of directly supporting state-led research and extension of sustainable agricultural practices. This reading would however be incomplete. As the experience of the Control Group shows, state support for sustainable agriculture in Agua Buena did not stave off high-levels of land-use change and differentiation of the peasantry following the coffee crisis in the region as a whole. One of the main reasons that this massive transition did occur was that local grassroots cooperative institutions failed to capably, honestly, and effectively represent smallholder family farmers in a period of crisis. While CoopaBuena and later CoopePueblos were instrumental as nodes of interaction between state level rural development institutions and the international development NGO CAN, the history of mismanagement, corruption and debt in these institutions, along with a lack of transparency and accountability, has meant that many farmers do not feel supported or represented by their grassroots institutions. Any claims that the cooperative institutions currently and historically in place in Agua Buena represent something akin to a social movement accountable and responsive to smallholder peasants would be mistaken. Consequently, there is an accountability gap between institutions at the state and international level and the farm-households they purport to support.

Institutions with more transparency and accountability built into their structure will be necessary to promote positive future social and agroecological change in Agua Buena among a larger number of smallholder farm-households. These institutions will also have to be appropriate to the local culture. In rural southern Costa Rica, family takes precedence over community. Thus it is not surprising that in CoopePueblos, a single family came to dominate the management of the institution to such an extent that the majority of the cooperative's members did not receive the benefits of Fair Trade and direct markets. One of my key informants from the Sustainable Group suggests another form of social organization, a *sociedad anonima*, as a more appropriate scale and design of peasant social organization. These groups are usually formed by smaller, more closely-knit groups who are more able and likely to hold each other accountable. This type of social organization has become much more feasible with the development of new technologies allowing coffee processing and commercialization at smaller scales. The challenge would be in linking these smaller groups, spread out across the countryside. A real social movement could serve that function. The emergence of such a movement is not inconceivable: While *Via Campesina* is not present in Agua Buena, the discourse of food sovereignty was a recurring theme in the subsistence logics of the farmers in the Sustainable Group.

Support should be given at all levels for emerging institutions such as *sociedad anonimas* that have adopted scales of organization more appropriate for the social and cultural context of the highland coffee communities of southern Pacific Costa Rica and at the same time express the agroecological and social justice concepts embedded in the ideal of food sovereignty. When combined with state-level research and extension into agroecological methods appropriate for building resistant peasant coffee production systems, a network of resilient households and local organizations will be better equipped to handle future economic crises and natural disasters.

Appendices

Appendix 1. ***Presentación***: Buenos días (Buenas tardes), mi nombre es...Estoy trabajando en un estudio sobre los cambios en los medios de vida rurales y practicas agrícolas desde la crisis de café y el impacto de mercados alternativos en el bienestar de las familias productoras del distrito de Agua Buena y queremos pedirle su colaboración contestando a las preguntas que le haremos. Durará 45-60 minutos aproximadamente, sus repuestas nos ayudarán mucho en nuestro trabajo, esperamos nos facilite tiempo... *(Se esperan que la entrevista sea realizada con las personas cabezas de familia)*

I. DATOS GENERALES

Número de Ficha: ________ Entrevistador: ____________________________________
Fecha: ______ / _____ / _______
Nombre entrevistado(a): _______________________ Hora inicio: _______ Final: ______

1. Dirección: _____________________
Comunidad: ___________________
Distrito: ______________________
2. No. Teléfono: _________________
3. Pertenece usted a la cooperativa con la cual comercializa su café:
a. ☐ Sí; *b.* ☐ No.
[Si la respuesta es No, ir a la pregunta 6]
4. Nombre de la cooperativa:
____

5. ¿Años tiene de ser socio de la cooperativa? ________________
6. ¿Vive en la finca? *a.* ☐ Sí; *b.* ☐ No.
7. Número de personas que viven en la casa: _________ *¿En 2000?:* ________
8. No. de familiares que dependen de usted: _________ *¿En 2000?:* _________
9. ¿Cual año llego ud. a Coto Brus?
____
10. ¿De donde vino? _______________
11. ¿Donde nació ud. (cantón)? _______

II. COMPOSICIÓN FAMILIAR, EDUCACIÓN

12. En el cuadro siguiente anotar todas las personas que duermen y comen en la casa hoy en día y después los hijos u *otras que se encuentran fuera de hogar pero vivieron allí en 2000.*

#	Nombre completo	Parentesco	Sexo *(M/F)*	Edad	Ocupación	Nivel escolar	Estud *(S/N)*	Esc. adulto *(S/N)*	Vive en la casa 2008	Vive en la casa 2000
1		**1**								
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										

***Sexo**: M-Hombre, F- Mujer;*
***Estud:** Estudia (Sí, No);*
***Vive en la casa 2008** (S/N); **Vive en la casa 2000** (S/N)*
Clave parentesco:
1- Jefe de familia
2- Conyugue
3- Hijo(a)
4- Padre/Madre
5- Abuelo(a)
6- Hermano (a)
7- Otro familiar
8- No familiar

Clave nivel escolar:
1- No aplica niños en edad aún no escolar
2- Analfabeto(a)
3- Preescolar
4- Primaria completa
5- Primaria incompleta
6- Secundaria completa
7- Secundaria incompleta
8- Técnico medio completo
9- Técnico medio incompleto
10- Universidad completa
11- Universidad

13. ¿Algunas personas de su familia han recibido becas para estudiar en los últimos 8 años?
a. ☐ Sí; *b.* ☐ No. *[Si la respuesta es Sí], Como se llama la organización que les dio la beca?*
____

¿Hay adultos en su hogar que han recibido clases/ capacitaciones durante los últimos ocho años?
a. ☐ Sí; *b.* ☐ No [si la respuesta es Sí, llenar cuadro]

Fechas	Temas	Organización

14. ¿Que clases/capacitaciones quisiera tomar en el futuro?

