

“PIFÁ, BANANAS, ORANGES ARE OUR FORESTS”: AGROFORESTRY AND
DEVELOPMENT AMONG SMALLHOLDER FARMERS IN PANAMA

A Dissertation

by

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ABSTRACT

Deforestation and forest fragmentation continue unabated in many parts of the world. Scholars point to the expansion of the agricultural frontier as a driver of forest and biodiversity loss. Government agencies and non-governmental organizations (NGOs) often promote agroforestry as a sustainable development strategy for combating deforestation while improving the livelihoods of smallholder farmers. Yet agroforestry projects designed by outsiders who have technical expertise but relatively little local or traditional knowledge can bring negative outcomes for farmers, local communities, and farmer associations. Prescriptive ideas from governments and NGOs may clash with or even contradict local understandings and practices of how forests, fields, and resources should be managed. Though farmers may participate in state and outsider projects, their decisions to embrace, ignore, or negotiate on their own terms how resources are managed ultimately determine the contents and contours of agricultural and forest landscapes.

The Panamanian government's Ministry of Environment, national institutions, and NGOs are promoting agroforestry projects among smallholder farmer association members. I compare the perspectives of farmer association members, non-members, and NGO and government staff to examine how farmers practice agroforestry, the reported benefits of agroforestry, the value of being part of a farmer association, and how agroforestry is supporting (or not) conservation in the Santa Maria River watershed and in the outskirts of Santa Fe National Park in Panama. Results of the research show how

micro-level natural resource management of smallholder farmers and livelihood strategies is linked with macro-level projects and discourse about agroforestry. Methods include semi-structured interviews, participatory mapping, and participant observation among smallholder farmers and NGO and government staff as well as the placement of camera traps on farms and in SFNP. The twenty-month ethnographic study reveals how farmers respond to the messages of environmental NGOs, government, and other outside actors. The significance of the project is in increasing knowledge about the complexities of managing natural resources for conservation while improving livelihoods.

DEDICATION

This dissertation is dedicated to the farmers of Santa Fe, Veraguas.

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Finally, thanks to my own family for their support. This degree is shared with you.

NOMENCLATURE

CBMAP	Corredor Biológico Mesoamericano del Atlántico/Atlantic Mesoamerican Biological Corridor
CDT	Consejo de Desarrollo Territorial/Territorial Development Council
MIAMBIENTE	Ministerio de Ambiente de Panamá/Ministry of Environment
MIDA	Ministerio de Desarrollo Agropecuario/Ministry of Agriculture and Livestock
NGO	Non-governmental organization
SFNP	Santa Fe National Park

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CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

Introduction

Deforestation and forest fragmentation continue unabated in many parts of the world (FAO 2010). Some scholars point to expanding agriculture as a driver of deforestation (FAO 2010; Geist and Lambin 2002; Schroth et al. 2004a). In Mesoamerica, rates of forest loss have been particularly dramatic (Garen et al. 2011; Harvey et al. 2008; Petit et al. 1999). By some estimates 80% of forests in the region have been converted to farms. Conversion leaves protected areas embedded within an agricultural landscape (DeClerck et al. 2010; Perfecto and Vandermeer 2010), and the resulting changes in land structure and function affect the lives of local people, especially those living close to subsistence (Scherr and McNeely 2008).

Despite global concerns about deforestation, we lack rigorous understanding of how deforestation affects and is affected by smallholder farmers. Some environmentalists advocate on behalf of farmers, arguing they are best suited to conserve biodiversity and ecosystem function within agricultural landscapes (Harvey et al. 2008). Indeed, some show smallholder farms are integral parts of a "natural" landscape (Perfecto et al. 2009; Schroth et al. 2004a).

By contrast, the Panamanian government and national NGOs (with international funding) have identified land management techniques of smallholder farmers as the *causes of deforestation* around Santa Fe National Park (SFNP) (ANAM 2009). Given the

perception of farming as the main cause of deforestation, the Panamanian government's National Environmental Authority, national institutions, and NGOs are promoting agroforestry projects. Although agroforestry, the cultivation of trees and crops, is a traditional land use among subsistence farmers in the tropics, it is also promoted by national and international development agencies as a tool to improve livelihoods and mitigate deforestation (Zomer 2009). In fact, such projects are outlined in the watershed and SFNP management plans. Agroforestry promoters focus especially on farmer associations, the groups farmers establish to maintain agricultural traditions, protect land rights, and participate in development initiatives. Through farmers' actions and involvement in agroforestry, farmers (and, indirectly, outside organizations) are shaping the landscape in Santa Fe.

Development projects like agroforestry have the *potential* to achieve goals that are socially, ecologically, and economically focused while providing a just distribution of benefits. Despite substantial investments in agroforestry projects, poverty levels within the Santa Fe district remain one of the highest in the province while environmental degradation continues. Farmers participating in agroforestry development projects receive a variation of the same packet of resources, including fertilizer, trees, workshops, extension assistance, and equipment. Is this development? Are farmers winning or losing by participating in these projects?

Research Objectives

My aim is to compare the views and experiences of farmers who practice agroforestry as part of sponsored farmer association projects with those of farmers who

practice agroforestry individually (i.e. outside of sponsored projects). I talked with representatives of national NGOs and government staff to learn more about the objectives and impacts of agroforestry projects. I probed about the intended impacts of agroforestry projects, the perceived benefits of agroforestry, and how agroforestry is expected to support the national park and watershed. Evaluating agroforestry from the diverging and overlapping perspectives of national NGOs, the Panamanian government, and farmers will help reveal how agroforestry projects are either hindering or supporting local livelihoods and conservation in the Santa Maria River watershed and SFNP in Veraguas, Panama.

The following **objectives** guide my research to understand how agroforestry development projects affect the farmers and environment within the Santa Maria River watershed and in the outskirts of SFNP:

1. Examine why farmers, NGOs, and government agencies participate in agroforestry.
 - Why do some farmers participate in agroforestry projects and others do not?
 - How and by whom are agroforestry projects being promoted?
 - How are economic, ecological, and social benefits meant to be allocated?
 - Who benefits from agroforestry and how?
2. Describe the relationship between agroforestry projects and farmer associations.
 - What is the value of being a member of a farmer association that participates in agroforestry projects?
 - How are certain farmer associations being targeted to participate in these projects?
3. Document the conservation and agroforestry practices of farmers on their farms.

- What types of agroforestry techniques are taught, by whom, and how are they practiced?
- How and why are certain plant species promoted and by whom?
- How and why do farmers select certain species to plant?
- How is agroforestry meant to support SFNP and the Santa Maria River watershed?
- How does the management of SFNP influence the management of farms and farming?

The farmers I have been working with will provide insight into how agroforestry shapes livelihoods and landscapes in particular ways. The research shows how farmers embrace, ignore, and/or otherwise respond to the messages of environmental NGOs, government, and other outside actors.

Literature Review

I use a political ecology framework to understand how farmers practice agroforestry, the reported benefits of agroforestry, the value of being part of a farmer association, and how agroforestry is supporting the national park and watershed. This framework allows me to understand the dynamics between social relations and environmental concerns (Borgerhoff Mulder and Coppolillo 2005). Perceptions about agroforestry among farmers and other actors will show how and why people interact with the environment and each other.

Agroforestry and Conservation

Agroforestry is “a dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental

benefits for land users at all levels” (Leakey 1997: 5). It comprises various practices, such as alley cropping, wind breaks, tree farming, and home gardens, that incorporate trees into farming systems (Schroth et al. 2004a). Development agencies often promote agroforestry as a multifunctional tool for achieving agricultural and conservation goals (Izac and Sanchez 2001).

Biologists have conducted extensive research on agroforestry. They have shown agroforestry systems can create biological corridors between forest remnants and protected areas (Cullen et al. 2004; Gascon et al. 2004; Laurance 2004), provide ecosystem services (Garrity and Agus 2000; Hall et al. 2011; Izac and Sanchez 2001; Jose 2009), and contribute to biodiversity conservation (Naughton-Treves and Salafsky 2004; Schroth et al. 2004a; Schroth and Harvey 2007). Nevertheless, only under certain conditions related to markets, policies, and income may agroforestry help reduce threats to protected areas (Garrity 1997; Murniati et al. 2001; Russell et al. 2010). The combination of factors is poorly understood (Angelsen and Kaimowitz 2004).

Many scholars have sought to understand the adoption of agroforestry (Cochran and Bonnell 2005; Mercer 2004; McGinty et al. 2008; Pattanayak et al. 2003). Understanding farmers’ adoption decisions provides insight into how farmers prefer to learn about agroforestry, who makes agroforestry adoption decisions within the household, and the perceived benefits of agroforestry (Current et al. 1995; Pattanayak et al. 2003).

The perceived benefits of agroforestry may be numerous (Bacon, Méndez, and Fox 2008; Méndez et al. 2010; Quandt 2010; Utting 1993). For example, Garen et al.

(2009) found that smallholder farmers involved in agroforestry projects in Panama planted a variety of multipurpose trees for wood, fruit, firewood, medicinal uses, and environmental purposes. These studies demonstrated the clear link of agroforestry to livelihoods. Livelihoods are “the capabilities, assets (stores, resources, claims and access) and activities required for a means of living” (Chambers and Conway 1992: 6).

Social Relations and Poverty Alleviation

To determine the role agroforestry has in supporting livelihoods and alleviating poverty, the costs and benefits must be understood. Many of the failures of agroforestry projects are the result of ignoring social and economic factors and providing few benefits to farmers (Current et al. 1995; Mercer and Miller 1998). Indeed, some agroforestry projects when implemented as part of development and conservation initiatives have delivered mostly *negative* social and ecological impacts (Pollini 2011; Rocheleau and Ross 1995; Schroeder and Suryanata 2004; Utting 1994). Other authors have also criticized development (Escobar 2011; Ferguson and Lohmann 2006; Stonich and DeWalt 2006). Escobar (2011) considered development a subversive tool used to control and dominate people of the ‘Third World’, which is related to uneven power relationships and the problematization of poverty. He criticized development for its consequences, how people participate in it, how people are affected by it, and who deploys it. Who is being targeted as part of development projects also must be considered (Classen et al. 2008).

Jansen (1998) discussed the power struggles that take place in the mountain agriculture setting in Honduras and showed that there are a number of micro (land size,

land titles) and macro (state intervention, commodity markets) level processes that influence producer practices. His work examined land degradation from farmers' perspectives and showed how development projects can exacerbate inequalities and exclude the very poor. Stonich (1989; 1992) similarly found that changes in the political economy of Honduras produced social and ecological shifts (land and watershed degradation) through the expansion of agricultural exportation, and smallholder farmers were displaced by an increase in capitalist accumulation.

Although some agroforestry projects may allow for, or even target, disenfranchised groups, they may also elicit new struggles along gender and class lines. Rocheleau and Ross (1995) demonstrated how planting the government promoted Acacia tree displaced women from their patio gardens and resulted in power struggles at the household level. That is, men thought of timber trees as their domain and excluded women from their own gardens and decision-making processes. In a study from Gambia, Schroeder and Suryanata (2004) also revealed how inequalities and the consequences of market forces associated with agroforestry projects created and reinforced situations that benefited some and deprived others. We see that natural resource management at the micro-level is interacted with macro-level forces that include the political economy and what is considered agroforestry. These dynamics resulted in an agroforestry system that was a monocrop of mango trees, less income generated (and earned) by the women, and poorer soil quality. The development organizations that promoted tree planting and the use of technical innovations were trying to meet their own objectives of land stabilization, but in so doing they altered the landscape and social relations in ways that

were a detriment to both. In this way, agroforestry projects produce spaces where control over resources and allocation of benefits may be contested (Izac 2003). For these reasons, Schroeder and Suryanata (2004) argue agroforestry systems can serve as tactics for dispossession and private accumulation by the state, NGOs and powerful elites. Their findings justify the need to examine the complexities and effectiveness (or ineffectiveness) of agroforestry projects to improve livelihoods and alleviate poverty—for all. Therefore, the implementation, development, and decisions of farmers practicing agroforestry merit further analysis.

Local Organizations and Natural Resource Management

At the crossroads of agroforestry and livelihoods are local organizations. Local organizations play an important role in rural livelihoods, conservation, and agricultural policy (Bebbington 1999; Bebbington and Batterbury 2001; Bebbington and Thiele 1993; Méndez 2004). Characteristics of the local organization may also play an important role in shaping the environment (Méndez, Gliessman, and Gilbert 2007). In Panama, farmer organizations and groups are often the product of social movements and development initiatives. For example, in Santa Fe, farmers must be members of an association to participate in agroforestry projects promoted by NGOs and government agencies with international funding. There are multiple scales interacting to influence social, political, economic, and ecological processes. Capacity for social mobilization (the ability to get resources from other entities by being part of an organization) is higher for members of an agriculture organization (Classen et al. 2008). Classen et al. (2008) found that participation among poor farmers in outside projects was an opportunity to

get ahead as it created social capital. Other participation incentives may include the ability of projects to support livelihoods (Méndez et al. 2007).

In summary, my research will link micro-level natural resource management of smallholder farmers and livelihood strategies with macro-level projects and discourse about agroforestry.

CHAPTER II

STUDY AREA AND RESEARCH METHODOLOGY

Social and Biological Context of Panama

Panama's economy is largely based on its services sector, which comprises 83% of the Gross Domestic Product. Industry makes up 14.1% and agriculture is only 2.9% (CIA 2016). Of the labor force, 64.4% is occupied in the services sector, 18.6% in industry, and 17% in agriculture.

Arriving in Panama City is to step into a cosmopolitan area. The ever-changing skyline of the city reflects Panama's significant economic growth in recent years. However, despite this prosperity, Panama has the second worst income distribution in Latin America (CIA 2016). These disparities are seen under the façade of the glamour of Panama City and are particularly evident in rural areas. Nevertheless, Panama has seen reductions in poverty levels in rural areas, which has been aided by assistance programs or government transfer programs (Koehler-Geib et al. 2015). Examples of these programs include the *red de oportunidades*, *beca universal*, *bono alimentario*, *suplemento alimenticio*, *120 a los 65*, and *ángel guardián*, which provide funds and health, education, and social services to target populations such as students, older adults, people living in poverty or extreme poverty, disabled individuals, and women as heads of households (MIDES 2015).

Panama is incredibly biodiverse. Based on Holdridge's life zones, Panama has twelve out of the thirty existing zones (40%) (ANAM 2011). Panama also forms part of

the Mesoamerican Biological Corridor. Panama has a system of 89 protected areas, which are categorized into various types of management systems, which represent approximately 37.3% of the national territory and 31.8% of land surface (ANAM 2011).

Study Site

Santa Fe is located in the northern part of the province of Veraguas, one of the *provincias centrales*. The community of Santa Fe was founded during the second half of the 16th century and the region became a prominent mining center and has a rich cultural heritage. (Politically, Panama is divided into provinces, districts, *corregimientos*, and indigenous territories, called *comarcas*.)

The Santa Fe district has 15,585 habitants who live in eight *corregimientos*: Santa Fe (town), Calovébora, El Alto, El Cuay, El Pantano, Gatú o Gatuncito, Rio Luis, and Rubén Cantú (Panama Census 2010). Table 1 provides census data relevant to the livelihoods of the residents of Santa Fe and their acquisition of household assets. Demographic patterns over the last twenty years show that the population of Santa Fe has increased by approximately 32% from 1990 through 2010. Despite the growing population within the district, more people have moved to the main town of Santa Fe. There is also out migration to Panama City for education and employment opportunities. Another trend in the demographics is a decrease in the percentage of the population whose economic activity is agriculture. Household incomes have risen, increasing the ability of residents to purchase goods and services. This is reflected in home improvement activities (e.g., changes in sanitation systems, cooking fuel sources,

household items such as having cell phones, and roof material). Despite these increases and improvements, poverty levels in Santa Fe remain high.

Table 1: Santa Fe district demographics from three census periods.

Categories	1990	2000	2010
Population	11,844	12,890	15,585
Sanitation			
Latrine/hole	49.32	75.08	74.77
Septic tank	3.41	6.54	12.33
Cooking fuel source			
Cooking gas	4.16	10.97	22.77
Wood	93.76	88.13	76.19
Household items			
Radio	47.48	74.65	71.91
Television	5.12	14.6	21.62
Cell phone	—	0.36	40.51
Stove	—	13.38	44.09
Light source			
Kerosene/diesel light source	91.26	81.71	45.45
Floor			
Concrete/pavement	23.1	34.09	38.79
Wood	2.79	8.32	16.49
Dirt	56.72	45.41	31.51
Roof			
Metal	60.09	65.94	70.79
Grass/palm leaves	39.58	33.55	26.14
Household income			
No income	14.61	3.69	—
Less than \$100/month	51.39	58.35	36.41
\$100-124	4.45	6.8	11.15
\$125-174	6.33	6.07	12.63
Individual income			
No income	64.07	31.53	—
Less than \$100/month	24.67	55.66	82.09
\$100-124	1.83	2.79	5.62

Table 1: Continued

Categories	1990	2000	2010
\$125-174	1.81	1.99	2.76
Economic activity			
Agriculture, cattle raising, hunting, forestry, fishing and related activities	77.38	77.3	69.94
Construction	1.24	3.26	4.65
Commerce	2.15	3.99	5.31
Public administration and service	1.85	2.31	3.82
Education	1.85	3.06	4.1

Source: Panama Census 2010

The majority of residents are farmers of mixed Hispanic descent, but some are indigenous Ngäbe and Buglé. Part of the district lies within the Santa Maria River watershed and many communities are located within the SFNP buffer zone. Farmers in the area have an over 40-year history of joining together in associations, beginning with the Santa Fe Popular Christian Movement in 1968 that helped mobilize farmers to reclaim lands from large and powerful landowners. Today the district has 33 registered organizations with legal status, the highest in the province.