III. MIGRACIÓN

15. ¿Hay algún miembro que ha emigrado a trabajar fuera del cantón durante los últimos 8 años (2000-2008)? a. ☐Sí; b. ☐ No.
(Utilice la columna "#" de la tabla anterior para especificar los miembros de la familia que han migrado a otros departamentos o al exterior por motivos de estudio, trabajo u otros, también utilice claves para destinos y motivos)

# Miembro	Destino	Motivo del viaje	Año y mes salio	Año y mes regreso

***Clave destinos:** **1.** Otro cantón, **2.** Centroamérica, **3.** EE UU, **4.** México, **5.** Canadá, **6.** Cuba, **7.** Suramérica, **8.** Europa, **9.** Asia, **10.** otros; **Clave motivos de viaje:** **1.** Para vivir únicamente, **2.** Trabajo, **3.** Estudio.*

13. Si nadie ha migrado ¿Por qué no ha salido Ud. o alguien de su familia a EU o Canadá u otra parte de Centroamérica y Costa Rica para trabajar o vivir?:

IV. Condiciones De Vivienda Y Bienestar Familiar (Entrevistador, use la observación directa para contestar algunas de estas preguntas. No se limite solo a preguntar)

14. ¿Tiene el hogar acceso al agua?
a. ☐ Sí; b. ☐ No.

15. ¿Cual es la forma de accesar? [encierre numeral, pueden ser varias]
a. ☐ pozo; b. ☐ río; c. ☐ naciente;
d. ☐ acueducto

16. ¿Es limpia? a. ☐ Sí; b. ☐ No

17. ¿Tiene Energía Eléctrica?
a. ☐ Sí; b. ☐ No.

18. ¿Cuántas habitaciones tiene la casa?
____

19. ¿Tipo de piso en la casa?
a. ☐ Cemento; b. ☐ Terrazo; c. ☐ Mosaico; d. ☐ Madera; e. ☐Cerámica;
f. ☐Otra ___

20. ¿Ha realizado mejoras en casa en los últimos 8 años?
a. ☐ Sí; b. ☐ No; ¿Que tipo de mejoras?

V. Uso De La Tierra 2000-2008

21. ¿Que áreas de la finca o parcelas están ocupada en los siguientes rubros?

Rubro	2000 Área he	2008 Área he	2010 Esperado Área he
1. Casa y Patio			
2. Café			
3. Maíz			
4. Frijol			
5. Hortalizas			
6. Pasto			
7. Tacotales			
8. Bosque reforestado			
9. Bosque natural			
10. Otros:			
11. Otros:			
12. Total			

VI. Cambios En Los Medios De Vida 2000-2008

22. ¿Cuales son los tres rubros más importantes para la economía de su familia?

En 2000	*En 2008*
a.	a.
b.	b.
c.	c.

23. ¿Cuales son las nuevas actividades productivas en los últimos ocho anos?
____
____

24. ¿De donde viene la iniciativa de las nuevas actividades?
a. Propia; b. Proyecto; c. Cooperativa
d. Otra: ____________________

25. ¿Desde su perspectiva como debería de diversificar la finca para tener diferentes fuentes de ingreso?
____

26. Cultivos Principales (Aparte de Café)
Cultivo 1:
____

Pregunta	Can-tidad	Unidad de Medida	En 2000
¿Cual fue la producción total en los últimos doce			

meses?			
¿Cuanto destinó a la venta?			
¿Cuanto destinó a consumo del hogar?			
¿Cuanto destinó para regalar?			
¿Cuanto destinó para semilla?			
¿Cuanto destinó para crianza de animales?			

Cultivo 2: ____________________________

Pregunta	**Can-tidad**	**Unidad de Medida**	**En 2000**
¿Cual fue la producción total en los últimos doce meses?			
¿Cuanto destinó a la venta?			
¿Cuanto destinó a consumo del hogar?			
¿Cuanto destinó para regalar?			
¿Cuanto destinó para semilla?			
¿Cuanto destinó para crianza de animales?			

Cultivo 3: ____________________________

Pregunta	**Can-tidad**	**Unidad de Medida**	**En 2000**
¿Cual fue la producción total en los últimos doce meses?			
¿Cuanto destinó a la venta?			
¿Cuanto destinó a consumo del hogar?			
¿Cuanto destinó para regalar?			
¿Cuanto destinó para semilla?			
¿Cuanto destinó para crianza de animales?			

Cultivo 4: ____________________________

Pregunta	**Can-tidad**	**Unidad de Medida**	**En 2000**
¿Cual fue la producción total en los últimos doce meses?			
¿Cuanto destinó a la venta?			

Cultivo 5: ____________________________

Pregunta	**Can-tidad**	**Unidad de Medida**	**En 2000**
¿Cual fue la producción total en los últimos doce meses?			
¿Cuanto destinó a la venta?			

¿Cuanto destinó a consumo del hogar?			
¿Cuanto destinó para regalar?			
¿Cuanto destinó para semilla?			
¿Cuanto destinó para crianza de animales?			

Cultivo 6:__________________________

Pregunta	Can-tidad	Unidad de Medida	En 2000
¿Cual fue la producción total en los últimos doce meses?			
¿Cuanto destinó a la venta?			
¿Cuanto destinó a consumo del hogar?			
¿Cuanto destinó para regalar?			
¿Cuanto destinó para semilla?			
¿Cuanto destinó para crianza de animales?			

Cultivo 7:____________________________

Pregunta	Can-tidad	Unidad de Medida	En 2000
¿Cual fue la producción total en los últimos doce meses?			
¿Cuanto destinó a la venta?			
¿Cuanto destinó a consumo del hogar?			
¿Cuanto destinó para regalar?			
¿Cuanto destinó para semilla?			
¿Cuanto destinó para crianza de animales?			

27. Numero de Animales

Animales	# 2000	# 2008
Ganado		
Cerdo		
Pollo		
Gallina		
Otros:		
Otros:		
Otros:		

28. Crianza de Animales: ***2000***

Pregunta	Ganado	Cerdos	Aves de corral	Otros	Otros
¿Cual es el valor de lo vendido en el año de 2000 (en 2000 colones)?					
¿Cual es el valor de lo consumido por el hogar?					
Total					

En 2008

Pregunta	Ganado	Cerdos	Aves de corral	Otros	Otros
¿Cual es el valor de lo vendido en los últimos doce meces (en 2008 colones)?					
¿Cual es el valor de lo consumido por el hogar?					
Total					

29. Productos Derivados: ***2000***

Pregunta	Leche	Queso	Huevos	Otros	Otros
¿Que cantidad vendió en el año 2000?					
¿Que unidad de medida?					
¿Que cantidad consumido en el año 2000?					
Total					

En 2008

Pregunta	Leche	Queso	Huevos	Otros	Otros
¿Que cantidad vendió en los últimos doce meses?					
¿Que unidad de medida?					
¿Que cantidad consumido en los últimos doce meses?					
Total					

30. ¿Que cultivos tenia intercalados en su cafetal en 2000?

____

¿En el 2008?

____

31. De los alimentos básicos para la familia ¿cuanto produjo en 2000? *[encierre numeral y escriba %]*
a. ☐ todos; b. ☐ más de la mitad;
c. ☐ menos de la mitad; d. ☐ nada;
% producido: ___
¿En el 2008?:
a. ☐ todos; b. ☐ más de la mitad;
c. ☐ menos de la mitad; d. ☐ nada;
% producido:___

32. ¿Contrato mano de obra externa para el manejo de café en el 2000?
a. ☐ Si; b. ☐ No

Personas temporales: _______
Permanentes: _________
¿En 2008?
Personas temporales: _______
Permanentes: _________

33. ¿En el 2000 de donde viene la mano de obra? *[puede ser más de uno]*
a. ☐ De Panamá; b. ☐ De la comunidad; c. ☐ Otros distritos o cantones
¿En 2008?
a. ☐ De Panamá; b. ☐ De la comunidad; c. ☐ Otros distritos o cantones

34. Jornales por año (utiliza las siguiente cuadra para calcular con entrevistado(a))

	Días de trabajo familiar en la finca	**Días de peón en la finca**
2000		
2008		

2000 Días de Trabajo por Mes (Familiares y Peones)

Persona	En	Fe	Ma	Abr	May	Jun	Jul	Ag	Se	Oc	No	Dic	Tot
Hombres													
Mujeres													
Jovenes													
Niños													
Niñas													
Peones													
												Tot	

2008

Persona	En	Fe	Ma	Abr	May	Jun	Jul	Ag	Se	Oc	No	Dic	Tot
Hombres													
Mujeres													
Jovenes													
Niños													
Niñas													
Peones													
												Tot	

35. Trabajo familiar no en la finca en Coto Brus (no migración)

# miembro	**Tipo de trabajo**	**2000 días de trabajo**	**2008 días de trabajo**

36. ¿En el último año ha tenido otra fuente de ingreso?
a. ☐ Si; b. ☐ No
¿Si la respuesta es si, de que tipo?