The district is extensive with a surface area of 1, 943.3 km², representing 18.2% of land in the province of Veraguas. With its mountainous terrain and landscapes spanning the continental divide, climatic conditions differ throughout the district. The company ETESA (Empresa de Transmisión Eléctrica, S.A.) has had a meteorological and hydrological station for the past 60 years within the Santa Fe community, near the Santa Maria River. I chose to use data from this station as it was closest to my field site. Data from the station show that the annual average temperature around the town of Santa

Fe is 24.6°C/76.3°F (8° 30' 30" and -81° 04' 23"). The average annual rainfall is 183.2mm and the relative humidity is 83.2% (ETESA 2016).

Table 2 presents information on the incidence of poverty in Santa Fe and its *corregimientos*. Santa Fe has been classified as one of the poorest districts in the province and in the country (ANAM 2013). It ranks number twelve out of seventy-six districts in terms of overall incidence of poverty levels with an incidence of 71.8%, and 41.4% of extreme poverty (MEF 2011).

The overall incidence of poverty measures the population that lives below the per capita value of the general poverty line in which people have sufficient income to purchase the basic food basket, but insufficient income to meet other basic needs (housing, education, health, transportation, clothing, etc.). The general poverty line used for districts outside of Panama and San Miguelito is USD \$1,094.60. Extreme poverty is defined as the incidence of those with insufficient income to purchase the minimum food basket which is USD \$584.40 for every district except the districts of Panama and San Miguelito. In terms of inequality in income distribution Santa Fe ranks number twenty-two out of the seventy-six districts and has a GINI coefficient of 0.45 (MEF 2011).

Table 2: Poverty incidence in the district of Santa Fe and its *corregimientos*.

		2011 Poverty Levels and Income Inequality							
		Overall Poverty Indicators				Extreme Poverty Indicators			
District and Corregimientos	Population	Overall Poverty	Poverty Gap	Poverty Severity	Coefficient of Variation	Extreme Poverty	Poverty Gap	Poverty Severity	GINI Coefficient
Santa Fe	15,539	71.8	34.9	20.4	3.5	41.4	13.8	6.2	0.45
Calovébora	4,397	89.4	50.7	32.2	3.7	65.1	24.5	11.8	0.38
El Alto	1,317	57.5	22.8	11.5	14.7	23.1	6.0	2.3	0.37
El Cuay	1,486	67.1	27.6	14.2	11.4	28.8	7.6	2.9	0.36
El Pantano	658	42.3	15.5	7.7	16.8	14.5	4.0	1.6	0.37
Gatú o Gatucito	1,315	85.4	44.5	26.8	5.0	55.6	18.8	8.4	0.35
Río Luis	2,204	78.7	37.7	21.5	7.6	44.7	13.9	5.9	0.40
Rubén Cantú	1,160	73.8	32.7	17.8	10.2	36.6	10.7	4.4	0.35
Santa Fe (cabecera)	3,002	49.3	19.7	10.3	13.7	20.0	5.8	2.4	0.46

Source: MEF 2011

Understanding poverty levels and income inequality provides us with a snapshot of the situation under which Santa Fe residents live, how they obtain environmental benefits and/or degrade them (ANAM 2011), and access resources. Reflecting on these measurements of poverty levels allows us to understand the information that institutions and organizations use to make decisions regarding the implementation of different kinds of projects. That is, Santa Fe's social, economic, and ecological characteristics have attracted agencies and programs to invest their money in the area under the guise of sustainable development.

Santa Maria River Watershed and Santa Fe National Park

Santa Fe is rich in hydrological resources, so much so that the mayor named the district the capital of water. Major rivers in the Santa Fe district include the Santa Maria, Bulaba, Narices, and Calovébora. The Santa Maria River and its affluents are the life-blood for many communities located along the river. Furthermore, the watershed is an important source of water for three provinces and has a total area of 3,326 km². The headwaters of the Santa Maria River are located in SFNP (ANAM 2009). As such, the management of the park affects the condition, function, and management of the watershed.

Santa Fe National Park was created by Executive Decree No. 147 11 in December 2001 and is approximately 72,636 hectares (see Figure 1). Its location in the highlands of Panama's central mountain range makes it an ecologically important site for biodiversity and ecosystem conservation. There are 1,171 recorded species in the park, 575 flora species and 596 fauna species (ANAM 2010). The park is strategically located to protect the production of water in sufficient supply and quality to meet the needs of communities and industries located downstream of rivers that drain into the Pacific slope (ANAM 2010).

The majority of watersheds within Panama are in a degraded state due to deforestation, poor land use planning, agricultural practices, and the lack of integrated guidelines, policies, and actions (ANAM 2009). Approximately 60% of the watershed is under secondary forest and subsistence agriculture. Current land uses are shade-grown coffee, subsistence crops that include rice, beans, corn, cassava, and *ñame*, and home gardens. The Panamanian government recently developed a management plan for the watershed, which includes policies that must be implemented (ANAM 2009). The long-term goal of the management plan is to protect natural resources and improve the quality of life of people within the watershed.

Agroforestry projects have been implemented as an activity to meet the requirements as outlined in the Santa Maria River watershed management plan, but also have been recommended as part of the municipal environmental plan, and the territorial development plan. That is to say that there is a political, ecological, and social impetus

to implement these projects. I focused my research in the southern part of the district outside of SFNP and within the Santa Maria River watershed as this area has attracted considerable agroforestry project investment. The agroforestry projects typically involve planting a mixture coffee, citrus, other fruit tree species, timber species, and banana and/or plantain varieties, near water sources.

Through the lens of political ecology we are able to determine what is affecting the in/ability and relative interest of farmers to use agroforestry as a means to improve their livelihoods and influence their environment. There are many factors that influence farmers, including access to resources (land, money, and labor), power struggles, and local-level decision making linked to the larger political structures.

Research Design

How do agroforestry development projects affect the farmers and environment of the Santa Maria River watershed and SFNP buffer zone? I answered my research questions with ethnographic description and semi-structured interviews to understand the actions of the people involved in agroforestry and development in Santa Fe at different scales. I used a purposive sampling method to select members and non-members of farmer associations within the Santa Maria River watershed and the SFNP buffer zone. This has allowed me to interview farmer association members and non-members who are involved in agroforestry and to find informants who best fit the purpose of my study (Babbie 2010; Bernard 2013). I selected farmer association members based on involvement in agroforestry projects, work with NGOs and government agencies, and location. Criteria for non-members include residence within and location of their farm

within the Santa Maria River watershed and within the buffer zone of SFNP, and lack of affiliation with a farmer association.

Table 3: Farmer association characteristics.

Farmer Association	Years Established	Reason for Establishment	Number of Members	Land Holdings	Land Management
Farmer Association 1	>30	Protect land rights and secure land tenure	18	Collectively held: 30 ha (including reforested area with Caribbean pine 30 years ago) Individually held: 0.25 - 5 ha	Collectively and individually managed plots
Farmer Association 2	~8	Community welfare issues and agriculture	35	Individually held: 0.25-5 ha	Individually managed plots
Farmer Association 3	>30	Community welfare issues and agriculture	20	Individually held: 0.25-5 ha	Individually managed plots
Farmer Association 4	~7	Common interest in organic agriculture production	25	Individually held: 0.25-5 ha	Individually managed plots; all members produce or are in the process of producing organically

I completed on-site semi-structured interviews with individuals from four farmer associations (see Table 3 for farmer association characteristics including years established, reason for establishment, number of members, land holdings, and land management) and with farmers who are not members of the associations. Interviews focus on how farmers work together in agroforestry projects, farmer association characteristics, how agroforestry projects are affecting the ability of farmers to work

together, agroforestry practices, the watershed, and SFNP. Non-members are asked about their agroforestry practices, agroforestry projects, the watershed, and SFNP.

To evaluate livelihoods, I included items on the interview schedule regarding the influence of agroforestry on income, perceived benefits, and agricultural production time allocation. I obtained information about socio-demographic household characteristics and asset holdings (Coomes et al. 2004; Steffan-Dewenter 2007).

I also asked farmers to take me on a walk through their agriculture and agroforestry parcels to discuss what trees are present, what trees they have removed, and how they use the trees (shade, fruit, wood, anything else that the farmers would like to describe or show me). I placed camera traps in SFNP and on farms and asked farmers to in order to obtain a better understanding of the animals that use these habitats. I also asked farmers to list from recall which animals they directly saw or saw evidence of on their farms.

During the semi-structured interviews, I asked farmers to draw maps of their agricultural parcels and discuss their aspirations and how changes in land and development might occur in the future. They described their maps and why they included certain features. I compared the maps drawn by farmer association members to non-member maps. The mapping exercise provides understanding of the influence of the development projects on the national park, how farmers' plots are organized, and cultivars planted (Dahlquist et al. 2007; Rocheleau and Edmunds 1997; Smith 2003). I obtained the GPS coordinates of the plots to determine the extent of the lands under agroforestry and their locations in relation to SFNP.

I used snowball sampling to find NGO and government personnel with whom to conduct semi-structured interviews. This allowed me to find key people working on agroforestry projects. The interviews covered issues regarding the implementation and evaluation of agroforestry projects and farmer association participation within the watershed, how they influence how farmers work together to manage their natural resources, how these projects are supporting the park and watershed, how they think agroforestry projects are supposed to work, and why they promote agroforestry among farmer associations. NGO and government personnel who directly promote agroforestry and work with farmers drew depictions or provided me with schematics of how an agroforestry parcel should look and is promoted among farmers. I compared the information from the NGO and government personnel with that of the farmer association members to evaluate different perspectives on agroforestry projects. Speaking with these actors allowed me to get a better sense of the intentions and interests of development and conservation organizations and donor agencies for the people and environments touched by development efforts.

As part of the ethnographic work, I participated in and observed: how association members and non-members manage their land devoted to agroforestry, how they allocate their time to agroforestry related activities, farmer association meetings, and visits from NGO and government staff. Participant observation is a method that allowed me to record aspects of daily life relevant to my research questions (Bernard 2013; DeWalt and DeWalt 2002; Schensul, Schensul, and LeCompte 1999).

Finally, I collected reports as well as archival and current documents related to the history of Santa Fe, agroforestry and agroforestry projects within the Santa Maria River watershed, and SFNP buffer zone. Archival research allowed me to obtain information about the agricultural, environmental, economic, and social policies that are potentially affecting the smallholder farmers and ecology of Santa Fe. I obtained socio-economic and economic development data from national census statistics (Stonich 1989). I conducted a total of 83 interviews, 55 with farmers and 28 with NGO and government staff involved in agroforestry project implementation.

The Ethnographer

In 2011, I contacted a Panamanian NGO that had been working in the Santa Fe area on issues related to sustainable development and biodiversity conservation. A member of the staff introduced me to a number of farmer association members during that time. I spoke with association members, NGO and government agency staff who implement agroforestry projects, and made on-farm observations. The apparent importance of agroforestry in people's daily lives and the idea that I could contribute to a better understanding of development and conservation influenced my decision to focus my research on agroforestry projects within the Santa Maria River watershed and the outskirts of SFNP.

My connection to Panama spans more than a decade as I was a Peace Corps Volunteer in Panama and my site was located along the Santa Maria River south of Santa Fe. As a Volunteer I worked with communities of smallholder farmers, including farmer associations, on agricultural and conservation projects. My past experiences in

Panama and my familiarity with the culture have helped me gain the confidence of the people with whom I work and interact with them with more ease than if I had had no experience in Panama. These experiences in Panama have also informed how I think about research, my methodology, and the way in which I will choose to present my work.

An important methodology that researchers utilize is decolonizing research (Denzin et al. 2008). The idea that the oppressed must participate in their own liberation is particularly seen in decolonizing research. Decolonizing approaches are tools to study the impacts of postcolonialism and the hegemony perpetuated by positivist research (Denzin and Lincoln 2008). These approaches also act to decolonize Western epistemologies. Decolonizing research basically deals with power and oppression especially among indigenous, colonized peoples, and/or non-western groups. Decolonizing research seeks to expose binary reductive categories and oppressive constructions thus opening spaces for other ways of knowing (Denzin and Lincoln 2008; Swadener and Mutua 2008). It also attempts to expose how positivist research has acted to oppress and restrict the agency of indigenous and colonized peoples. This research has produced discourses that have made Others (marginalized, underrepresented people) powerless because these discourses authorize certain people to speak while making other voices less authoritative (and perhaps silencing them). Critical methodologies and decolonizing approaches often use narratives to confront political institutions, challenge power structures, critique positivism, and stand in contrast to colonizing knowledge. These methods help to legitimize other types of knowing, particularly indigenous

epistemologies and different versions of science and help to rewrite history (Denzin and Lincoln 2008).

Postcolonial theory and decolonizing approaches stand in stark contrast to positivism. Positivism seems to have institutionalized itself as the theoretical perspective for science. Under the guise of positivism, non-positivist methodologies may be critiqued, the results of research questioned, and the knowledge of research participants may be delegitimized. As such, the epistemological and theoretical stance of a researcher is extremely important to the research process, outcomes, and those involved in the research (e.g. researcher, stakeholders, audience of research). The qualities espoused by positivism (truth claims, certainty, validity, objectivity (Crotty 2008)) and its link to science, make it privileged. Crotty (2008) states, “This supreme confidence in science stems from a conviction that scientific knowledge is both accurate and certain. In this respect scientific knowledge contrasts sharply with opinions, beliefs, feelings and assumptions that we gain in non-scientific knowledge” (p.27). The idea that only scientific knowledge is valid and accurate results in privileging a certain way of thinking over others and has significant implications for research. If a researcher maintains this position and espouses the tenets of positivism, then she may disregard the perspectives, ideas, and knowledge of the people that she is studying. As such, their voices may be excluded from the scientific process. This process then can be seen as a form of exerting power and oppression over certain people based on different worldviews and the privileging of science. Positivism could be equated to or be considered a form of colonialism, especially if it acts to delegitimize knowledge. A researcher thinking that

she is objective, unbiased, and whose findings are certain and valid will have a myopic view of the world and the knowledge held by people.

The themes associated with postcolonial theory (meanings, knowledge, hegemonic interests, equity, oppression, research, ethics) were clearly demonstrated to me in a number of ways when I conducted research last summer in Panama. I will briefly provide an example of a few interactions that took place that summer then examine the ethical implications of my research with a postcolonial/decolonizing lens. At the start of my time in Santa Fe, a community leader gave me his opinions of the United States, which has had a long and, at times, tumultuous history with Panama. He spoke of the 1989 invasion, the CIA, the Peace Corps, all of which to him were various forms of outsiders acting to control resources in the name of development and find out information about Panamanians to use to their advantage. I told him about my research. He was curious about what I was going to do with the information that I was gathering. He told me that many people had come to Santa Fe over the years to do a thesis and then left, not doing anything with their theses or sharing their results. He said he had several theses on a bookshelf that nobody did anything with. Many people that I spoke with had similar concerns and asked me what I was going to do with my results. They wanted to know what happened to the information when I left. I told them that I was going to come back to continue doing research and would let them know all that I had learned during my time there. I also said that I would share the information with other people so that they could learn about Santa Fe and the people who lived there. When it was nearing for the time for me to leave, the community leader told me that he heard from the people

that I had spoken to that I was very open and well-received. He said that it was because, “*La forma de ser, hablas bien el español y casi eres el mismo color que nosotros*” (your demeanor, you speak Spanish well, and you are almost the same color as us).

The interactions with people made me realize that the role of research and the researcher have considerable complexities regarding power and domination. Among these complexities is the perception that people have of the researcher, including personal attributes, where she is from, race, language skills, etc. I wanted to briefly touch upon the topic of language and race. Language, in particular and which I touched upon earlier, has ethical implications. Battiste (2008) argues that linguistic competence is a requirement for research in indigenous issues. If the researcher is using the language of the colonizer, then indigenous ways of knowing and worldviews are being subsumed. The people involved in my research project all speak Spanish as their first language. The ideas regarding language that Battiste (2008) put forth could be extended to non-indigenous issues as language involves ways of knowing and understanding knowledge no matter what the language. Therefore, I think that it is important that the researcher be able to communicate in the language that is preferred by the people with whom the researcher is working. In terms of my skin color, I have a worldview that is influenced by my life experiences that have been shaped by identity as a woman and a person of color. These qualities influence how I interact with people and also make decolonizing approaches appealing to me. These qualities also influence my ethics regarding research and influence my awareness of issues of power and oppression that are a part of postcolonial theory.

Issues of power and perception were very apparent in my conversations with the community leader, which reflects themes of colonization, appropriation of knowledge, and ethics. A case could be made that I represented a colonizing entity in two senses; as a citizen of the United States and as a researcher. The action of gathering other peoples' knowledge and using it is reflective of an underlying power structure. My conversations during my first summer at my field site also made me aware that I was an outsider and that, in a sense, I was the Other. They were categorizing and developing representations of me as I had of them. I am aware of how people are being represented in my research and how these representations could affect the people with whom I am working. In terms of the farmers with whom I work, they may perceive me as someone who knows what she is talking about, may think that what I know is more legitimate than what they know, they may act deferentially to me, they may not want to share their knowledge with me, and may not think that their knowledge of the world or even their world is legitimate. In decolonizing framework, this would be seen as Western positivist authority acting to determine what is legitimate knowledge and oppressing the voices and experiences of colonized peoples. Nevertheless, I have an ethical obligation to represent their daily lives without promoting oppressive constructions and perpetuating a discourse that authorizes certain people to speak, while silencing others (Swadener and Mutua 2008). In terms of other stakeholders like NGO and government personnel, I have an equal ethical obligation not to delegitimize their knowledge or feel authorized to speak for them. I may not interact with them the same way and they may not react to me the same way as the farmers. Some of them may have been trained in Western positivist thinking or been

exposed to researchers in the past. Nevertheless, I will treat the knowledge that they share with me the same way that I will treat the knowledge shared by farmers, as legitimate and with respect.

As a researcher, I am in a position where I can speak for other people and benefit from their knowledge. If I am able to speak on the behalf of others and am considered an authority, is this another form of colonialism? According to Battiste (2008) and Lincoln and Denzin (2008), who speaks for whom and who benefits from research are ethical issues. My work will be speaking for the stakeholders (the aforementioned farmers, NGO personnel, and government workers) that live and work in the Santa Maria watershed. I have to question my role as a researcher, including the authority and power that I might hold, and think about who benefits from my research (Swadener and Mutua 2008). I do not adhere to the positivist theoretical perspective or the objectivist epistemology. I consider myself a constructionist and I do not claim to take an objective perspective regarding events in the Santa Maria River watershed. I respect and consider other forms of knowledge as legitimate and believe that there are various interpretations of phenomenon.