---

37. ¿En los últimos 8 años como han cambiado sus ingresos?
a. ☐ Aumentado; b. ☐ Disminuido;
c. ☐ Ningún cambio
Y sus ahorros:
a. ☐Aumentado; b. ☐ Disminuido;
c. ☐Ningún cambio

38. ¿Ha sentido alguna vez que no ha podido cubrir sus necesidades básicas de alimentación?
a. ☐Si; b. ☐No

39. ¿Siente que hay un riesgo de perder su finca?
a. ☐ Si; b. ☐ No

40. ¿Quiere que sean agricultores sus hijos?
a. ☐ Si; b. ☐ No

VII. Precios, Volúmenes, Calidades, y Rendimiento Para La Cosecha

41. ¿Cual fue su producción total de café en 2000 ______ fanegas; _____fanegas/he
En la última cosecha (2008)? ______ fanegas; _____fanegas/he
En 2007? ______fanegas; _____fanegas/he
Esperado en 2009? ______fanegas; _____fanegas/he

A quien vendió sucafé	Certificación	Mercado	Cuantos fanegas vendió	Cuanto recibió de adelanto Colones / fan	Pago a la entrega Colones / fan	Ultimo pago o reajuste C / fan	Mes de pago final	Precio completo C / fan

A quien vendió su café
1- Coopepueblos
2- Coopesabalito
3- Coopesanvito
4- Coyote
5- La Lila
6- Otro (especifique)

Certificación
1- Orgánico
2- Café Sostenible
3- Rainforest
4- Comercio Justo
5- Starbucks
6- No sabe

Mercado
1- Comercio Justo
2- Orgánico
3- Orgánico y justo
4- Convencional
5- Comercial
6- Mercado Directo
7- No sa

42. ¿Que piensa usted es un precio justo (por fanega)?

43. ¿Recibe pre-financiamiento?
a. ☐ Si; b. ☐ No De quien? _____________

44. ¿A que tasa interés anual recibe pre-financiamiento? ___ %

45. ¿En los últimos 2 años ha recibido crédito?
a. ☐ Si; b. ☐ No De quien? _____________

VIII. Datos De Cooperativa y Comunidad

46. ¿Como es su participación el la cooperativa?
a. ☐ muy activa; b. ☐ medio activa;
c. ☐ poco activa; d. ☐ ha sido miembro de la junta

47. ¿En el los últimos doce meses, cuantos días invirtió en los siguientes trabajos relacionados a la cooperativa:

Trabajo relacionado con la cooperativa	**# días**
días asistiendo a reuniones de cooperativa	
días en capacitaciones y intercambios	

48.
¿Ser miembro de una coop. le ha ayudado a vender el café a mejores precios?
a. ☐ Si; b. ☐ No; c. ☐ No se

49. ¿Cree que la cooperativa ayuda facilitar vínculos con otras redes y organizaciones?
a. ☐ Si; b. ☐ No; c. ☐ No se

50. ¿Hay buena comunicación entre la administración y los socios?
a. ☐ Si; b. ☐ No; c. ☐ No se

51. ¿Como es su participación en los grupos comunitarios, actividades religiosas, rituales de la comunidad y deportes:
a. ☐ muy activa; b. ☐ medio activa;
c. poco activa; d. ☐ ha sido miembro de la junta

IX. Manejo Del Cafetal

52. Años en cultivo del café? ____

53. ¿Por cuantas generaciones ha cultivado café?
a. ☐ somos primeros; b. ☐ nuestros padres; c. ☐ nuestros abuelos; d. ☐ nuestros bisabuelos; e. ☐ Otros (especifique) __________________

54. ¿Cual es la variedad principal de café sembrada?
a. ☐ Caturra; b. ☐ Costa Rica – 95
c. ☐ Catui; d. Otra (especifique)

55. ¿Uso de la tierra antes de café?

56. ¿Cual es la distancia de siembra?
Entre plantas _________ m.
Entre calles _________ m.

57. ¿Cual sistema de poda utiliza en el cafeto (si la respuesta es selectiva va a 64)?
a. ☐ Por calle; b. ☐ Por lote;
c. ☐ Selectiva

58. Utiliza la poda selectiva por…
a. ☐ Planta; b. ☐ Rama; c. ☐ Parche

59. ¿Que tipo de poda usa?
a. ☐ Poda baja; b. ☐ Poda alta

60. ¿Deshijo el cafetal?
a. ☐ Si; b. ☐ No (pase a 69)

61. ¿Cuantos hijos deja por planta

62. ¿Cuando fue la ultima vez que resembró su cafetal? (año)

63. ¿Cual es la edad de su cafetal? ______años

64. ¿Cuantas veces al año arregla la sombra?___

65. ¿En 2000 realizó atomizaciones para controlar enfermedades y plagas?
a. ☐ Si; b. ☐ No ¿Cuántas veces al ano atomizó? _____
En 2008? a. ☐ Si; b. ☐ No ¿Cuántas veces al ano atomiza? _____

66. Enfermedades, plagas y atomizaciones

Enfermedad o Plaga	¿Se encuentra?	¿Realiza atomizaciones?	¿Cuantas veces al año atomiza?	*En 2000:* ¿Se encuentro?	*En 2000:* ¿Realiza atomizaciones?	*En 2000:* ¿Cuantas veces al año atomiza?
ojo de gallo						
derrite o quema						
roya del cafeto						
chasparria						
mal de hilachas						
nematodos						
jobotos						
arañitas						
cochinillas						
broca						
otra						

67. Productos utilizados y en las atomizaciones

Producto	No. de atom.	Producto	No. de atom.	Producto	No. de atom.