Nevertheless, despite my own epistemological leanings, I am trained and am currently being trained in Western scientific discourses that may act subversively in a hegemonic manner on the stakeholders with whom I work. Postcolonial theory and decolonizing approaches make me aware of the implications of my research, including how my research can affect the people with whom I work by potentially perpetuating hegemonic discourses and practices. I have used binary logics such as

“developed/underdeveloped” to characterize the region where I work. This dichotomization acts to reinforce patterns of privilege and exploitation (Swadener and Mutua 2008). The ease with which I use these terms may reflect my educational training. The institution in which I am a part is driven by Western positivist thinking and, in part, determines what are considered valid research questions, a point of contention of many scholars who use critical and indigenous methodologies. As such, from the start the research process privileges certain ways of thinking over others. Collaborative research through partnerships and the cogeneration of knowledge espoused by Swadener and Mutua (2008) would help in reinvisioning the research process. This type of research would also demonstrate that research does not have to diminish the voices of certain people or act to delegitimize knowledge. Furthermore, the ethical tenets proposed by Battiste (2008) demonstrate the need to collaborate with stakeholders so that their input is incorporated in the research process, including the final interpretations and analysis of the data. Decolonizing research also seeks to expose how positivist research has acted to oppress and restrict the agency of indigenous and colonized peoples.

Lincoln and Denzin (2008) call for a new set of ethical protocols that involve moral and political considerations. They do not consider the Institutional Review Board’s standards sufficient especially when indigenous people are involved. They claim that many indigenous cultures’ ethics are not ascribed in codes of conduct. Therefore, researchers have to be aware of the ethical issues that are not reflected in IRB forms. In terms of my own ethical stance, I can aim for my research to be as collaborative and participatory as possible while being respectful of the local knowledge that is being

shared with me. I am also committed to sharing the data that is generated from this research with the people involved, particularly with those who shared their time and experiences with me. I must also be aware of how my own discourse will affect the stakeholders involved in the research (e.g., is it acting to delegitimize knowledge). This is true of the research process while I am in Santa Fe and also after I leave. The ways that I will interact with people and the discourse that I use may leave a lasting effect of the stakeholders involved in the research. For example, if I do not use any decolonizing methods, they could feel more marginalized after having had their knowledge appropriated and feel that their knowledge was not legitimate enough for them to speak for themselves.

Taking all of this into consideration, throughout my time in Santa Fe, days involved conducting interviews, participant observations that included clearing brush from parcels, planting trees, harvesting coffee, fertilizing trees, preparing tree nurseries, weeding gardens, attending farmer association and community meetings, and observing interactions between farmers and NGO/government personnel. A lot of time was also spent with individuals and households just hanging out, chatting about issues related to agriculture, national and international politics, and informal moments that informed my opinions and shaped my research questions.

More specifically, after my initial visit in 2011, I returned for two months in 2012 trying to get an understanding of the important agricultural, livelihood, and conservation issues in Santa Fe. The five months I spent in 2013 allowed me to hone down my research questions, establish rapport with community and farmer association

members, and further understand the dynamics of agroforestry, development, and conservation in Santa Fe. I returned to Panama in 2014 and would spend the next six months conducting interviews and archival research, working on farms, attending meetings, and conversing with many farmers and their families. From January-March 2015 and from September 2015-January 2016, I continued my research. Overall, I spent 20 months in Panama.

Over the many field seasons in Panama, I was able to be in Santa Fe for each month of the year. Being there each month of the year was important because I was able to see and experience the agricultural production and farm management that takes place throughout the seasons and cycles, understand how agroforestry projects are managed, observe interactions between government and NGO personnel with farmers, attend farmer association meetings, and gain an overall understanding what takes place during the year. I was able to see the evolution of projects and associations and experience the fads and fickleness of development during my time in Santa Fe. All of these experiences allowed me to better understand the political, social, and economic factors acting at various scales that impact the environment and people of Santa Fe.

Each field season I stayed in the town of Santa Fe, which was a strategic location given that I could easily access many communities where farmers lived by walking, taking a bus, or taking a taxi. I had the opportunity to stay with the family of a respected leader of the community each time, which helped with making connections and putting me in touch with gatekeepers.

Every year when I am back in Panama I wonder whether I am asking or have asked the “right” questions. The research questions were shaped by observations, conversations, and exploratory interviews with farmers and NGO and government personnel. I was an outsider, but with so many years of traveling to or living in Panama, I now feel like I’m in a liminal space, not quite outsider, but also not an insider. In the last few field seasons many people told me that I was now a *Santa Fereña* (that I could now be considered from Santa Fe). That is to say, people’s perceptions of me changed over time, because mutual trust had been built. Having been in the Peace Corps in Panama was an advantage as they often asked me about my experiences and formed a level of respect for me for having lived in the *campo*; because of this experience I had the ability to share similar cultural experiences with them. However, there was a farmer association member that asked me on various occasions what my function was. Despite that the president of the association had introduced me to the group and I had talked to the group about my work, what I was doing there, and that I could hopefully be of use to them. His inquisitiveness about me was, in part, because he was naturally curious about whom I was, but also because no one had been there in a similar capacity, so my role for him was hard to define.

I thought of myself as a researcher, friend, and listener of stories. I wanted to hear and understand their concerns and the topics that were important to their daily lives to inform the research questions. It was an iterative process to during my first visits in order to adjust the interview questions and methods. My interpretations of my findings

are influenced by my personal life experiences, including those in Panama. The more time you spend in a place, the more complex things seem to be.

CHAPTER III

FARMER ASSOCIATIONS, POVERTY, AND AGRICULTURAL DEVELOPMENT

“Working in groups, I believe, is the strength of the poor. Working organized together has helped us a lot. We don’t have a lot of resources, but yes we can do great things. The only way to do great things is to be united.”

-Santa Fe Farmer

Introduction

Farmers within the area have an over 40 year history, beginning with the Santa Fe Popular Christian Movement in 1968 that helped mobilize farmers into groups to reclaim their lands from the rich, of joining together in associations to participate in the determination of their own futures. This legacy is evidenced the many formal organizations with legal status in the district, the highest concentration of organizations in the province. One third of these organizations are active farmer associations.

Collaboration in the form of groups and associations often takes place for natural resource management (Bebbington 1999) and biodiversity conservation (e.g., through agriculture and protected areas) (Pretty and Smith 2004). Farmer associations and cooperatives can help shed light on the themes of poverty, development, and natural resource management. Collective action is relevant to conservation and development at the local level because it influences land use and income generation (McCarthy et al. 2004). For example, cooperatives are used in strategies for rural development and poverty alleviation (Nyoro et al. 2007) as development agencies often gravitate towards groups for the implementation of projects (Crewe and Harrison 1998).

Associations and groups are common in Panama. They typically are made up of smallholder farmers that have come together for a common purpose. When the association is established, members can register the association with the Ministry of Agriculture (MIDA) to obtain formal legal status. Registering the association is an incentive as it allows these associations to receive funds through projects from government institutions and other organizations. Project implementing organizations choose with whom to work based on geographic location, funding source requirements, the objectives of the projects, and the reputation of the association. Projects have a series of requirements that align with the overall mission and function of that organization. Associations usually do not solicit projects, but are “found” by organizations.

Despite the high concentration of organizations and years of experience of people being organized, the district has one of the highest incidences of poverty and extreme poverty within the province (Panama Census 2010). The number of organizations with whom to work and Santa Fe’s strategic location near SFNP and within the Santa Maria River watershed has seemed to attract a great number of development and conservation projects, with investments totaling in the millions.

This chapter explores farmer associations and their role in agroforestry project implementation, local various perspectives on agroforestry projects related to poverty alleviation, and critiques of development.

Father Héctor Gallego and *Cooperativismo*

Social movements are an important part of the history of the area and still remain an influential force among the *campesinos* of Santa Fe (PRODESO 1989). In 1968, Jesús

Héctor Gallego, a Colombian Catholic priest, was assigned to the newly established parish of Santa Fe. He encountered areas difficult to access, extreme poverty, illiteracy, and powerful families who oppressed local farmers. Control over local farmers took many forms. These powerful families also controlled large land tracts and paid day laborers very little wages for their work. They also owned all of the stores where farmers had to buy goods at exorbitant prices.

Given the difficult conditions people living in Santa Fe were experiencing, Gallego would work the next three years to evangelize, organize, and raise the awareness of community members about their situation. Having been influenced by Paulo Freire, Gallego used a methodology to work with farmers that involved self-reflection, critical analysis, and awakening of consciousness in order to free themselves from their oppression (Fundación Héctor Gallego n.d.). His teachings and discussions often focused on working together, being organized, and *cooperativismo*. Farmers with the help of Gallego began to open their own stores, at first just selling salt, matches, and soap. His legacy is engrained in the landscape and its people, which is most evident in the idea of *cooperativismo*, working together for social and economic opportunities. He helped organize the Santa Fe Popular Christian Movement, form the *Cooperativa la Esperanza de los Campesinos*, and create grassroots community organizations.

The most physical representation of his legacy is the *Cooperativa la Esperanza de los Campesinos* was established on July 10, 1969. The name reflects the hope of campesinos for a better future, one in which they are in charge of their own destinies. The cooperative has grown from these initial stores and now has two multi-service stores

in the town of Santa Fe, store branches in other communities, a bus that runs the Santa Fe to Santiago route, a coffee processing plant, a chicken processing plant, and land throughout the district in strategic locations. The cooperative has a number of committees that work on behalf of communities within the district to provide outreach, education, and technical services. They also receive funding and projects from outside organizations for cooperative members.

Members of the cooperative are its owners. They receive a dividend at the end of the year based on the amount of purchases they have made during that year. Members of the cooperative can also receive loans, use its banking services, and receive a higher purchase price for the coffee they sell at the cooperative's coffee plant. In 2015, there were 1,221 members of the cooperative.

Although Gallego was kidnapped and disappeared on June 9, 1971, the idea of working together, being organized to achieve goals, and *cooperativismo* are representative of the spirit of Santa Fe. In the campesinos of Santa Fe he created confidence that they could achieve change. Through their ability to organize and the establishment of the cooperative, farmers improved their social and economic circumstances. Working together and *cooperativismo* continue to be reflected among different communities and organizations, especially farmer associations, throughout Santa Fe.

From 1969 through 1977 the government implemented agrarian reform which partially overlapped with part of Gallego's influential time in Santa Fe. Agrarian reform redistributed land and created policies to establish communal agricultural settlements

and agrarian production associations. This time period was one of tremendous change and social revolution in Santa Fe that saw shifts in power relations and resulted in lasting impacts on how farmers come together to access resources, reflecting similar agrarian movements all over Latin America, with similar ties to liberation theology and ideals of alleviating poverty and inequality through grassroots organizations.

Farmer Associations in Santa Fe and Project Implementation

In Panama, it isn't uncommon for whole communities to be involved in associations. At the entrances to them and within the communities are the signs from government agencies and placards on newly constructed buildings with project titles, amounts of funds dispersed, and the association names of the beneficiaries. These are literally the signs of development. From the time I was a Peace Corps Volunteer, I realized that farmer association and projects were intimately linked together. Having heard the history of Santa Fe and the passion with which people spoke about Hector Gallego and his legacy on many occasions, it was not surprising to me that the people of Santa Fe have mobilized themselves into groups.

Although farmer association members typically do not solicit projects, these associations are a tool and a strategy farmers use (and/or consciously deploy) to receive funds and projects from sponsoring organizations, including government and NGOs. In the Santa Fe district there are thirty-three registered associations with legal status. They have been established for a variety of reasons including securing land tenure, obtaining resources, and practicing agriculture. Projects have also influenced the establishment of

new farmer associations. Every farmer association is distinct in terms of member level of participation, governance, and land holdings.

In order to be considered for a project, a farmer association has to be registered and have legal status as recognized by MIDA. Project implementing organizations choose with whom to work based on geographic location, funding source requirements, the objectives of the projects, and the reputation of the association. Projects have a series of requirements that align with the overall mission and function of that organization such that the project. Although projects usually are not solicited by the association, some are savvier than others in selling themselves in order to receive funding.

Millions of dollars in loans and grants that have been injected into Santa Fe on projects related to agricultural production, forestry, livelihoods/income generation, and strengthening protected areas. Associations are obvious targets because implementing organizations can meet project requirements, achieve greater results, and satisfy project funders through the use of farmer associations. That is, organizations can reach more people to communicate the techniques that they want farmers to practice to achieve their project goals rather than doing the same activities on an individual basis.

Many farmer association members are convinced that these projects are positive and provide a number of benefits on the surface. This may be in part because of the language used throughout project implementation. The language that they use surrounding the projects seems to be one of transactions. Terms like “beneficiaries,” “selling the idea,” and “projects” are used daily. Even I use these terms to talk to farmers about development and their perspectives about it. In transactions goods and services are

exchanged and, therefore, perhaps farmers feel like they are obtaining something through the interaction that takes place as part of projects. In transactions there may also be winners and losers, but in this case is this a win-win situation? Are both implementing organizations and farmer association members benefitting from this mutual transactionary collaboration?

The word “project” in particular has become very common. It has evolved to represent a type of currency that government, NGOs, and members of farmer associations deal in for transactions of resources (people, land, equipment, infrastructure), knowledge, and technology. “Project” encompasses, envelops, and packages complex issues into an innocuous word. This term denotes something short-term with a start and an end, which contradicts the long-term nature inherent in most agroforestry systems. All of the aforementioned terms make farmers seem like they are passive rather than active participants; action is taken on farmers by implementing organizations such that farmers receive things passively rather than association members exerting their own power to achieve things for themselves. This creates a separation that translates into a lack of ownership for the project. This is exemplified by how farmer association members called their meeting space built by a development NGO as the “project office.” It wasn’t considered “our office,” it is affiliated with the project and, therefore, called that. Are these projects another type of exploitation? Many members of the older farmer associations united to exploit their power to obtain control and access to resources. Many newer associations have formed to simply obtain resources passively

and may not recognize the potential power that groups have for determining their own futures.

During my time in Panama in 2015, I noticed a sharp decline in the participation of associations. There was something inexplicable in the air, something like a quietness that previously was not there. For example, there wasn't much movement or activity among farmer associations. In 2012, it seemed like there were many agency and organization personnel promoting projects, recruiting participants, and implementing projects. In the years since, and up until 2015 there was quite a bit a movement and mobilization of resources surrounding projects. I asked many people about my observation and if they felt the same way. The explanation I was given was that because of the change in government in 2014, many projects were suspended. Panama holds general national elections every five years. National elections affect every level of government and the projects that they manage. Changes in the political party cause a ripple effect through government institutions, NGOs, businesses, and local organizations and the projects these organizations implement and the farmer associations that are supposed to benefit. Projects that were in their monitoring phase, closed. The change in government also meant the last phase and what farmers consider the most important phase of projects, the commercialization, were never implemented.

Development and Implementing Organizations

The district of Santa Fe has received millions of dollars in funds for projects related to sustainable rural development, natural resource management, and conservation. Its geographic location, abundance of natural resources, and high

incidence of poverty make it strategic location for investment. There are multiple ways to define poverty from different perspectives. From the perspective of the government and NGOs, it is the measurement of the population that lives below the per capita value of the general poverty line in which people have enough income for the purchase of the basic food basket, but not enough income to meet other basic needs (MEF 2011). Given that poverty can be a contested term and have different social, economic, or cultural meanings and indicators the term will be further unpacked here from the perspective of farmers. Their conceptualizations of poverty are influenced by capitalist notions and market economies in which lack of income directly influences poverty status. However, farmers who I spoke with stated that there are many types of poverty including poverty in ideas (e.g., capabilities (Sen 2005)) and poverty in access to resources (e.g., health services, education, and markets). Some considered themselves truly rich because of the provisions of their natural capital (provisions of nature of water, clean air, forests, and land) and social capital (family connections). Their main concerns revolve around having sufficient food for consumption and access to health and education services. The idea of poverty may have been conceptualized for campesinos in terms of income, but the real issue is lack of human development and access to resources.

A number of national and international organizations and government agencies have invested resources in communities, organizations, and farmer associations in Santa Fe. Among farmer associations, resources have included saplings, seeds, fertilizer, money, technical support, equipment, trainings, workshops, and are typically tied to a development project that seeks to improve agricultural production, increase income

generation, and protect the environment. MIDA also supports members of farmer associations through its PARTICIPA and ProRural projects, which were funded by the Global Environment Facility and World Bank.

In the last five years, Fundación Natura and the Ministry of Environment (MIAMBIENTE) have heavily promoted agroforestry projects targeting smallholder farmers in Santa Fe. I have chosen to focus on the projects implemented by these institutions as they were the most active during my field seasons in terms of working with farmer associations and their projects. Furthermore, each institution worked with the same farmer associations; if farmer associations had worked with one of these organizations, they had also worked with the other. Here is a brief description of each institution.

Fundación Natura

Fundación Natura, established in 1994, focuses on issues related to biodiversity conservation and sustainable development in Panama (Fundación Natura n.d.a). They work on the integrated management of watersheds throughout the country that they have prioritized based on the watershed's environmental and economic value. They have a strong presence and have worked for many years in Santa Fe as one of the watersheds that Natura has prioritized is the Santa Maria River watershed.

Many of the funds from the projects initiated by Natura in Santa Fe come from the Panama Ecological Trust (Fideicomiso Ecológico de Panamá (FIDECO)). The Panama Ecological Trust (FIDECO) was established in 1995 through an agreement between the Panamanian government and The Nature Conservancy (TNC), each

contributing monetary support, including the United States Agency for International Development (USAID) (“Contrato de Fideicomiso” n.d.).

The primary responsibility of Natura, as the FIDECO trustee, is to manage financial assistance in support of conservation and environmental activities with non-governmental organizations (NGOs), educational institutions, and community associations. They are more or less a clearinghouse for money and the administration of projects. Projects implemented through this fund have focused on natural resource protection within watersheds and national parks, reforestation programs, environmental education programs with communities near protected areas, biodiversity conservation, scientific research, sustainable agriculture and soil conservation promotion, particularly in watersheds and national park buffer zones.

The agroforestry component of the projects focused on farm improvement and integrating other environmental protection techniques and ecotourism strategies. These projects also provided funds to establish nurseries in various communities to generate income for project participants. The projects were initiated in July 2010 and ended in April 2013. The total amount for the projects was USD \$68,930.00 with USD \$55,000.00 from the FIDECO funds and USD \$ 13,930.00 from in-kind contributions from the local organizations.

Ministry of Environment

The Ministry of Environment (Ministerio de Ambiente de Panama, MIAMBIENTE; formerly the National Environmental Authority, ANAM) has invested heavily in the associations and communities within the Santa Fe district. Much of their

funding comes from the World Bank and the Global Environment Facility (GEF) for the purpose of economic growth and poverty reduction. In addition, the conservation of the Mesoamerican Biological Corridor in Panama, including the segment where Santa Fe is located is of global importance to maintain its ecosystems and ecological functions and funding from these organizations reflects this.

MIAMBIENTE has a special entity within the agency that focuses on the protection and conservation of resources within the Mesoamerican Biological Corridor (CBMAP). CBMAP II (Corredor Biológico Mesoamericano del Atlántico) is a Panamanian government initiative created through MIAMBIENTE and the Global Environment Fund (GEF) with funding from the World Bank (ANAM 2011).

CBMAP implemented projects with six different local associations in Santa Fe, of which four were farmer associations, one is a cattle association, and one is an orchid association. Of the projects that CBMAP implemented, two were focused on agroforestry.

A third phase of the project would have included commercialization of agricultural projects as a continuation to the projects that were implemented in the first and second phases. Farmers considered this the most important phase of the project (to market their goods and services). However, due to the national elections and a new government in 2014, MIAMBIENTE did not implement the third phase. Projects typically have three phases. The first phase involves the selling of the idea of the project and obtaining farmer association consent to participate in the project, as well as providing participants with trainings and workshops about agroforestry techniques and

other skill building exercises. The second phase involves the provision of resources and supplies to the association members and the establishment of parcels. The third phase is typically focused on commercialization of the agricultural products.

These institutions are important players within Santa Fe, the watershed, and SFNP. The decisions they and their donors make at the national and international scales regarding project scope and implementation affects hundreds of people directly and thousands of people indirectly at the local scale in terms of land use allocation, potential for income generation, and social interactions with other farmers.

You see their staff and logo emblazoned cars zipping around town, but they rarely seem to cross paths. Collaboration between Natura and MIAMBIENTE as well as other organizations that implement similar projects or that have similar goals (i.e., development, conservation, and/or protection of natural resources) with farmer associations seems limited. The strategies that these organizations deploy in agroforestry implementation make them highly influential on the social, political, economic, and ecological components of Santa Fe and its residents. The decisions that they make at the top regarding development trickle down to affect the farmers and their land.

The NGO and Government Perspective

Among the technical staff who promote agroforestry projects, agroforestry is seen as an environmentally friendly method of agricultural production with the ability to improve rural livelihoods. General objectives of agroforestry, which may not all be achieved, that are promoted are to increase crop and animal productivity; ensure sustainable production through appropriate land use; diversify food production; produce

wood, fuelwood, and other products for farmer subsistence; mitigate the damaging effects of sun, wind and rain on soils; minimize water runoff and soil loss; and combine the traditional knowledge of farmer with modern knowledge.

In the early stages of agroforestry project implementation, NGO or government agency technical staff will typically hold meetings and workshops to communicate information about the project purpose, stages of the project, and the different types of agroforestry systems and their advantages. This is the “selling the idea” phase of the process in order to convince farmers of the benefits of the project. They also inform participants about which species will be planted, the distance for planting the species, the amount of tree/seed quantity provided, how to establish a tree nursery, and maintain and manage trees; basic training in agroforestry management. They provide the packet of tools to work on the project that includes machete, shovel, wheelbarrow, PVC pipes, and other inputs such as fertilizer. Table 4 provides a summary of resources typically provided by project implementing organizations. The intangible resources will be addressed later in this chapter. This package of materials is a type of blueprint for agroforestry projects and every organization seems to have this same one.

“Sometimes we have all of the equipment, but don’t have the necessary people to participate in the project.”
-Government extension agent

Table 4: Resources provided to agroforestry project participants.

Tangible Resources	Intangible Resources
<p>Equipment</p> <ul style="list-style-type: none"> • Machete • Spade • Wheelbarrow • Rubber boots • Shovel • Nursery bags • PVC pipes <p>Inputs</p> <ul style="list-style-type: none"> • Fertilizer • Seeds • Saplings <p>Infrastructure</p> <ul style="list-style-type: none"> • Offices • Building materials (plastic, netting) <p>Reimbursement</p> <ul style="list-style-type: none"> • Compensation to pay self for labor 	<ul style="list-style-type: none"> • Accounting and banking skills • Leadership skills • Agricultural production techniques • Environmental and policy awareness • Organizational capacity building • Project management • Communication skills

To monitor the projects, the implementing organizations rely on trimestral visits by staff and reports from the association to assess how the project is progressing and gather statistics on participants. Projects usually include monitoring (follow-up) for 1-3 years, not very long when considering that economic and livelihood influencing benefits from the projects will take time to obtain because of the long production cycle of some species. That is, there is plenty of time for projects to fail before benefits might accrue. Furthermore, there isn't sufficient funding to continue monitoring these projects indefinitely. Therefore, organizations like Natura have formed agreements with MIAMBIENTE and MIDA to continue monitoring aspects of the projects. Natura required participants to sign contracts in a type of memorandum of understanding regarding the roles of the parties involved that states that farmers will maintain the

“project” trees in perpetuity. One aspect of the understanding is that the landholder and beneficiary of the project would be responsible for the maintenance of the trees in the future.

Farmers have the majority of the long-term responsibility to maintain agroforestry project parcels and trees (the environmental goals) while the implementing organizations may not be able to complete projects or deliver on project goals of farmers securing agricultural production and improving livelihoods as promised when they are selling the project idea (and touting the poverty alleviation/development goals). This may result because project implementing organizations are often constrained by limited resources and short-term funding cycles. Government extension staff may say the following to create an ideal image (i.e., to sell the idea of project agroforestry), “The project is a mechanism to conserve more land by providing support; to improve the farm and have the people benefit by improving the coffee, production, and for the consumption and sale,” but their actions are contradictory.

Having had “success” in one project facilitates the ability of the group to receive another project; successful groups (groups that have successfully managed a project) receive *buena fama*. One government employee tasked with working with associations, emphasized the need to have strong leadership within the group in order to obtain financing and successfully manage a project. Even if project participants receive many training sessions about agroforestry practices, the challenge is to put in practice what have learned after the project has ended.

Some extensionists affiliated with projects seemed hesitant to discuss the negative aspects of projects in detail. They tell farmers one thing by focusing on both conservation and livelihood development, but even they realize the weaknesses of the project and that the advertised results may not come to fruition. I also felt that, perhaps, the technical staff haven't critically analyzed the situation in depth regarding the allocation of costs and benefits, the impacts of projects on the social relations within farmer associations, and the long-term commitment of maintaining a farm. Outside organizations have as their priority to protect the environment, but staff that work with farmers recognize the importance of providing opportunities for sustainable development and that strict protectionist policies alone are not always conducive to achieving conservation goals. One example is from an extension agent who stated, "Agroforestry becomes the real solution. You cannot protect and protect without seeing money; you would die." His opinion suggests that he sees agroforestry as a potential way to reconcile conservation and development.

There is a type of inconsistency or contradiction between the way staff perceive projects and the way that they sell them to farmers. The general idea is to provide a sufficient injection of capital such that farmers will achieve project objectives and have improved long-term well-being. If project-implementing organizations have always done this and haven't produced the expected results or results that are worthwhile economically to stakeholders then you have to ask, is something wrong?

The Farmer's Perspective and Challenges of Development

As previously stated, farmers join associations for a number of reasons. Thorp et al. (2005) argue that group formation allows its members to achieve their goals, which can be important in poverty reduction through the generation of income. Membership in an association also provides access to development projects. One of the most important considerations in relation to projects is the ability, through their association and project participation to mobilize resources that will benefit themselves and their families. An association member explained his reasoning for joining a farmer association as the following, "In order to have things, you have to work, you have to associate yourself with a group, to contribute/cooperate." This farmer's opinion as well as others interviewed supports the idea that farmers are interested in short-term economic incentives as reasons for practicing agroforestry. In this case, implementing organizations provide resources to participants that can be used for farm improvement. Association member participation in projects also provides a number of challenges and opportunities in terms of time commitment, conflicting interests being met, effects on the association and its members, access to resources, for them.

Members dedicate considerable time to workshops, trainings, meetings, preparing land for planting, and maintaining trees--time they would have used for other activities on their farms. Agroforestry projects also seem to have the potential to support outside interests while keeping farmers in poverty. As one association member stated:

"Therefore, all projects come with the purpose, I say, to entertain us a little...

And if today they give us a development project, as they say, give us the same

tools to continue doing the same thing, that is not development... [They are] not really thinking about the person...[They are] not thinking about improving the quality of life. For me it is something else...Give a hoe to a man so that he wears himself out removing rocks, that is not development. That is not technology. That is not knowledge transfer. No. That is called slavery, for me. The projects in this country are poorly made copies that arise from other interests and capitalist systems. No?"

Even though he speaks broadly of development, he raises issues regarding benefits and the purpose of these development projects, including agroforestry. From this research, many farmers, like the one quoted below, perceive outside organizations as sustaining a “business of poverty” one in which they gain and the poor lose.

"... There are a ton of organizations that are doing agricultural projects [a number of Panamanian institutions and NGOs] but every one of them poorly done So there is a certain ...competition among all institutions and NGOs as to how they can get closer to communities, how can they get more people to support them, because in the end NGOs are doing business with poverty. And that is horrible. Who sustains all of the resources that NGOs receive? The poor do. And from them comes the description of how the poor live and they have done this since 1960 and something and today they continue writing the same thing to justify doing the same thing. And where are the millions of dollars that these organizations have received? They are in cars, in wages, in buildings, but the farmer still lives the same."

The type of development being promoted and offered in its current state is not the type to alleviate poverty in the long run. If these same strategies have been used for decades, something is not working. Outside organizations have demonstrated time and again that they will keep investing in the farmers of Santa Fe. As a result, farmers have developed an expectation that they will receive funding. This was not surprising to me, especially after my Peace Corps experience. Over the years as I've continued to go back and visit my old community, and I've seen new offices, equipment, and many projects that have rolled in and out, but the people are in the same state. They have also become accustomed to this type of paternalistic support. Even farmer association members recognize this and, in some cases, have come to expect projects. They, too, have become part of the business of poverty. At times being in groups could be considered detrimental to farmers as they may become used to an unending cycle of projects and interventions. Even if one project fails, they know another project will arrive to provide them with another injection of resources.

Findings suggest that agroforestry projects other challenges exist including that may be fracturing local groups by exposing weaknesses. As one man said, "*An organization's [farmer association's] reason for being should not be the projects. Projects must be a component that empowers organizations financially. An organization's reason for being should be something else and that is to actually improve quality of life without damaging our environment.*"

As some members become more successful at implementing the techniques and skills they have learned, they have left, perceiving the association as a hindrance to their

success. That is, the ability to earn money is given priority over the collective good of the group, with some members leaving to pursue work on their own. This may enhance the livelihoods and well-being of some. However, fracturing of associations can affect the watershed and SFNP as commonly held land becomes dissolved into individual plots and under different management regimes. (See Stronza (2009) for similar challenges). These data substantiate the idea that members of farmer associations are *negatively* and *positively* affected by their participation in agroforestry projects. Projects are both strengthening and straining relationships among farmers.

The attrition of farmers from their associations may have other long-term social effects and inhibit individuals' abilities to participate in future projects that require group membership. One farmer stated he was not a member of an association because he did not want to have to support others, and he thought he was financially better off by himself despite the materials and supplies offered by agroforestry projects. He preferred to work individually. His story suggests that differing work ethics and differing degrees of commitment to a collective may be deciding factors in association participation.

A positive aspect of farmer participation in agroforestry projects is what I call social benefits. These benefits are received at an individual and association level from workshops in the form of practical skills (e.g., project management and accounting) and leadership skills that can be transferred to other projects to benefit the individual and association. In some cases participation resulted in increased personal empowerment in the form of greater self-confidence and the acquisition of soft skills such as increased leadership capabilities. In some cases project management skills also increased and

knowledge about environmentally friendly agricultural techniques and their implementation increased (e.g. the inclusion of ditches for erosion prevention). These types of skills might be the most long-term and beneficial to farmers, but the most undervalued by implementing organizations.

Although not part of my initial research, it became apparent to me that project involvement provided participants with professional development opportunities that could benefit them long-term, particularly women. This is evidenced by this statement made by a female association member when she spoke about what she had gained from participation in an agroforestry project.

"They [an NGO that implements agroforestry projects] opened the door for us to learn to manage projects ... We learned that as people with limited resources, we can access projects and resources while in an organization being for the benefit of society ... Being a woman and housewife, we can give much more."

Her self-confidence and self-esteem has increased as a result of her participation in these projects. I saw her confidence increase over time and she is very proud of how she's developed. These projects, therefore, provide opportunities for personal and professional development with long-term benefits as they can be used in other capacities over time.

Is this Development?

Given the propensity of development organizations to invest in farmer associations in Santa Fe, is this considered development? By whom? What is being developed? Participating in agroforestry projects provides access to what can be substantial resources in the short-term that farmers would otherwise have to purchase.

Will the many transactions that take place as part of a project alleviate poverty (as defined by the government)? Perhaps in the long run, but currently they do not. A farmer laughed at me when I asked him whether he thought that the projects could take people out of poverty. He responded by saying that he would have to dedicate all of his time to only cultivating coffee on huge farm.

The social changes that took place in the sixties and seventies provided the groundwork for the continued establishment of organizations in Santa Fe and continued motivation for social change. For farmer associations this has meant that people have continued to come together to achieve common goals related to agricultural production. On the other hand, they are tools for outside organizations to provide support while achieving their own goals of conservation.

Are these projects used as strategies to keep people in poverty? Given that some development projects are funded by organizations that provide loans to the Panamanian government, highly critical farmers, such as the one previously quoted, argue that the project loans are meant to keep Panama in debt and maintain people in poverty.

The perspectives of NGO and government staff surrounding agroforestry projects do not completely align with those of association members. Their major focus seems to be on the environment and the promotion of environmentally friendly agricultural production (e.g. agroforestry). Even though livelihood improvement is touted as a main component of these projects, it takes a back seat to natural resource protection (e.g. watershed protection, biodiversity conservation). Therefore, this research supports the idea that NGO and government actors will be more interested in conservation-related

outcomes rather than on the social and economic dynamics that play out among farmers. The idea is that if you give farmers physical resources and educate them on improved agricultural techniques then they will have higher yields that they can consume and sell for income. It has become their responsibility to resolve environmental degradation for the global community (even if relatively minimal) while at the same time using economic growth as the solution to alleviate poverty.

Research has shown that there are kinds of differing expectations about outcomes between farmer associations and outside organizations. That is, farmer association members have come together to obtain and protect land rights, maintain farming traditions, access markets, improve livelihoods, mobilize resources, and coordinate activities. On the other hand, NGO/government institutions appear to be using the ability of farmers to come together in an association in order to achieve watershed protection, biodiversity conservation, and improve livelihoods.

Given all of this, why do farmer associations matter? Because they are the vehicles through which outside organizations can manipulate social, ecological, and economic structures. They are also spaces where resistance and conformity take place. Ecologically, members are shaping the landscape in Santa Fe through the implementation of projects. That is, outside organizations influence large landscape scales by working with groups by implementing recommendations of tree species, selection of quantities of trees, location of trees, and decision with whom to work. Association members and agroforestry project implementing organizations seem to be using each other to obtain what they need.

There is a lack of equitable availability of resources and services available to all people of Santa Fe. This factor is what has and also attracted people to participate in projects as they are able to obtain resources and services that they may not have obtained if they were not affiliated with an association. Is this true economic development? They want economic power to access resources. On paper, farmer association members have power in the form of being organized. However, they could be considered weak institutionally.

Who is Winning and Who is Losing?

The history of Santa Fe over the past decades has created the current circumstances in which money is being dumped into the area through farmer associations. This has begged the following questions: Is this development? Whose interests are being met through the implementation of these projects?

In some ways farmer association members are benefitting from their involvement with development projects and in other ways they are losing. They benefit from the initial injection of resources, trainings, and technical assistance. Also, one of the most relevant findings about the benefits of agroforestry projects involves the ability of farmers to obtain skills (leadership, project management) and increase their self-confidence, which have lasting effects. These skills and personal growth suggest that, perhaps, agroforestry projects are making a contribution to the development of the people of Santa Fe. In this sense development can be seen as the improvement of the capabilities and capacity of farmers. Rather than solely providing a direct economic solution, these projects may need to place more focus on the development of the

capabilities of the people, as this may lead to actual sustainable development.

Nevertheless, members are absorbing much of the costs associated with natural resource protection/change in terms of time allocation, labor provision, agricultural inputs while the costs to implementing organizations is minimal. That is, the distribution of costs and benefits is not equal.

The social aspects of development and its role among farmer associations is important to consider in relation to agriculture and biodiversity conservation. Although there may be many perceived benefits of projects, there are also harsh critiques about this form of development through agroforestry project implementation. It will take years to reap some of the advertised benefits of these projects (higher production yields, income generation, etc.). I have little doubt that these projects will keep coming to the Santa Fe area to “develop” the people. But is there a better model? How many times can you receive the same project and not see the results?