68. Control de malezas

¿Como controla las malezas?	¿Cuantas veces al año?	¿En 2000?
Manual		
Herbicidas		

69. Abonos

¿Que tipo(s) de abono aplicado al suelo utiliza?	¿Cuantas veces al año?	¿Que productos químicos o orgánicos utiliza?	*En 2000:* ¿Cuantas veces al año?	*En 2000:* ¿Que productos químicos u orgánicos utiliza?
Orgánico				
Químico				
Ninguno				

70. ¿Cuales cambios ha realizado en la finca desde 2000? (encierre el número, puede seleccionar varias opciones)
a. ☐ Menos uso de agroquímicos; b. ☐ Más trabajo de conservación de suelo;
c. ☐ Conservación de Agua; d. ☐ Otros (especifique) ________________

71. ¿Quiere cambiar su cafetal al sistema orgánico?
a. ☐ Si; b. ☐ No¿Porque? ________________________

72. ¿Cual es el nivel estimado de la pendiente del terreno?
a. ☐ 0-25%; b. ☐ 26-50%; c. ☐ 51-75%; d. ☐ 76-100%

73. ¿Cuales prácticas de conservación de suelos utilicé?
Ninguna: a. ☐ Si; b. ☐ No
Siembra de contorno: a. ☐ Si; b. ☐ No.
Gavetas: a. ☐ Si; b. ☐ No.
Canales de desviación: a. ☐ Si; b. ☐ No.
Barreras vivas: a. ☐ Si; b. ☐ No.
Barreras muertas: a. ☐ Si; b. ☐ No.
Acequias de ladera: a. ☐ Si; b. ☐ No.
Cultivos de cobertura: a. ☐ Si; b. ☐ No.
Otras_______________________________

74. ¿Que significa la sostenibilidad para usted?

75. ¿Que es su plan/ visión para la finca en los próximos 5 anos?

76. ¿Algún otro comentario o mensaje que usted quiera compartir con la cooperativa o CAN?

MUCHAS GRACIAS POR SU AYUDA

Appendix 2.

Nombres del equipo del inventario: Fecha:
Nombre del productor(a):
Ubicacion geografica del arbol centrico:

______matas por_____ m2 café altura promedio___________ café circum. promedio___________	% sombra ____ % pendiente _____ Comentario y recomendaciones:	Conservación de Suelos __ gavetas __barreras __contorno __canales de desviación	# especies árboles______ # especies cultivos ______

No de Árbol	Nombre Común	Nombré _ científico	circum_cm	altura_m	No de Árbol	Nombre Común	Nombré _ científico	circum_cm	altura_m
1					71				
2					72				
3					73				
4					74				
5					75				
6					76				
7					77				
8					78				
9					79				
10					80				
11					81				
12					82				
13					83				
14					84				
15					85				
16					86				
17					87				
18					88				
19					89				
20					90				
21					91				
22					92				
23					93				
24					94				
25					95				
26					96				
27					97				
28					98				
29					99				
30					100				
31					101				
32					102				
33					103				
34					104				
35					105				
36					106				
37					107				
38					108				
39					109				
40					110				
41					111				
42					112				
43					113				
44					114				
45					115				
46					116				
47					117				
48					118				
49					119				
50					120				
51					121				
52					122				
53					123				
54					124				
55					125				
56					126				
57					127				
58					128				
59					129				
60					130				
61					131				
62					132				
63					133				
64					134				
65					135				
66					136				
67					137				
68					138				
69					139				
70					140				

Appendix 3.

Excerpt from CoopePueblos Board of Director's Meeting Minutes, March 28th 2011

ACTA N° 69 SESIÓN ORDINARIA

CONSEJO DE ADMINISTRACIÓN, COOPEPUEBLOS R.L.

Sesión ordinaria número sesenta y nueve del Consejo de Administración de la Cooperativa Agroecológica y de Servicios Múltiples R.L. COOPEPUEBLOS R.L. celebrada en las instalaciones de la cooperativa, ubicadas en Copa Buena, Agua Buena; al ser las catorce horas del veintiocho de marzo del año dos mil ocho.

El precio total del bien inmueble en cuestión, en función de las condiciones especiales de venta para COOPEPUEBLO R.L depende del plazo requerido por el mismo para efectuar el pago del saldo final.

PRIMA: el monto de la prima será de nueve millones de colones (¢ 9.000.000.^{00}) pagaderos en efectivo el día 07 de marzo del 2009, es decir a un año plazo; este monto y plazo de pago NO están sujetos a ningún tipo de negociación.

SALDO: el monto del saldo y por ende del valor total de la propiedad dependerán del plazo que se requiera para hacer efectivo este pago, para tal efecto se toma como referencia la siguiente tabla:

Fecha límite PAGO	Plazo Total	Monto Saldo
07 marzo ´09	12 meses	**¢ 11.000.000**
07 julio ´09	16 meses	**¢ 12.000.000**
07 noviembre ´09	20 meses	**¢ 13.000.000**
07 marzo ´10	24 meses	**¢ 14.000.000**

Excerpt from Report by CoopePueblos Watchdog Committee, June 16, 2008

Comité de Vigilancia.

Sesión ordinaria #31 celebrada el día 16 de junio de 2008, al ser las 3:00 pm la asistencia de Sergio Ureña Arias y Noemy Herrera Espinoza; ausente José Luis Gonzales Sancho.

Nuestra mayor preocupación es la compra de un lote para construir el beneficio, este lote lo ofreció don Alexis Méndez, el expuso su propuesta de negocio donde la comisión negociadora no objetó ninguna contra, solo lo que don Alexis propuso, a nuestro parecer se excedió en la cantidad. Otro punto es que don Roberto Jiménez ofreció un lote donado, solamente con el gravamen de que no fuera vendido ni prendado, esto para ayudar ala cooperativa, y por parte del consejo de administración y gerencia no se le envío ninguna nota de consideración por su oferta, ósea donde se le rechazó. Creemos que se debe estudiar más cualquier negocio que se plantee, ya que contamos con un arrastre financiero muy grande para la empresa que está empezando, no deseamos que este hueco aumente, que se le de solución.

Appendix 4.

Sustainable Group (25584 individuals and 61 species)					Control Group (2684 individuals and 58 species)				
Species	**Local Name**	**# Ind**	**% of total**	**N/E**	**Species**	**Local Name**	**# Ind**	**% of total**	**N/E**
*Erythrina poeppigiana**	Poró gigante	802	31.34	N	*Musa X paradisiacal*	Plátano	962	35.8	E
Musa acuminata	Banano	505	19.73	E	*Erythrina poeppigiana**	Poró gigante	468	17.4	N
Musa X paradisiaca	Plátano	408	15.94	E	*Erythrina berteroana*	Poró pequeno	465	17.3	N
Erythrina berteroana	Poró pequeno	245	9.57	N	*Musa acuminata*	Banano	440	16.4	E
*Inga edulis**	Guaba	119	4.65	N	*Dracaena fragrans*	Caña India	64	2.4	E
Dracaena fragrans	Caña India	64	2.5	E	*Citrus sinensis*	Naranja criolla	40	1.5	E
*Psidium guajava**	Guayaba	57	2.23	N	*Inga edulis**	Guaba	35	1.3	N
*Gliricidia sepium**	Madero negro	41	1.6	N	*Gliricidia sepium**	Madero negro	26	0	N
*Persea americana**	Aguacate	31	1.21	N	*Cestrum racemosa**	Zorillo	11	0.41	N
Citrus sinensis	Naranja criolla	23	0.9	E	*Citrus aurantifolia x reticulata*	Manderina agria	11	0.41	E
Yucca guatamalensis	Itabo	23	0.9	N	*Spathodea campanulata*	Llama del bosque	10	0.37	N
*Senna papillosa**	Vainillo	22	0.86	N	*Quercus seemannii**	Roble encino negro	10	0.37	N
*Cecropia obtusifoila**	Guarumo colorado	20	0.78	N	*Persea americana**	Aguacate	10	0.37	N
*Inga densiflora**	Guaba	15	0.59	N	*Juglans olanchana**	Cedro nogal	10	0.37	N
*Platymiscium curuense**	Cristobal	15	0.59	N/End	*Macadamia sp.*	Macadamia	9	0.34	N
Myrcia spp.	Murta	13	0.51	N	*Senna papillosa**	Vainillo	8	0.3	N
Mangifera indica	Mango	12	0.47	E	*Pinus caribea*	Pino	8	0.3	E

Neurolaen a lobata	Gavilana	11	0.4 3	N	*Ocotea spp.*	Quina	8	0.3	N
Euterpe precatoria*	Palmito dulce	10	0.3 9	N	*Inga densiflora**	Guaba	8	0.3	N
Juglans olanchana	Cedro nogal	10	0.3 9	N	*Quercus insignis**	Roble encino blanco	7	0.2 6	N
*Cedrela odorata**	Cedro amargo	8	0.3 1	N	*Citrus limetta*	Limón dulce	6	0.2 2	E
Citrus reticulata	Manderin a dulce	8	0.3 1	E	*Yucca guatamalensis*	Itabo	4	0.1 5	N
*Byrsonima crassifolia**	Nance	6	0.2 3	N	*Mangifera indica*	Mango	4	0.1 5	E
Citrus aurantifolia x reticulata	Manderin a agria	6	0.2 3	E	*Psidium friedrichsthalia num*	Cas	3	0.1 1	N
*Tabebuia guayacan**	Corteza amarillo	6	0.2 3	N	*Persea spp.*	Aguacatil lo	3	0.1 1	N
Astronium graveolens *	Ron ron	5	0.2	N	Myrcia spp.1	Murta	3	0.1 1	N
*Bactris gasipaes**	Pejibaye	5	0.2	N	*Cordia alliodora*	Laurel	3	0.1 1	N
*Inga spectabilis **	Guaba	5	0.2	N	*Citrus reticulata*	Manderin a dulce	3	0.1 1	E
Aspidospe rma spruceanu m	Manglillo	4	0.1 6	N	*Cedrela tonduzii**	Cedro dulce	3	0.1 1	N
Cordia alliodora	Laurel	4	0.1 6	N	*Calophyllum brasiliense**	Cedro maria	3	0.1 1	E
Piper auritum	Anisillo	4	0.1 6	N	*Beilschmiedia pendula*	Tigíssaro	3	0.1 1	N
Sysyngium malaccens is	Manzana de agua	4	0.1 6	E	*Spondias purpurea*	Jocote	2	0.0 7	N
Averrhoa carambola	Carambo la	3	0.1 2	E	*Psidium guajava**	Guayaba	2	0.0 7	N
Eucalyptus spp.	Eucalipto blanco	3	0.1 2	E	Myrcia spp.2	Murta	2	0.0 7	N
Spathodea campanula ta	Llama del bosque	3	0.1 2	E	*Miconia spp*	Lengua de baca	2	0.0 7	N
*Verbesina tapantiana **	Lengua de baca	3	0.1 2	N	*Ficus pertusa*	Higuerón	2	0.0 7	N
*Caliandra caliothysru s**	Caliandr a	2	0.0 8	N	*Citrus aurantium*	Naranja agria	2	0.0 7	E
*Cecropia peltata**	Guarumo blanco	2	0.0 8	N	*Cassia alata*	Saragun di	2	0.0 7	N