Agroforestry projects are opportunities for farmers to obtain control and access to resources. However, the conception of these projects is not always done in consultation with the association such that members are not asked what they need or want. These projects are a mixed bag for association members, on the one hand they are increasing their access to resources, technology, and capital, and on the other hand they have little influence as to what strategy of development will be used on them. These projects could be improved by involving association members in projects from their inception. From what farmers have told me, this could mean that their needs are better understood and able to be met and their knowledge and experience in agricultural practices could be

better integrated into project development. This, in turn, could make the projects more sustainable in the long-term and project participants would take more ownership over projects.

CHAPTER IV

“PROJECT” TREES AND AGROFORESTS

“They [development organization] sold us the idea that these plants would flourish... We planted many, many seedlings that they brought us...the trees that we have here naturally, naturally from here, they won out over the trees we planted from outside [that are not from Santa Fe],...we are maintaining the same plants that are from right here.”

–Santa Fe farmer

Introduction

The Panamanian government and NGOs have provided incentives to farmers to plant trees in the form of agroforestry to achieve development and natural resource conservation goals; these projects are the strategy used to improve livelihoods and mitigate deforestation. These organizations promote agroforestry among smallholder farmers because those farmers are perceived as the causes of deforestation in the area. Many of the agroforestry projects are aimed at smallholder farmers that produce coffee and citrus in Santa Fe.

Agroforestry project implementing organizations promote specific species for farmers to manage on their farms. Despite farmers having practiced agroforestry for generations, these projects train farmers to practice agroforestry a certain way, using a specific set of knowledge to impart upon farmers about how agroforestry should be practiced. Farmers and outside actors (NGOs and government agencies) have both differing and shared perceptions of how agroforestry should be done, particularly in relation to how parcels should be organized and what tree species should be included.

The agroforestry projects focus on the promotion of coffee varieties, citrus (orange and mandarin), bananas/plantains, other fruit trees, and timber species.

To assess the impacts of agroforestry projects on the people and environment of Santa Fe, I compare the views and experiences of farmers who practice agroforestry as part of sponsored farmer association projects with those of farmers who practice agroforestry individually. I talked with representatives of national NGOs and government staff to learn more about the objectives and impacts of agroforestry projects. Their perspectives help to understand the intended impacts of agroforestry projects, the perceived benefits of agroforestry, and how farmers respond to their messages surrounding agroforestry. Evaluating agroforestry from the diverging and overlapping perspectives of national NGOs, the Panamanian government, and farmers helps reveal how agroforestry projects are either hindering or supporting local livelihoods and influencing land management practices in the Santa Maria River watershed and in the outskirts of SFNP.

In this chapter I examine the agricultural production systems of smallholder farmers in Santa Fe. I pay particular attention to management techniques among farmer association members and non-members and discuss the structural differences of association member and non-member farms. I also examine the costs and benefits of agroforestry production by looking at the economics of coffee and orange production, agroforestry project participation, labor availability, and land tenure and resource. Also, included is a fictional characterization of the amalgamations of experiences of association members and non-members. I include this to forefront local voices,

demonstrating how people work their lands, the influential factors that affect their decisions, and to offer a glimpse of people's lives. I also examine the role of women in agriculture and share the story of Sara to illustrate the interaction of development organizations with farmers and the production and exchange of knowledge. Finally, I draw conclusions and discuss how macro scale factors influence decisions at the micro scale.

Agricultural Systems in Santa Fe

Residents of communities of Santa Fe have received substantial amounts of funding for development and conservation purposes. NGOs and government agencies use agroforestry as a strategy to achieve conservation and development objectives with a focus on conservation, water protection, and livelihood improvement. Members of farmer associations are the focus of these projects with implementing organizations investing various resources for farmers to manage agroforestry parcels characterized by a mixture of annual crops and dominated by coffee, citrus, and *Musa* spp., other fruit trees, and shade and timber species on a *finca*.

I begin this chapter with a vignette based on the experiences farmers shared with me.

Vignette

Characters

Maria, mother, wife of Miguel, farmer association member

Miguel, father, husband of Maria, farmer association member

Carlos, neighbor of Maria and Miguel, independent farmer

Pedro, day laborer of Carlos from another community

Juan, indigenous day laborer of Carlos, travels from the *comarca* to find work

Thursday

It's 5am and the sun hasn't risen. Maria is cooking breakfast for her family. Her children have to get ready for school and the hour long walk to get there. After the children leave she gets ready to go to the monthly group activity and meeting with the other members of her farmer association.

Maria is the fourth one to arrive. Her husband, Miguel who is also a member of the association, couldn't attend the meeting because he had a doctor's appointment in the provincial capital and left the house at 3am. As she walks to the communal land and project office that was built by an NGO, she reflects on why she's still participating in the association and hopes that this project will help to improve her family's farm.

Eventually three more people arrive on their horses. One of the riders is from a community about two hours walking distance away. He has joined this group because very few people in his community were interested in the project and he couldn't participate without associating with a group. At one point he had told the group, "All of that is good that they continue with determination until the end, learning with the extensionists. It's important to have a feasible and a happy end, that you realize something so that people improve themselves economically. People think more about that than in conservation. It would be better if the projects were focused on economics and conservation together."

They wait for the other members to arrive. In total they are eleven. The number of active participants has dwindled over the years. Their meetings are held at the offices that were built with funds from a collaboration between a Panamanian NGO and a foreign government agency that funds development projects.

At the last meeting the group decided to continue filling the plastic bags that will be used to grow trees as part of the government sponsored project to improve farms, protect natural resources, and generate income. They know how to mix the dirt based on the instructions given to them by the government extension workers and the work they did on the past three projects that they have worked on.

While some fill bags, others work on clearing the communal land around the office because it has been several months since the last time it was cleaned. Maria works cleaning the area with her machete with the others. Some of the trees that were planted several years ago as part of another project to reforest areas near water sources have not developed successfully. They remove grass and other small trees that can restrict the growth of the project trees. They are small and thin because, although that particular tree can grow in the region, it is not suited to this particular area. The people clearing the ground talk about the weather, what their farms are producing, politics, prices of food, and their families.

Because this will be an all-day meeting they will be cooking lunch. They send the youngest person, the son of one of the founding members of the association, to the local cooperative store, which is a half an hour walk away, with the money that each

member gives as a contribution to the association to purchase chicken, oil, coffee, and salt.

After he returns and an hour of filling bags, Maria and the other women go to the kitchen area that was provided by an NGO. The NGO was promoting the construction of fuelwood conserving stoves made of bricks and raised off the ground. The stove was never completed so they cook on the ground with the pots supported by three rocks. The women stay around the kitchen cooking rice and chicken and talking about their children and school. After eating, the men go back to filling bags and after washing the dishes and cleaning the kitchen area, the women join the men.

After working a little longer they start the meeting on the patio area of the office where they discuss the harvest of pine trees and the allocation of communal land to members. Members of the group had planted the pine trees over thirty years ago as a project for future income generation and harvest of the trees for household uses. Someone from the community wants to buy five trees which will be sold for \$10 each. They also discuss the future of the group and why participation has been decreasing over the years. Members of the group are aging; two are blind and one is ninety-three years old, and yet they still come because they feel a sense of responsibility to attend the meetings and contribute to the association. Getting youth to participate in the group has been difficult as many young people have left the area to find work elsewhere.

The president of the association says, “Remember that *el técnico del proyecto* will be here next week to look over the progress that has been made. He’ll bring the

seeds to plant.” After the seeds are planted in the seedbed and transferred to the bags, each member can eventually plant the trees on their farms.

After all of the current concerns are discussed, they plan the work schedule for the next month. They learned to create work plans from a previous project many years ago. They also discuss the upcoming events in town that members may want to attend. The association president adjourns the meeting and they lock the equipment that they used in the office.

Maria goes home to continue working.

Friday

Miguel and Maria have been making *chicha* for Friday’s *junta* (a communal work party). He has invited his neighbors and other farmer association members. Miguel wants to prepare the land so that he can plant the trees that were given to each association member last week by the national NGO. There are about 15 different types of fruit and timber species some of them they’ve never heard of. Each member can take 20 of the trees and will receive 200 coffee plants at a later date.

When he gets to the farm, many of his friends and neighbors and other association members are there waiting to get started. They start *tirando machete*, working together to remove weeds and small trees. They also cut down large trees that would produce *mala sombra* for the coffee and leave trees standing that are *buena sombra* and timber species that are still developing. Miguel likes one particular type of tree because many birds like to visit it. As they work, they laugh and joke about the

elections, orange production, and road access. Other women are at the house to help Maria with the food preparation for the men.

They start from the top of the farm working their way down with the sometimes steep contours of the land, which are bounded on two sides by a stream. Occasionally, they will *salomar*, the sounds resonating across the hillside. One man mentions that they have to keep the trees along the edges of the streams to protect the water.

He says, “We have to protect *los palos* around the stream.”

Miguel does not own this land, but because he is a member of the association, the members consented to loan the land to him to plant trees from the NGO project. They talk about the positive and negative aspects of the projects that they have been involved in, climate change, and future production.

Miguel says, “Projects are good, very good, so that there are people who are dedicated to planting.” Although he sees the benefit of projects, he is always thinking about the future and having enough production for his family. He also hopes that market access will improve so that he may sell his excess production.

One of his neighbors, Carlos, disagrees. “When the money arrives, it causes a rift in the group and the fighting begins. There isn’t any solidarity, in order to be a businessman you would need to be involved in over 40 projects.” Carlos lives in the same community as Maria and Miguel, but he isn’t a member of the association. He doesn’t believe that these projects can *sacarse a la pobreza*.

By the end of the day they have worked on the half-hectare of land, although only a quarter hectare of land is required to participate in the project. Miguel will have to

come back another day to dig the holes, fill them with fertilizer, and plant the *palos de proyecto*.

He says, “Most of the production will be for consumption. We have to eat. In *el campo* you find anything to eat. When the coffee finally produces, I will sell my coffee to the cooperative. Anyway, you have to sell to get money and so that you can mobilize yourself.”

After they’ve finished preparing the land they go to Miguel’s house to eat. After eating they will continue preparing the land until around 5pm.

In the following months, Miguel is able to plant his trees and they’ve been slowly growing. The project *técnico* will want to know if he planted all of his trees and how they are doing. He hopes that as they continue to grow, that they will not obtain many pests and diseases.

Several Months Later

Carlos goes out when he can to check over his farm. His days are usually spent working at the Farmer’s Hope Cooperative. It’s located several kilometers from his house. Today he’s sent a day laborer, Pedro, to the farm to make progress on weeding the areas underneath the coffee plants and orange trees. Miguel also goes with him to return the favor for Carlos *ganándose el peón* at the *junta*.

There’s a buzzing sound coming from the farm. Pedro is working with a weed eater instead of a machete. Many people now have weed eaters because they are more efficient when compared to one person using a machete to do the same job. Pedro will earn \$8 for his work, had he not been given food, he would have received \$10. Carlos

knows that Pedro is a good worker and often looks for him to work on his farm. It's difficult to find day laborers. He told his wife, "There aren't *peones*. The sugarcane mills are absorbing the laborers. The state welfare programs to help the poor make them sleep and not produce. They *ganan suave* (earn money easily) with the state. This is creating a problem because they are abandoning agriculture." Because Carlos has the cash resources he can hire laborers and invest more in the improvement of his farm.

Juan is picking coffee with Miguel. He comes from what the locals call *la montaña*, the indigenous land. He will work in the area for the next few months to earn enough money to purchase goods to take back home.

Although the sun is shining brightly and the weather is warm, there is a good amount of shade mainly from the *guabo* trees that falls on the workers. The land was his father's who also had a coffee plantation that was very productive. Six years ago Carlos had to replace most of the coffee because it had become infected by coffee rust.

Making the seedbed and coffee nursery was the easy part of replacing the coffee. He used seeds he had stored and also bought other varieties of coffee from farmers that were supposed to be very productive. Carlos walks around checking the trees and looking for signs of infestations of coffee rust and coffee borer, which has him very concerned. Many of the orange and mandarin trees are full of fruit and starting to ripen. He will get another two laborers to harvest the fruits when they have ripened. He has a few tubers planted around the farm that he likes to bring back to his family to use in soups. He's harvested three today to take back to his family.

He looks at a few of the trees that he's been cutting a band around the trunk of in order to kill them. Many of them do not provide good shade for the coffee. He considers many of the trees bad for shade and as they've grown, he has continued to eliminate them. He is letting the hardwoods mature to harvest them in the future to use in construction. He knows that his children and grandchildren will have plenty of trees when they choose to build their houses.

All of the coffee he harvests he will sell to the cooperative's coffee processing plant. Since he is a member of the cooperative he will be paid a slightly higher price for the coffee than those who are not members. The irony is not lost on him that he would rather grow and sell his coffee to the coffee processing plant and then buy coffee at the cooperative than process it himself.

By the end of the day Pedro has weeded most of the farm and Juan and Miguel have picked five buckets of coffee each. Juan will stay at the *rancho*, which is a structure with a palm leaf roof and no walls, where he will sleep and cook most of the time he is working in the area.

Pedro will come back tomorrow to finish weeding.

Vignette Summary

This vignette highlights the nuances of how farmers practice agriculture, conveys some of the narratives and opinions surrounding agroforestry and development, and provides a snapshot of their daily activities and lives.

Each of the characters and their interactions are a representation of the experiences that farmers shared with me and that I observed. Through the story we get a

glimpse of the inner workings of an association meeting and the way that members are influenced by participation in agroforestry projects in terms of land management decisions and meeting household needs. Through Maria we see the internal conflicts surrounding project participation and the household commitments she must attend to in addition to her responsibilities as a member of the association. The story also highlights how farmers obtain project resources that they may not otherwise have access to in order to improve their farms. When managing their land farmers take into account a number of factors including household needs, market access, and protection of water sources. The vignette not only underscores the time commitment and labor resources needed when participating in projects, but also the similar costs when practicing agroforestry as an independent endeavor. All individuals in the vignette are working in various capacities to maintain their livelihoods.

Many farmers understand the strengths and advantages that come with being in a group, but also the negative aspects. Many of the association members are over sixty years old yet continue to contribute their associations through regular attendance. With changing demographics of the association members, there are conservation and development implications, which I will address in this chapter.

Agricultural Production

In the subsequent parts of this chapter I analyze the agricultural practices of farmer association members and non-members to provide a clearer picture of the ways in which development projects have influenced the land management and livelihoods of farmers. I begin with a general description of agriculture in Santa Fe. Farmers within the

upper Santa Maria River watershed of the district of Santa Fe predominantly practice traditional agriculture, including the planting of trees in agroforestry systems (ANAM 2009). While in the middle and in the lower regions of the Santa Maria watershed, agricultural production uses more advanced methods of technology that require the use of mechanized equipment. This difference in agricultural practice has influenced the land cover type between the upper and middle and lower regions of the watershed. However, within the upper watershed the dominant land cover type is subsistence agriculture (59.3%), then mature forest, and secondary forest. Table 5 presents the land cover types in the upper Santa Maria River watershed. The majority of agricultural holdings belong to smallholder farmers and, therefore, the composition of land cover type largely depends on the production systems of these producers.

Table 5: Land cover type in the upper Santa Maria River watershed.

Cover Type	Area (km²)	Percentage
Mature Forest	271.04	19.2
Secondary Forest	233.02	16.5
Subsistence Agriculture, Fallow Land	839.54	59.3
Forest Plantations	33.49	2.4
Agriculture and Livestock	28.75	2.0
Water	8.96	0.6
Other Uses	0.07	0.0
Total	1414.87	100

Source: ANAM 2009

Soils in the Santa Maria River watershed have limited agrological productive capacity and require extensive inputs (ANAM 2009). A little less than half of the watershed (43.41%) has severe limitations for the development of agricultural and livestock activities. The watershed management plan recommends the establishment of agroforestry systems as an alternative strategy given the limited capacity of the soils in the area (ANAM 2009). Soil degradation and erosion are other limiting factors for agricultural production in Santa Fe. A positive aspect of agroforestry is that it has the potential to increase production in areas with low soil fertility and help mitigate land degradation (OTS 1986).

Despite the severe limitations in soil quality, farmers are able to produce crops for consumption and sale. Santa Fe farmers produce a number of annual crops. The most harvested crops include rice, corn, cassava, *ñame*, *cepa*, *ñampi*, and culantro (see Table 6). The majority of the harvested crops is for consumption. On a provincial level Santa

Fe is very productive, producing more than 50% of the broccoli, cabbage, dachin, lettuce, table tomatoes, green onions, kidney beans, beets, onions, chayote, celery, and carrots. Given these levels of production within the district and the statements that farmers made in conversations, suggest that they are currently food secure producing sufficient quantities for consumption. However, increases in the prices of staple goods and climate variability have made food security more tenuous. Furthermore, the ability of farmers to produce a diverse variety of crops colors our understanding of poverty in Santa Fe as it demonstrates that other factors besides income influence well-being. This idea is important to address given that agroforestry projects use metrics to determine poverty levels, which contribute to decisions about which populations organizations target for the implementation of the projects, including projects implemented among farmer associations.

Table 6: Agricultural crops produced in Santa Fe for agricultural year 2010-2011.