Citrus aurantium	Naranja agria	2	0.08	E	*Carapa guianensis**	Cedro bateo	2	0.07	N
Citrus limetta	Limón dulce	2	0.08	E	*Acnistus aborescens*	Guitite	2	0.07	N
Nephelium lappaceum	Mamón chino	3	0.12	E	*Ulmus meicana*	Cenizo	1	0.04	N
Ocotea spp.	Quina	2	0.08	N	*Tabebuia guayacan**	Corteza amarillo	1	0.04	N
*Quercus insignis**	Roble encino blanco	2	0.08	N	*Sysyngium malaccensis*	Manzana de agua	1	0.04	E
*Quercus seemannii**	Roble encino negro	2	0.08	N	*Platymiscium curuense**	Cristobal	1	0.04	N
*Terminalia amazonia**	Amarillón	2	0.08	N	*Palicourea podifolia**		1	0.04	N
*Allophylus psilospermus**		1	0.04	N	*Ochroma pyramidale*	Balsa	1	0.04	N
Annona muricata	Guanábana	1	0.04	N	*Malva paviflora*	Malva	1	0.04	N
*Casipoubrea elliptica**		1	0.04	N	*Inga tonduzii*	Guaba	1	0.04	N
*Cedrela tonduzii**	Cedro dulce	1	0.04	N	*Inga spectabilis**	Guaba	1	0.04	N
*Diphysa americana**	Guachipelin	1	0.04	N	*Eucalyptus spp.*	Eucalipto blanco	1	0.04	E
Eriobotrya japonica	Nispero	1	0.04	E	*Diphysa americana**	Guachipelin	1	0.04	N
*Guatteria costaricensis**		1	0.04	N	*Cinnamomum criplinerva*	Aguacatillo	1	0.04	N
*Miconia spp.**	Lengua de baca	1	0.04	N	*Cecropia obtusifoila**	Guarumo colorado	1	0.04	N
*Quararibea funebris**	Cacao de montana	1	0.04	N	*Caliandra caliothysrus**	Caliandra	1	0.04	N
Ricinus communis	Higuerilla	1	0.04	E	*Bixa orellana**	Achiote	1	0.04	N
*Sapium allenii**	Chilamate	1	0.04	N	*Bactris gasipaes**	Pejibaye	1	0.04	N
*Cestrum racemosa**	Zorillo	1	0.04	N	*Annona muricata*	Guanábana	1	0.04	N
*Solanum chrysotrichum**	Berengena silvestre	1	0.04	N	*Anacardium occidentale*	Marañon	1	0.04	N
Sysyngium jambos	Manzana rosa	1	0.04	E	* Shared w/ Primary Forest Fragments or Las Cruces Reserve N=Native to southern Costa Rica E = Exotic/ Introduced END=				

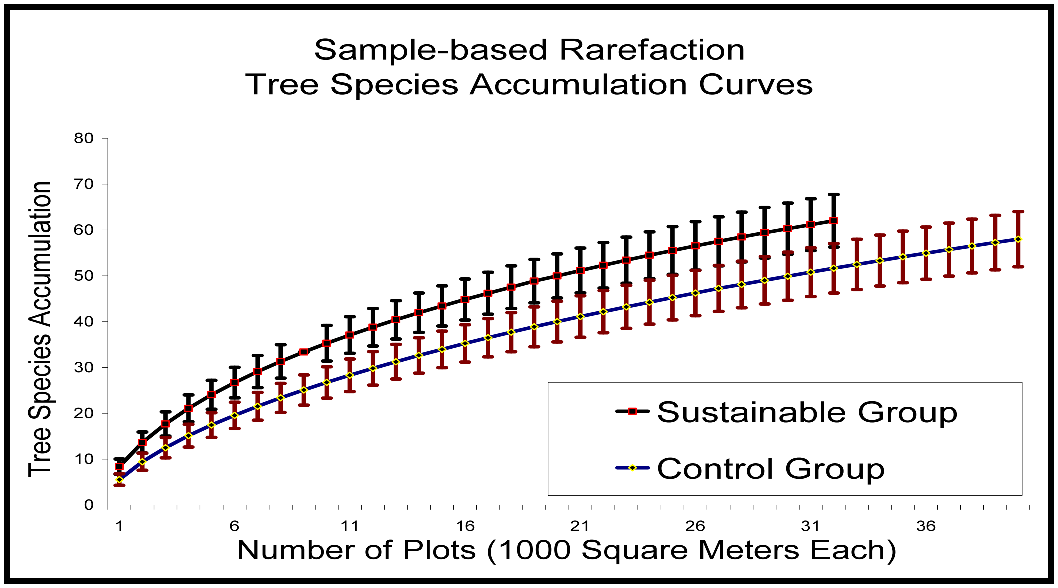
					Endangered - IUCN
*Tabebuia rosea**	Roble de sabana	1	0.04	N	Shaded = Unique species to either CG or SG not found in the other group
Theobroma cacao	Cacao	1	0.04	N	