Crop	Common Spanish Name	Scientific Name	Quantity Harvest	% Provincial	% Sold	% Consumed
Beet	Remolacha	<i>Beta vulgaris</i>	9 (100 lbs.)	93.68	33.33	66.67
Broccoli	Brócoli	<i>Brassica oleracea</i>	18 (lbs.)	100	38.89	61.11
Cabbage	Repollo	<i>Brassica oleracea</i>	639 (100 lbs.)	77.74	33.02	66.98
Carrot	Zanahoria	<i>Daucus carota</i> subsp. <i>sativus</i>	27 (100 lbs.)	91.58	11.11	88.89
Celery	Apio	<i>Apium graveolens</i>	142 (100 lbs.)	84.95	10.56	89.44
Cepa	Cepa/dachin	Not identified	3,760 (100 lbs.)	90.88	3.83	96.17
Chayote	Chayote	<i>Sechium edule</i>	171 (100 lbs.)	76.36	15.20	84.80
Corn	Maíz	<i>Zea mays</i>	6,453 (100 lbs. dried grain); 7,955 (100 new cobb)	5.59; 13.06	6.32; 1.09	93.68; 98.91
Cucumber	Pepino	<i>Cucumis sativus</i>	95 (100 lbs.)	11.84	17.89	82.11
Culantro	Culantro	<i>Eryngium foetidum</i>	2,699 (lbs.)	15.87	15.30	84.70
Green onion	Cebollina	<i>Allium fistulosum</i>	677 (lbs.)	67.77	14.88	85.12
Kidney bean	Poroto	<i>Phaseolus vulgaris</i> L.	1,187 (100 lbs. dry)	57.9	30.30	69.70

Table 6: Continued

Crop	Common Spanish Name	Scientific Name	Quantity Harvest	% Provincial	% Sold	% Consumed
Lettuce	Lechuga	<i>Lactuca sativa</i>	46 (100 lbs.)	82.5	32.50	67.50
Onion	Cebolla	<i>Allium cepa</i>	151 (100 lbs.)	79.63	31.09	68.91
Otoe	Otoe	Not identified	787 (100 lbs.)	14.14	52.17	47.83
Pear tomato	Tomate perita	<i>Solanum lycopersicum</i>	108 (100 lbs.)	21.36	39.07	60.93
Pigeon pea	Guandú	<i>Cajanus cajan</i>	817 (100 lbs.)	7.49	14.61	85.39
Rice	Arroz	<i>Oryza sativa</i> L.	12,312 (100 lbs. with husk)	1.05	25.00	75.00
Sweet pepper	Ají dulce	<i>Capsicum</i> spp.	758 (cosecha)	24.7	7.22	92.78
Ñame	Ñame	<i>Dioscorea alata</i> L.	2,838 (100 lbs.)	8.62	0.34	99.66
Cassava	Yuca	<i>Manihot esculenta</i>	8,555 (100 lbs.)	16.2	6.07	93.93
Ñampi	Ñampi	<i>Colocasia esculenta</i>	1,686 (100 lbs.)	37.15	12.86	87.14
Sugarcane	Caña	<i>Saccharum officinarum</i>	283 (tons cut)	0.064	7.05	92.95
Table tomato	Tomate de mesa	<i>Solanum lycopersicum</i>	474 (100 lbs.)	58.31	14.97	85.03

Source: INEC 2011

There are typically two planting seasons during the agricultural production year in Santa Fe. The first one (*la primera coa*), traditionally begins at the start of the rainy season (March-May). During this time, farmers typically plant corn, beans, rice, cassava, *otoe*, *ñame*, and pigeon peas. Because of climate change and the resultant delayed rains, in recent years, farmers have had to push back planting times; planting times have become more variable with farmers noting significant changes in weather patterns. The second planting season (*la segunda coa*) typically starts in September and October. During this time, farmers plant beans and corn. Table 7 shows the traditional planting and harvesting times of crops in Santa Fe over a two year period.

The following calendar illustrates the planting and harvest times for crops in Santa Fe. The calendar assumes that the rainy season is approximately from April through December and reflects the traditional planting times throughout the year.

Table 7: Traditional planting and harvesting times of crops in Santa Fe.

Crop	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Rice (Arroz Tres Mesina)				■	■		■	■																
Rice (Arroz Chino)				■	■						■													
Corn				■	■		■	■	■	■														
Kidney bean										■	■		■	■										
Cassava				■	■	■	■	■					■	■	■	■	■	■	■	■	■	■	■	■
Otoe				■	■	■	■	■					■	■	■	■								
Ñame				■	■	■	■	■					■	■	■	■								
Ñampi				■	■	■	■	■	■				■	■	■	■	■	■	■	■	■	■	■	■
Pigeon pea				■	■	■	■				■	■	■	■	■									
Frijol de bejuco				■	■	■	■			■	■		■	■										
Coffee			■	■	■	■	■	■	■	■	■	■	■	■										
Orange and mandarin				■	■	■	■				■	■	■	■	■									
Banana and plantain				■	■	■	■						■	■	■	■	■	■	■	■	■	■	■	■

*Brown squares indicate planting time, blue squares indicate harvest times, and yellow squares indicate coffee development in nursery.

Planting and harvesting times are distributed such that farmers are able to access food throughout the year. Their production techniques and practices guarantee food security by using a mixture of annual and perennial crops. Farmers also are able to store rice, corn, and kidney beans for later use while some fruits and vegetables are planted and harvested throughout the year, including bananas, plantains, and cassava. Farmers plant fruit and timber species at the start of the rainy season in order for the tree to take root prior to the dry season. Having timber on farms may also reduce pressure on forests (Richardson, Binggeli, and Schroth 2004) as they act as a material and economic reserve when needed. Farmers tell me that timber species are harvested as needed (typically harvested according to the cycles of the moon) for multiple household uses and for sale.

In the next sections I describe in more detail the production of coffee and oranges in agroforests as these crops comprise the majority of farms in Santa Fe, are promoted by agroforestry implementing organizations, and are socially, economically, and ecologically valuable.

Santa Fe Agroforests

Santa Fe farmers maintain traditional agrosystems with large amounts of plant diversity. The prevalent parcel type is characterized by a variety of tree species used for shade, fruit trees, *Musa* spp., annual crops, coffee varieties, and citrus species (orange, mandarin, lemon). These farms are highly productive and the variety of output from these farms is considerable. Permanent crops are for household consumption and sale as farmers produce vegetables, fruits, grains, animals, animal feed, fuelwood, medicinal plants, and resources for construction use.

Coffee, Oranges, and Mandarins

For generations farmers in Santa Fe have planted coffee among other crops and trees in traditional shade coffee plantations. These are economically and culturally important agroforestry systems. Coffee is grown throughout Santa Fe at elevations ranging from approximately 300m to 1000m. Producers cultivate two species of coffee, *Coffea arabica* and *Coffea canephora*. *C. arabica* is considered the better quality coffee in terms of taste, but in terms of production both species have advantages and disadvantages according to farmers.

Farmers produce coffee for household consumption and sale. They may sell their coffee at the *La Esperanza de los Campesinos* Cooperative's plant. Farmers founded the cooperative over 40 years ago with the assistance of Padre Jesus Héctor Gallego who taught them to critically analyze their situation, exposing them to liberation theology during a time when farmers had little control and access to resources. The presence of the coffee processing plant makes coffee production a viable economic endeavor as farmers have the ability to sell their coffee at a relatively close location throughout the year.

The coffee varieties that farmers grow in Santa Fe are included in the following table. Each variety requires different amounts of shade, inputs, and management. That is, the management of each variety has its risks as certain varieties are more demanding in terms of the inputs required for production than others. Furthermore, certain varieties are more susceptible to plagues and diseases. Therefore, the decision regarding which variety to plant (or which one is being promoted and provided to farmers through

projects) is influenced by a number of factors: knowledge transfer from agricultural extensionists to farmers, adoption of technology, and market forces (Westphal 2008). These factors directly and indirectly contribute to shaping the landscape through management techniques and farmers' livelihoods through consumption and sale of production. Table 8 presents data based on interviews with farmers and agricultural extensionists about the different coffee varieties grown in Santa Fe.

Table 8: Coffee varieties grown in Santa Fe.

Variety	Arabica/Robusta	Distinctive qualities	Yield (low, average, high)	Comments
Caracolillo/Robusta	Robusta	Develops large leaves and can grow to be tall which may cause problems during harvest	High	—
Catuai	Arabica	Susceptible to coffee rust	—	—
Catimor	Arabica	Requires large amounts of fertilizer; resistant to coffee rust	High	Has been called the rich man's coffee because of its high input requirements
Caturra	Arabica	Susceptible to coffee rust	High	Also has a variety that produces yellow fruit that is very sensitive to rain
Villa Lobo	Arabica	—	Average	Few farmers have
Castillo	Arabica	—	—	MIDA has contracted a nursery in Santa Fe to produce this variety

Table 8: Continued

Variety	Arabica/Robusta	Distinctive qualities	Yield (low, average, high)	Comments
Robusta mejorada	Robusta	Resistant to rust with appropriate shade and fertilizer management	High with the appropriate management	—
Geisha	Arabica	—	Average	Few farmers have access to or have planted this variety
Criollo/Typica	Arabica	Can grow very tall	High	The older coffee plantations were comprised of this variety

So many farmers have been devastated by coffee rust (*la roya*), which is caused by the fungus *Hemileia vastatrix* and coffee borer beetle (*la broca*), *Hypothenemus hampei*, as both have killed off extensive numbers of coffee plants. Farmers are replacing coffee rust susceptible varieties with Catimor. This is in line with the recommendations that the Ministry of Agriculture (MIDA) made to farmers. The Cooperative has intimated that it will not purchase Catimor from farmers due to its poor flavor profile. This contradiction could have repercussions among farmers as they continue to plant Catimor while the only local buyer and processor of coffee, the cooperative, will not accept that type of coffee. The decision to plant trees is an economic one in certain circumstances (Simmons, Walker, and Wood 2002) and farmers are changing their land management for expected economic returns that they might not receive. These factors acting together may mean that 1) farmers remove Catimor and replace it with another variety; 2) the Cooperative changes its policy and will purchase

Catimor; and/or 3) farmers replace coffee. This situation demonstrates the influences that macro-level forces (i.e., market forces and MIDA) have on micro-level decisions (i.e., land management decisions by farmers and knowledge transfer). Citrus species are also an important part of agroforests. Santa Fe stands out for its variety of oranges with farmers selling approximately 75% of the production at the provincial level (INEC 2011). Despite the large quantities of citrus that are produced in Santa Fe, farmers often allow substantial amounts of oranges and mandarins to go to waste because of poor market access and/or the costs associated with harvest including labor and transportation are too high. During citrus orange and mandarin season I would see piles of oranges and mandarins rotting on the ground and in trees. Regarding oranges, many farmers have told me that, “*It’s cheaper to let them rot.*” This speaks to the challenges of market access and inadequate market prices that farmers face.

Management Techniques and Socioeconomic Characteristics

The production differences between members of farmer associations and non-members in how they practice agroforestry are nuanced. What I mean is that their practices are very similar in some ways and in others they are very different (see Table 9 for a summary of farm management differences).

Farmer association members and non-members participate in agroforestry for resource production and use. Both are seeking to maximize economic returns/profits and productivity for foodstuffs and material and minimize risk. However, association members exhibit production techniques that are focused more on consumption rather than sale compared to non-members.

Producers, who are not members of associations, in general have less observable tree diversity on their farms. These farms have more ordered sections of different species of *Musa*, citrus, coffee, and fewer varieties of trees for shade compared to members of farmer associations who participate in agroforestry projects. That is, these farms reflect a more advanced management in terms of how agroforestry "should" be done.

Table 9: Farm management differences between farmer association members and non-members.

Characteristic	Member	Non-member
Parcel organization level	Low-medium	High
Tree and crop diversity	Medium-high	Low
Management focus	Consumption*, resource use*	Sale, resource use*

*Consumption refers to managing production for household consumption. Resource use refers to the goods and services produced in agroforestry for use.

The majority of farms of both members and non-members have at least one species of *Inga*. However, *Inga* species are the dominant shade tree on non-member farms. All farmers value this genus as a shade species and its ability to improve soil quality as it is a nitrogen-fixer. The fruits of some species of *Inga* are consumed in households and often sold seasonally at markets and fairs. Several farmers also noted that *Inga* spp. attract animals to their farms, which they considered to be a positive attribute. Timber species such as Spanish cedar and mahogany are also grown in these systems.

The observable differences between farmer association members and non-members in agroforestry management practices are apparent in the following photographs (see Figures 2 and 3).

Figure 2: Photograph of a farmer association member parcel.



Figure 3: Photograph of non-member parcel.



Farmers usually will promote (plant and maintain) useful trees and remove unwanted ones. When I visited parcels and asked farmers why they removed certain trees, they considered them to be “bad shade” for coffee or that they had no useful reason to be kept on the farm. Farmers analyze which products are most profitable in the market while also analyzing what they need to produce for food security. In many cases, coffee is the most profitable crop. Therefore, the management of coffee is often a main priority, which along with considerations regarding resources for household consumption and use, strongly influences farm management decisions.

As part of agroforestry projects farmers receive workshops on what agroforestry systems should look like, how trees should be planted, and how they should be managed by farmers. As a result, farmer association members have the additional risk of having

limited choices imposed on them by project implementation; their freedom of choice is constrained by project implementing organizations and their donors. That is, the decisions regarding what to plant, how many to plant, and where to plant are influenced by outside entities.

Tellingly, when I was planting coffee with a farmer, I asked him at what distance we were going to plant. He said the exact measure didn't matter because they weren't project plants. He told me to plant it where it looked good. His statement suggests that project involvement influences management techniques. This example suggests that farmers are picking and choosing when they use the practices taught by project implementing organizations.

Agroforestry systems promoted are similar to traditional systems that have been practiced in the area for generations. It is interesting that farmers have so much experience with agroforestry and yet outside organizations are trying to impose on producers what they believe agroforestry should look like. It seems like they are valuing one type of knowledge over another while using criteria that may help them achieve their own aims.

One farmer association member compares the theory to the practice of agroforestry and difference between farmers and technical staff that promotes agroforestry, suggesting that there are differing knowledge bases between farmers and technical staff and their application. He states, *"There isn't a separation among the crops. It's an integrated diversity of crops. We, the farmers, use logic. We pattern the practice from nature. The extensionists use theory. We have learned that each crop*

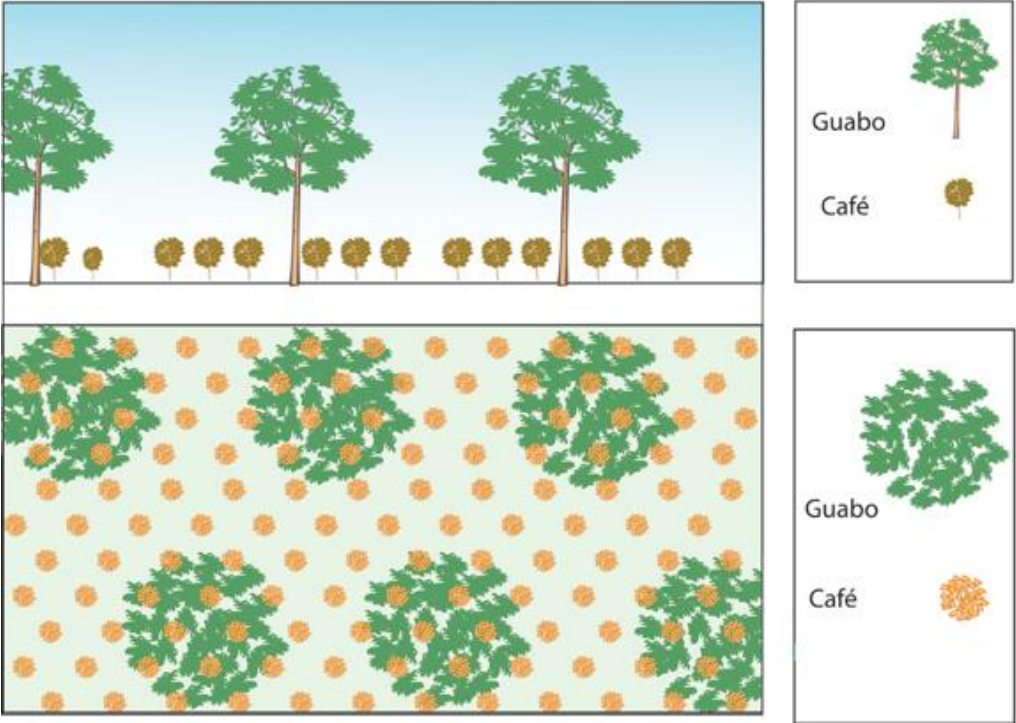
demands something different in different places. Each crop has different characteristics. In a mix, crops help each other, some provide nutrients that others need.” His idea of agroforestry highlights the advantages that he considers agroforestry to provide by planting a diversity of crops together.

A comparison of farmer and NGO and government staff maps and schematics provides insight into how farmers practice agroforestry and how agroforestry is promoted through trainings and workshops that farmers must attend as part of the project. The maps that farmers drew of their parcels elucidate what they consider to be important features on their farms. The maps also highlight the differences between how outside organizations consider how agroforestry “should” be implemented with how it is actually practiced by farmers.

The images below demonstrate how implementing organizations promote agroforestry systems and communicate to farmers the practice of agroforestry (see Figures 4 and 5). In this example coffee and *guabo* (*Inga* spp.) are planted in a system. Figure 5 has more diversity compared to Figure 4, incorporating, oranges and plantains into the coffee system. However, neither schematic demonstrates the diversity of trees and crops managed by farmers. The systems described and shown in the schematics of agroforestry project NGO and government staff are also well organized in a linear fashion. Their schematics seem to contradict the idea of maintaining diversity and achieving conservation goals because they lack diversity. Rather, they seem to reflect an idea towards increased yields and market production. Therefore, what NGOs and government agencies are “selling” and teaching farmers doesn’t quite jibe. Are they then

sacrificing conservation goals for market objectives? The findings are contradictory because both farmer and NGO/government narratives suggest that more emphasis is placed on achieving conservation while the schematics, and, therefore, knowledge being promoted seem to be taking into account economic incentives through increased production.