Appendix 5.

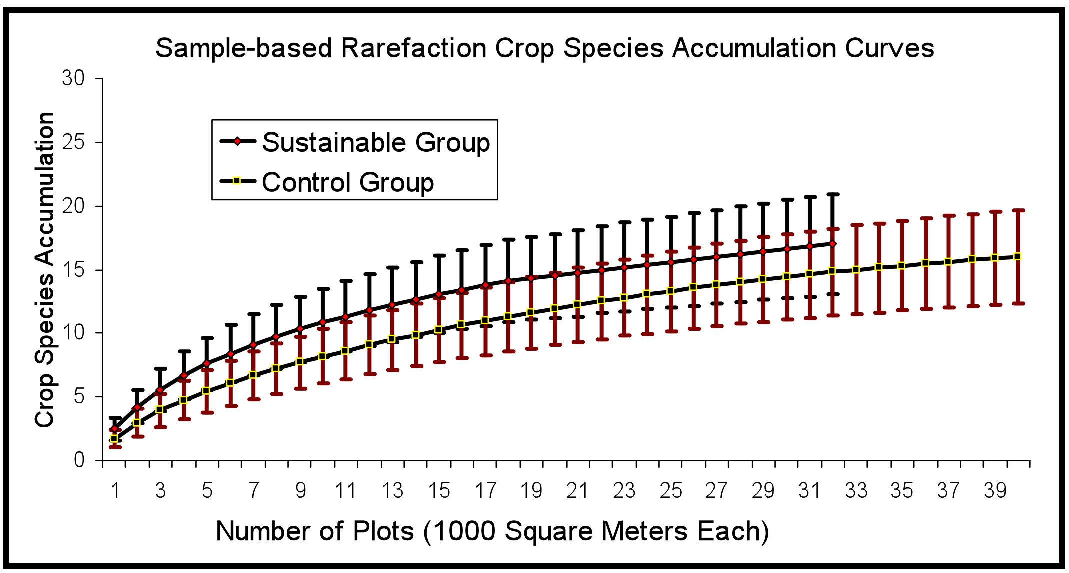
Sustainable Group (17 species and 1157 individuals)				**Control Group** (16 species and 1121 individuals)			
Species Name	**Local Name**	**# Ind**	**% of total**	**Species Name**	**Local Name**	**# Ind**	**% of total**
Manihot esculenta	Yuca	302	26.1	*Colocasia esculenta*	Ñampi	323	28.8
Ananas comosus	Piña	216	18.7	*Manihot esculenta*	Yuca	253	22.6
Sacharum officinarum	Caña azucar	142	12.3	*Xanthosoma sagittifolium*	Tiquisque	116	10.3
Zea mays	Maíz	132	11.4	*Mora spp.*	Mora de arbol	113	10.1
Xanthosoma sagittifolium	Tiquisque	119	10.3	*Sacharum officinarum*	Caña azucar	87	7.8
Colocasia esculenta	Ñampi	110	9.5	*Arracacia xanthorribiza*	Arracache	78	7
Raphanus sativus	Rabano	57	4.9	*Ipomoea batatas*	Camote	55	4.9
Dioscorea alata	Papa china	44	3.8	*Ananas comosus*	Piña	27	2.4
Costaceae	Caña agria	11	1	*Cucumis sativus*	Pepino	21	1.9
Cymbopogon nardus	Zacate limón	8	0.7	*Solanum quitoensis*	Naranjillo	19	1.7
Solanum quitoensis	Naran-jillo	5	0.4	*Dioscorea trifida*	Papa china	8	0.7
Dioscorea trifida	Ñame	4	0.3	*Cymbopogon nardus*	Zacate limón	6	0.5
Cucurbita moschata	Ayote	3	0.3	*Cucurbita moschata*	Ayote	5	0.4
Mucuna pruriens	Frijol tercio-pelo	2	0.2	*Sechium edule*	Chayote	5	0.4
Sechium edule	Chayote	1	0.1	*Zea mays*	Maíz	4	0.4
Mora spp.	Mora de arbol	1	0.1	*Cajanus cajan*	Frijol gandú	1	0.1

Passiflora edulis	Mari-cuya	1	0.1	Shaded = Unique species to either CG or SG not found in the other group

Appendix 6.



Appendix 7.



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