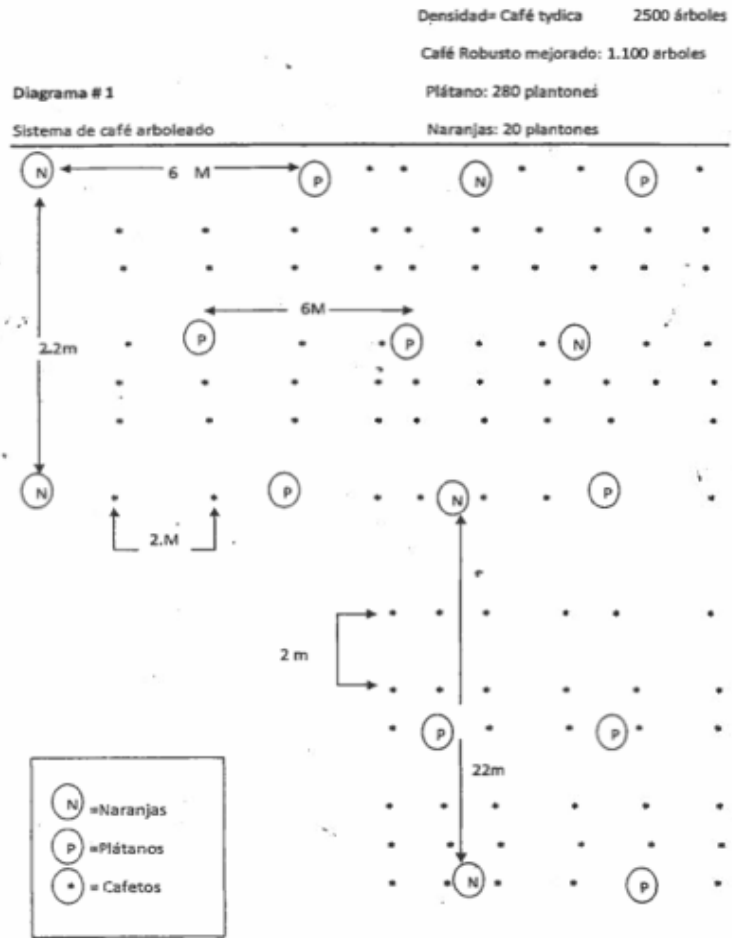
Figure 4: Schematic of agroforestry parcels as promoted by an NGO.*



Source: Fundación Natura n.d.b

* The larger tree, guabo, is representative of *Inga* spp. and the smaller plant is coffee.

Figure 5: Schematic of agroforestry parcels as promoted by a government agency.*



Source: MIDA n.d.

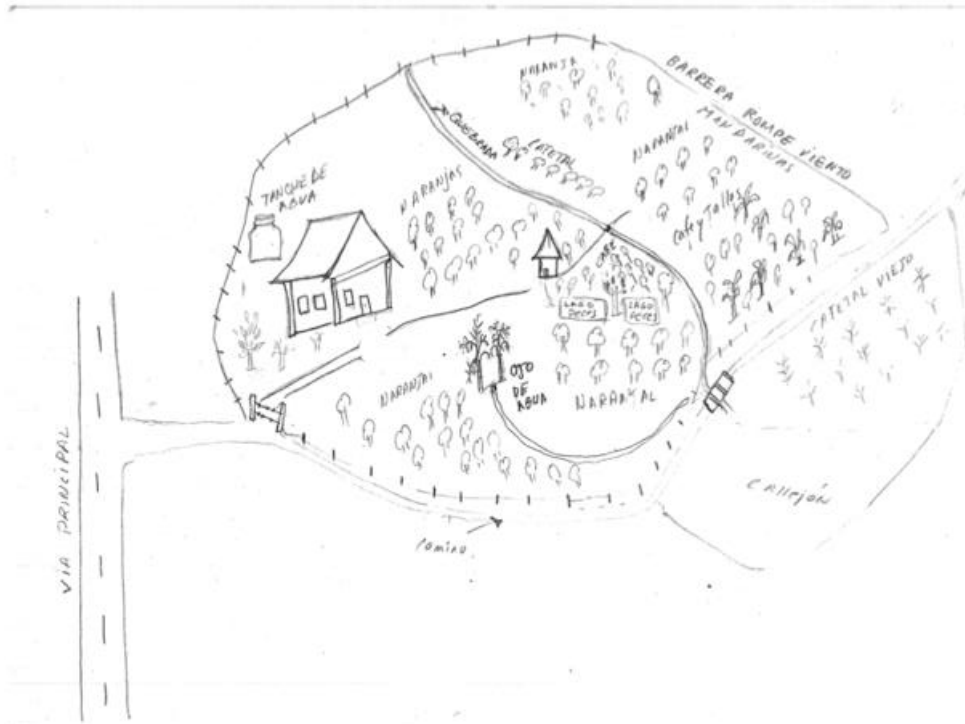
* N represents oranges, P represents plantains, and C represents coffee plants.

The drawings that follow are from a farmer association member (Figure 6) and non-member who has not participated in agroforestry projects (Figure 7). These maps underscore the differences in production between farmer association members and non-members and the potential influence that participation in agroforestry projects has on agricultural management and knowledge transfer. Compared to the farmer association member, the non-member's parcel is organized in a more ordered manner with distinctive areas for orange and coffee production. They focus on maintaining coffee and oranges for income generation. The differences in the maps shows how market influences agricultural production techniques. Even the non-members' farm is more diverse than the NGO and government schematics. Suggesting that what they are promoting may be unrealistic for the farmers of Santa Fe or not taking into account how farmers actually practice agroforestry in Santa Fe. These findings show that farmers and outside actors (NGOs and government agencies) have differing perceptions of how agroforestry should be practiced.

Figure 6: Drawing of agroforestry parcel by farmer association member.



Figure 7: Drawing of agroforestry parcel by non-member of association.



Although farmers may plant crops in rows and distances measured among them, these farms hardly look like the schematics depicted by agroforestry project implementing organizations. This suggests that farmers aren't necessarily using the knowledge of the extension workers and/or they are integrating some of the knowledge with their own experiences. Their farms are organized based on their experiences working their land.

Livelihoods and Trees

Will farms in the future become more like the schematics shown above? I don't believe so given the importance that diverse agroforestry systems have on livelihoods. Agroforestry contributes to farmer livelihoods through the production of resources for consumption, sale, medicinal purposes, and household uses. The majority of production is for consumption. Agroforestry contributes about one-third of overall income to farmers; among association members, agroforestry contributes 38.07% and among non-members agroforestry contributes 35%. Income generated from agricultural production is seasonally dependent. Therefore, throughout the year farmers earn income from various enterprises. On average 36.78% of income comes from agroforestry related production. The majority of farmers stated that coffee (\$225/100 lbs.), plantains (\$0.25/each), and kidney beans (\$0.60-\$0.80/lb.) were the greatest generators of income. Management of agroforestry parcels may be influenced by the socioeconomic and household characteristics of the farmers. Non-member farmers have more economic resources than producers who are members of associations and typically they have more diversified incomes (they have more sources of income than farmer association members). More economic resources allow farmers to invest more in their farms, which influences their land use and implementation of management techniques. That is, they have more economic power to invest in their farms and this is reflected in their agroforestry parcels. Table 10 presents socioeconomic characteristics and production data for association members and non-members who practice agroforestry.

Table 10: Farmer socioeconomic characteristics and production data.

Characteristic	Member (N=26)	Non-member (N=20)	Both (N=46)
Age (years)	56.80	47.50	52.76
Education (years)	7.92	7.85	7.89
Number of household members	4.15	3.95	4.06
Landholding size (hectares)	3.70	2.08	2.65
Land under agroforestry (%)	89.42	82.48	86.40
Land title (%)	23.08	50	34.78
Work days per year in parcels	214.69	219	216.56
Production for sale (%)	34.04	46.5	39.46
Production for consumption (%)	65.96	53.5	60.54
Income from agroforestry (%)	40	35.75	38.15

One extension worker shared with me that at first they implemented a project focused on only timber species with construction and commercial value, but realized that they were undermining the livelihoods of farmers by only focusing on those species. Therefore, the NGO began to implement agroforestry and promotion of species that had direct benefits to farmers in the form of food and other natural resources. One extensionist's perspective on the reasoning behind the promotion of coffee is: *"We work with agroforestry systems because coffee is one of the few crops that can work in an environmentally friendly way and has good practices associated with it. Because coffee is always associated with some type of [tree] coverage, including the coffee itself provides coverage along with other species. Therefore, this system of production allows us to maintain that kind of coverage. Also as people have coffee cultivation as an*

economic alternative we feel that they will provide the care and attention that coffee needs... because besides contributing to the environment they can provide them an economic resource for the family. And also conservation objectives are met.” His perspective includes the idea that coffee agroforests are environmentally friendly, include a variety of species, and provide economic returns.

Farmers’ knowledge of tree species and their uses is extensive, reflecting their importance to their ways of life. Trees are sources of goods and services that they would otherwise have to purchase (Westphal 2008). Results from interviews, observations, and transect walks with farmers in their parcels show that farmers maintain a diversity of trees. Overall, farmer association members and non-members maintain more than 150 tree species in their farm parcels. Agricultural crop species were similar between members and non-members, however non-members produce more crops for sale (44%) from their agroforestry parcels than do association members (34%). Many of the tree species in the agroforests have multiple purposes in that they provide resources apart from their main function (Méndez et al. 2010; Westphal 2008). Agroforestry implementing organizations promote very little variety compared to what naturally grows and what farmers plant that are not project trees.

One of the constraints to having successful projects is the capacity of the technical staff. Farmers strongly recommend that the extension agents be knowledgeable of local flora and fauna. Taking this a step further, this would also mean recognizing the knowledge and skills of farmers and integrating their experience not only into project design and management, but also into how extension services are provided to the general

public. Furthermore, when asked how these projects could be improved, farmers have stated that they wanted more “native” species that are adapted to the area to increase the possibility of tree survival and future use to benefit the farmer. Farmers use the word “native” to describe tree species that they consider adapted to the area and that they have maintained for generations. These “native” species may include species that are technically non-native to Panama. I use this term in accordance with farmers’ understanding and definition of their native tree species.

Members of farmer associations manage, on average, 18.27 tree species and non-members manage 16.68 tree species. However, farmers use 10 different species of guabo (*Inga* spp.), making it one of the most important species that farmers manage, especially for coffee shade. The table also doesn’t reflect the more than 7 varieties of banana cultivated by farmers nor the multiple varieties of oranges that are grown in Santa Fe. Also, the production of annual crops and medicinal plants add to the diversity of the agroforestry systems.

The species listed in Table 11 are the most common ones found among farmer association members. These species are important to farmers’ livelihoods, many of which have multiple purposes. Farmers use them for consumption, sale, construction, shade, medicine, soil fertility, and water protection. Many of the species listed here are also promoted by agroforestry project implementing organizations. So in some ways NGOs and government agencies are taking into consideration what farmers consider important to their livelihoods. The species that are more commonly found among non-farmer association members are oranges, mandarins, plantains, and *pifá*, which is a palm

tree that produces highly nutritious fruits that people like to drink with coffee. These are also the crops, among this list, that provide the highest amount of income when sold.

With coffee and oranges being the most profitable. These data reflect that land management decisions are based on household characteristics, consumption needs, and income generation.

Table 11: Common plant species maintained and promoted in agroforestry systems.*

Common Name	Scientific Name	Use intensity by members (%)	Use intensity by non-members (%)	Use	Promoted
Café	<i>Coffea</i> spp.	100	100	1	Yes
Guabo	<i>Inga</i> spp.	92.31	80	1, 5, 6	Yes
Naranja	<i>Citrus sinensis</i>	88.46	95	1	
Mandarina	<i>Citrus</i> spp.	76.92	80	1	Yes
Guineo	<i>Musa</i> spp.	73.08	65	1	Yes
Plátano	<i>Musa</i> spp.	69.23	80	1	Yes
Caoba nacional	<i>Swietenia macrophylla</i>	69.23	35	2	Yes
Pifá/pixbae	<i>Bactris gasipaes</i>	61.54	65	1	
Mango	<i>Mangifera indica</i>	57.69	40	1	Yes
Espavé/javillo	<i>Anacardium excelsum</i>	46.15	10	7	Yes
Mamon chino	<i>Nephelium lappaceum</i>	42.31	45	1	Yes
Guarumo	<i>Cecropia</i> spp.	30.77	15	5	
Guanábana	<i>Annona muricata</i>	30.77	30	1, 4	
Laurel	<i>Cordia alliodora</i>	30.77	30	2	
Nance	<i>Byrsonima crassifolia</i>	30.77	45	1	
Palma real	<i>Attalea butyracea</i>	30.77	15	2	

Table 11: Continued

Common Name	Scientific Name	Use intensity by members (%)	Use intensity by non-members (%)	Use	Promoted
Corotú	<i>Enterolobium cyclocarpum</i>	26.92	25	2, 3, 5, 6, 7	
Caimito	<i>Chrysophyllum cainito</i>	26.92	10	1	Yes
Cacao	<i>Theobroma cacao</i>	26.92	25	1	Yes
Cedro amargo	<i>Cedrela odorata</i>	23.08	15	2	Yes
Aguacate	<i>Persea americana</i>	23.08	40	1	

*Uses: (1) Fruit/food, (2) construction/wood, (3) shade, (4) medicine, (5) attracts animals, (6) soil fertility, (7) water protection.

The other species that farmers mentioned in interviews and walks as being present on their farms had uses that include fuelwood, protection of water sources, fences, and windbreaks.

Production and Participation by the Numbers: What are the Costs and Benefits?

Because agroforestry is seen as an environmentally friendly practice that also has the potential to generate income for livelihood improvement, government and NGOs promote it as a method to achieve conservation and socioeconomic goals. To shed light on this idea, I looked at the benefits, challenges, and costs of agroforestry management from the farmer's and implementing organization's perspectives.

Farmer association members are taking a risk by dedicating land in crops that extension agents and technical staff are recommending. If these crops fail then they will have incurred costs associated with having planted these trees, which may include time, labor, and input purchases. Although the trees that implementing organizations promote are, for the most part considered fair choices in the sense that the trees have multiple

uses, farmers' control and access to resources is regulated by outside organizations.

Non-members are not under the same constraints as farmer association members. Non-members have more freedom of choices regarding which crops to plant.

Farmers share perceived benefits and challenges regarding agroforestry management. Perceived benefits include improved soil fertility, controlled soil erosion, provision of timber, provision of fuelwood, provision of shade, a source of income, and a source a food. Perceived challenges varied among farmers. The variation reflects the individual agroforestry experience, knowledge, and management skills of each farmer. The most common challenges faced by all farmers are inadequate resources in terms of time, money, and, labor, pest and disease infestation, poor market prices, and poor access to markets. One of the more important management concerns shared among all farmers is the control of on-farm plagues and diseases, particularly among coffee and oranges. Lack of resources for farm investment and market issues are the largest constraining factors for all farmers.

Economics of Coffee and Orange Production

The economics of surrounding coffee and orange production are important to consider because they often dominate agroforests. According to MIDA, to produce one hectare of coffee would cost \$4,125 in the first year, with profits being generated in the fifth year producing a cost-benefit ratio of 1.22 and profitability of 22.35% (MIDA 2008). Their analysis is somewhat unrealistic because this scenario would be cost prohibitive for most smallholder farmers in Santa Fe as many farmers do not have access to the resources described in the analysis for coffee production. Nor can they dedicate

such an expanse of land solely to coffee. Their livelihoods depend on minimizing costs and maintaining systems that can provide year round resources.

According to MIDA, to produce one hectare of oranges the initial investment would be \$3,287.46 with profits accruing in the third year of production. In this scenario there would be a cost-benefit ratio of 1.04 and profitability of 4.08% (MIDA 2013). Unlike coffee, whose price when sold is considered fair by farmers and sale is aided by the presence of the cooperative's processing plants, oranges, on average, sell for \$2 per 100. Even though farmers consider oranges profitable, poor market access and low prices mean that farmers rely on intermediaries for sales.

I don't know of any farmers, neither association members nor non-members, who devote one entire hectare to the production of only coffee or oranges, so MIDA's costs and benefits are unrealistic for the average farmer in Santa Fe. However, for either system, the investment is substantial to establish the farm, especially one hectare. A more realistic farm would be one that combines various crops to satisfy household consumption needs and potentially obtain multiple streams of income throughout the year.

Agroforestry Project Budget

From an economic standpoint, participation in agroforestry projects has costs and benefits to farmers. The costs saved by an individual farmer through participation in a three year, \$13,490 project allocated for twenty farmers is \$567 (see Table 12 for a breakdown of costs for this agroforestry project). That is, an individual farmer is saving \$485 in agroforestry inputs (including 150 trees to reforest riparian areas, 500 coffee

plants, 20 orange plants, and 20 plantains or bananas), \$57 in equipment (of course a shovel, spade, pick axe), and \$25 in transportation costs, a total of \$567 that s/he would otherwise have to pay. According to the budget, the only contribution that a farmer makes is through labor. The budget is underestimating the amount of community contribution in the form of labor costs, labor days, and by excluding the value of the land. It also does not take into account the time spent in trainings nor the cost to mobilize yourself to attend trainings. I asked farmers if they thought that projects truly reflected their contribution and they said no; numbers cannot reflect the time, risk, energy, and human capital that farmers contribute.

Table 12: Summary of costs for the establishment of agroforestry parcels for an example project.

Expenditure Item	Unit	Unit Cost	Quantity	Total Cost	Community Contribution	Government Contribution
Agroforestry						
Reforestation of riparian habitat	Sapling	\$0.50	3,000	\$1,500.00	0	\$1,500.00
Coffee	Sapling	\$0.50	10,000	\$5,000.00	0	\$5,000.00
Orange	Sapling	\$3.00	400	\$1,200.00	0	\$1,200.00
Plantain and banana	Sapling	\$1.00	400	\$400.00	0	\$400.00
Organic fertilizer	100 lbs.	\$8.00	200	\$1,600.00	0	\$1,600.00
Parcel cleaning	Daily wage	\$8.00	20	\$160.00	\$160.00	0
Farm planning	Daily wage	\$8.00	20	\$160.00	\$160.00	0
Maintenance	Daily wage	\$8.00	20	\$160.00	\$160.00	0
Fertilizer application	Daily wage	\$8.00	20	\$160.00	\$160.00	0
Shade management	Daily wage	\$8.00	10	\$80.00	\$80.00	0
Planting of crops	Daily wage	\$8.00	40	\$320.00	\$320.00	0
Parcel maintenance	Daily wage	\$8.00	20	\$160.00	\$160.00	0

Table 12: Continued

Expenditure Item	Unit	Unit Cost	Quantity	Total Cost	Community Contribution	Government Contribution
Subtotal				\$10,900.00	\$1,200.00	\$9,700.00
Tools						
Shovel	Unit	\$8.00	20	\$160.00	0	\$160.00
Posthole digger	Unit	\$20.00	20	\$400.00	0	\$400.00
Spade	Unit	\$7.00	20	\$140.00	0	\$140.00
Pick axe	Unit	\$7.00	20	\$140.00	0	\$140.00
Hose	Unit	\$15.00	20	\$300.00	0	\$300.00
Subtotal				\$1,140.00	0	\$1,140.00
Transportation						
Transportation of saplings, seeds, materials, and tools	Travel	\$100.00	5	\$500.00	0	\$500.00
Subtotal				\$500.00	0	\$500.00
Technical assistance						
Technical assistance	Work day	\$100.00	3	\$300.00	0	\$300.00
Bank costs	Unit	\$150.00	1	\$150.00	0	\$150.00
Subtotal				\$450.00	0	\$450.00
Training						
Agroforestry systems	Work day	\$250.00	1	\$250.00	0	\$250.00
Commercialization	Work day	\$250.00	1	\$250.00	0	\$250.00
Subtotal				\$500.00	0	\$500.00
Total				\$13,490.00	\$1,200.00	\$12,290.00

Source: ANAM 2012

To emphasize, the costs that they would have had to pay are deferred as part of this project participation by farmer association members is approximately \$567. In other projects, farmers are also able to save on seed, trees, fertilizer, plastic nursery bags, and other equipment. The amount of \$567 may be enough to purchase resources needed to slightly improve a farm, but a significant increase in the resources provided by projects

would have to occur to provide a substantial injection of funds for farmers. Another possibility is to be involved in multiple projects in order to accrue the resources needed to establish a farm. Non-members incur these costs without any injection of funds from projects. After the project closes, both members and non-members have the same basic responsibilities in terms of costs. That is, the investment in farms does not stop with the project.

Labor availability, land tenure and resource, and market access influence farmer association member and non-member agroforestry management and livelihoods. An analysis of these influential factors in relation to agroforestry management follows.

Labor Availability

Labor availability and time are potential constraining factors for farm production. Participation in agroforestry projects adds another layer of complexity. Agroforestry systems provide opportunities for rural labor (Urrea 1995). Labor can provide additional costs and act as a constraint to the amount of land that can be cultivated (Angelsen and Kaimowitz 2004), therefore, it is important to consider the labor aspects of agricultural production.

Labor availability is a growing concern among farmers in Santa Fe as the percentage of the population dedicated to agriculture decreases. Within the province of Veraguas, the majority of farmers are 35 years old and older with the highest number of farmers being 65 years old and older (see Table 13) (INEC 2011). For this study, the average age of farmer association members, 56.8 years, is higher than non-members, 47.5 years.

Because of the decreasing numbers of youth choosing to farm, labor availability may also decrease to a level where labor demands cannot be met. This has implications regarding food security, land distribution, and land use. If farmers are not able to produce sufficient food to meet their needs or have the income to purchase food, levels of food insecurity may increase.

The majority of farmers require assistance in maintaining their farm. Demand for on farm labor is typically first met by the farmer’s family. If the family does not have adequate laborers it will contract them.

Table 13: Number of farmers by age group in the province of Veraguas.

Farmers							
Total	Age Groups						
	Less than 21	21 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 or older
36,642	197	576	4,204	7,168	7,890	7,293	9,314

Source: INEC 2011

On farm labor typically consists of hiring a day laborer that may be contracted for a period of one day or many weeks. Most participants of the study contracted laborers occasionally. Laborers are often hired to clean the parcel, plant, and/or harvest crops. This is hard manual labor. I often worked with farmers in their parcels, giving all of my effort, but not doing nearly as much as they do. Workers are typically paid \$8 for a day’s work including 1-2 meals provided by the contractor. Without food the laborer is paid \$10, which is considered a steep price to pay as the compensation for day laborers

has increased substantially over the last 10-15 years. The boom in the construction industry, which pays higher wages to laborers, has provided pressure to increase wages to provide competitive compensation to workers in the agricultural sector. Changes in demands from economic sectors, influenced by market forces at national scales, have trickled down to affect agricultural production at local levels.

Land Tenure and Resource

The Panamanian government implemented agrarian reform and attempted to redistribute land between 1969 and 1977 (Meditz and Hanratty 1989). The government obtained 500,000 hectares of land and expropriated another 20%. The majority of land acquired was in the Veraguas and Panama provinces. During this time period the *campesino* movement obtained momentum and power. Participants of the movement focused on protecting their land against the capitalist interests of the dominant political class who were not in favor of the smallholder farmer (Gandásegui 2003). Reform included focused efforts to organize farmers into collectives for agricultural development. The government provided economic aid to organized farmers. It also made available farm machinery, increased rural credit, supplied improved seeds and other inputs, and provided technical assistance (Gandásegui 2003; Meditz and Hanratty 1989; Thiesenhusen 1987). This same pattern continues today in Santa Fe with the provision of similar goods and services through NGO and government funded programs. Social conditions among farmers improved as a result of agrarian reform, however, economic conditions did not similarly improve.

Despite agrarian reform, land titling was not a component. Recently, the National Authority for the Administration of Land's (Autoridad Nacional para la Administración de Tierras (ANATI)) recent campaign to help citizens dedicated to agricultural activities title their land for free. Many of the farmers I spoke with are interested in participating in the program. Land title provides security and may increase investments existing agricultural land without expansion (Angelsen and Kaimowitz 2004). Scholars argue that insecure property rights is a disincentive for agroforestry, but also that planting trees may be a way to overcome insecurity by claiming land (Angelsen and Kaimowitz 2004).

The majority of farm holdings (81.20%) in Santa Fe do not have a property title (see Table 14). In my study, only 35% of study participants have land title or are in the process of obtaining title (23% of farmer association members and 50% of non-members). Land tenure is not a requirement to participate in agroforestry projects, only right of possession (*derecho posesorio*) and, therefore, is not a constraining factor. The property regime in Santa Fe is generally well-defined and, as such, this may explain farmers' willingness to invest in their farms, including through participation in agroforestry projects (Angelsen and Kaimowitz 2004).

Table 14: Land use and tenure security in Santa Fe district.

Indicator	Value
Surface area of farms (ha)	53,206.95
Number of farms	3,285
Farm holdings with property title	14%
Farm holdings without property title	81.20%
Farm holdings under lease	0.10%
Mixed tenure regime	4.70%

Source: INEC 2010

There has been an increase in land sales in the area to expatriates and Panamanians moving to Santa Fe or purchasing second homes there. Sales are projected to increase as fewer people stay within the agricultural sector. Although land is usually maintained within the family, land resources may become scarce in the future due to sales. There are social, economic, and environmental ramifications of these land sales.

As farmers continue to sell their land there is an increasing possibility that farmers will become landless. One potential ramification of this situation is that a different kind of poverty will emerge characterized by the farmer's inability to produce sufficient food to feed his/her family. An interviewee described that in some cases farmers are left with just their houses and do not have enough land left to cultivate sufficient crops to feed their families. Also, given that few off farm and non-skilled employment opportunities exist within Santa Fe, farmers may not be able to generate sufficient income for the purchase of any necessary goods and services.

Many of the expatriates and second home owners have started farms to produce coffee. These farms are distinct from the farms of residents who have lived in Santa Fe for generations. The farms of expatriates and second home owners are characterized by more intense production (coffee plants are planted more closely together), higher use of inputs (fertilizers, insecticides), and fewer tree species.

As more expatriates and Panamanians buy homes, land, and develop farms in the area, the physical and social landscape may begin to change significantly as the agricultural frontier (land under agricultural production) expands, different management techniques are implemented, and they continue to adopt techniques that may have

negative environmental impacts in order to increase coffee production. This may mean a displacement of the local population. Although land resources are not directly tied to agroforestry projects, perhaps the positive benefits that they extend to farmers through farm improvement and the provision of livelihood assets may influence their decisions to remain in the agricultural sector and not sell their land.

An extensionist recognized the costs and benefits to farmers for participating in agroforestry projects in terms of land use and the need to promote multiuse systems that can benefit the environment and people. *“People, campesinos, farmers have few resources, even little land. They will not give what little land they have only to plant trees. Coffee is one of the crops that are native here they have always depended on. And orange. Really the end the experience told us we cannot do pure reforestation, perhaps only if it was a protected area. But have to give them something in exchange for the benefit in the short-term...If because everyone breathes but who pays for that to them. The strategy was to look for an alternative and the alternative was agroforestry systems.”* He explains that farmers are both constrained by putting their already limited amount of land only under systems that would not provide an economic benefit to farmers. He also recognizes the need for farmers to also have short-term benefits. He importantly, touches on the idea that farmers bear a lot of the responsibility and cost to protecting the environment so that many can benefit.

Role of Women

Although studying the gendered difference in agricultural production was not a focus of this study, I wanted to highlight the important contributions of women to

agriculture in Santa Fe given their intimate knowledge of agriculture and natural resource management. Women's roles in agricultural production are highly varied and are influenced by employment status, family structure, farm location, and household needs.

Whether a farmer association member or non-member, women attend to the spaces in and around the house. They manage small home garden agroforestry systems that are typically not dominated by coffee varieties, but by several fruit tree species (e.g., papaya, soursop, banana), medicinal plants (e.g., chamomile, linden, *paico*, *mastranto*), and vegetable crops for daily cooking use (e.g., tomatoes, celery, culantro). Although men may help, this area is typically controlled by women. The products produced from these spaces are generally used for the household. Having the home agroforestry systems provides the advantage of high accessibility and low input and labor costs associated with them. Their decisions regarding the management of these spaces influence the diversity of flora that is grown around the house. When the more substantial agroforestry parcel is not located near the house women may not attend to the agroforestry farm parcel as often as men.

Within farmer associations women are in the minority (unless it is a women's farmer association). Often they are not members given the additional obligations that are involved in association membership and project participation. Although I was unable to interview more than thirteen female farmers, I had the opportunity to spend time with many women in their homes to discuss everyday topics (I spent more time in informal situations with women than men). Part of their knowledge domain is linked to food

preparation and medicinal purposes as well as for economic revenue. However, many of the women that I spoke to tended to minimize their knowledge and production roles that they have.

Women's participation is specifically sought after by organizations promoting agroforestry projects. These organizations see the benefit of integrating more women because as the main family caregivers they can engage in endeavors that can improve livelihoods through increased economic opportunities and food security. When women do participate in associations they usually take on traditional gender roles of cooking and cleaning for the group, but will also work in the parcels.

It would behoove development organizations to increase women's participation in such a way so that they can influence the design and implementation of projects and programs for *their* own benefit. This may lead to their participation in broader discussions that may inform policies related to agriculture, natural resource management, and conservation practices and opportunities.

Story of Sara

I spent a lot of time with one farmer in particular. Her father-in-law recently sold large portions of his land and now her husband is working as a construction worker building houses on what was his father's land. Farm land and a coffee plantation were converted to provide the space to build the houses. The land is less than one kilometer away from SFNP.

She had worked over the last 5 years improving her farm. She has focused on growing leafy greens. She also cultivates ornamental plants. Because of her membership

in a farmer association she was able to participate in projects that provided seeds, material for greenhouses, technical assistance, and capacity building seminars and workshops.

She sells her produce to people living in Santa Fe, but also has customers that come from the provincial capital. The management of her parcel has become influenced by the demands of her clients as she has started growing more leafy greens because of customer preferences. Although business is sporadic she says that she loves what she does and is proud of herself. Every time I've worked on her farm and we're having lunch, she says, "What more could you want than having the plate full of food come from your own farm?"

She is both critical and appreciative of development projects and farmer associations. In the last year she decided to leave the association. One of the main reasons because she left was that she became tired to the other members' lack of motivation to contribute to the success of projects. She also felt used by the agencies because they often came to her farm and would use her farm claiming that it was their work and technical assistance that had shaped the farm. She "This has occurred many times here, where an outside extensionist comes and says you, "Well, I'll teach you to make bocashi [an organic compost]". I get the ingredients, I work with my people, and who gets paid? The technician. He is "teaching" me, but the work? I am doing it, not him. The extensionist always comes to get signatures and teach-- they earn their salary, at the expense of whom? It's because the people think the extensionists know everything. But it's not like that. This is another issue I discuss with my people. I tell

them not to get excited about outsiders teaching them. They are the ones that know what you are going to plant, how you are going to plant it because the land here is yours and you work it.”

On the other hand, “They teach you how to work organized and ordered. For example, to plant oranges and native trees at a distance. The projects teach producers how to organize their production.”

A group of visiting extension workers came to her farm to learn about the agricultural techniques she uses to grow her crops. She says, “What a strange visit that was. They didn’t ask me very many questions.” I ask, “Did you feel nervous?” She responds, “I don’t get nervous anymore because I’m the expert about my farm and I have a lot of experience.” This is true, and she usually has a lot more experience than the people visiting her.

Sara is both a teacher to other farmers and extension workers and a student of the extension workers. They are all generating and sharing knowledge. She recognizes her own worth and has confidence in her own knowledge. Many farmers have a tendency to step back and be influenced by the “expert” opinions of outside staff. She steps forward. The story of Sara illustrates that farmers accrue benefits from projects to support their livelihoods, but also that there internal factors within farmer associations and external factors from agroforestry project implementing organizations that create situations in which a farmer may leave the association. These types of situations would be relevant to outside organizations to consider if they want to continue implementing projects so that they may develop strategies to strengthen groups and/or work with motivated farmers on

an individual basis. Her story also shows the interaction of development organizations with farmers, and the production and exchange of knowledge that often takes place. These interactions involving knowledge exchanges can often influence land management decisions of farmers and the achievement of project goals on the part of implementing organizations. These factors paint a complex picture of interacting forces with multiple implications.

Interacting Forces

The socioeconomic and physical conditions of Santa Fe make it apt for the implementation of agroforestry systems, but also attract development organizations. Analyzing the influence of agroforestry projects on farmers and the environment in Santa Fe through the lens of farmer association members, non-members, and NGO/government agency staff reveals complex interactions related to land use, livelihoods, and market forces. All farmers have adopted agricultural strategies that are influenced by household needs and market considerations for income generation. The exposure of farmer association members to development organizations and their projects has meant that they have become integrated into an additional layer of influence and complexity that is not felt by farmers uninvolved in agroforestry projects. This additional layer consists of outside organizations' promotion of agricultural techniques, tree species, and land uses. Nevertheless, farmers involved in agroforestry projects are deciding which types of knowledge they integrate onto their farms. In a way, they pick and choose from among what is being taught, promoted, and suggested to them based on

what they consider to be useful. As such, we see both similarities and differences in the way that both members of associations and non-members practice agroforestry.

The differences in land management practices between farmer association members and non-members aren't necessarily because association members are participating in agroforestry projects. Land management decisions are based on multiple factors including household characteristics, consumption needs, the potential for income generation, labor, market access, land resource, and occupation. Specifically, the differences that are seen among farmers are influenced by individual and household level socioeconomic characteristics, particularly that non-members have more income streams, allowing them to invest in their farms more than farmer association members.

The data from observations and interviews of farmer association members, non-members, and NGO/government agency staff also reveal contradictions and affirmations related to the attempt to achieve sustainable development and livelihood improvement through the implementation of agroforestry projects. Agroforestry project implementing organizations place priority on biodiversity and natural resource conservation, but what they promote is influenced by market forces. Farmers' agroforestry parcels also reflect the desire of farmers to maintain their livelihoods and generate income. That is, all farmers maintain a variety of species that they consider important to their livelihoods. Without the diversity of production that farmers manage throughout the year, they potentially would be less able to meet their needs in terms of consumption and generation of income. Through the promotion of species that farmers consider important

to their livelihoods and have the potential for income generation, NGOs and government agencies are supporting livelihoods through the implementation of agroforestry projects.

Decisions regarding agroforestry project implementation involve the availability of money (e.g., grants and loans), resources, and trends in development. That is to say, farmer association members are exposed to multiple levels of influence, from the strategies of development donors, who then establish the criteria that must be met by implementing organizations, to the project implementing NGO/government technical staff, the knowledge they impart, and the perspectives they share with farmers. All of these moving parts act within a system that is influenced by the economy in such a way that shapes the livelihoods of farmers and the agricultural landscape of Santa Fe. Therefore, in some ways farmers are almost like passengers in a large machine of development, riding along and driven by outside factors.

However, research shows that through their ability to ignore and embrace cues from outside organizations, that farmers are, in fact, recognizing and assessing the benefits and costs of participating in agroforestry projects in a way so that their well-being is improved and their influence on the environment is minimized. They are also recognizing their ability to shape development by sharing their input (and determining what they implement on their farms despite the influence of development organizations).

Farmers experience benefits, costs, and challenges related to agroforestry production. Farmers most likely will see economic and livelihood benefits in the long-term. However, economic benefits will depend on the further development of markets, access to them, and fair prices for their production. Additionally, the establishment of

better market access in the future may in turn affect land use through more intensive production of cash crops such as coffee and oranges. Farmer association members do receive short-term benefits through project participation in the form of resources for farm improvement and/or the establishment of new agroforestry parcels, but have long-term commitments to maintain the project trees on their land. There will always be costs associated with agroforestry with the benefits accruing to farmers at the local level, regionally through their protection of the watershed, as well as nationally and internationally through their management of environmental services. Farmers bear a lot of responsibility. Furthermore, there are costs associated with agricultural production including investment in land resources, labor, and inputs which are only slightly mitigated for farmer association members.

Overall, we see that there are multiple internal factors interacting with external factors at different scales of time and space.

CHAPTER V
CONSERVATION, POLICIES, AND THE PARK

“Tener una vida saludable en harmonia con la naturaleza...”
-Santa Fe Farmer

Introduction

Protected areas have been established throughout the world to try to reduce the effects of anthropogenic threats on the environment. The International Union for the Conservation of Nature (IUCN) defines a protected area as, “a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values” (Dudley 2008). Countries differ in their classifications of protected areas on a national level and in the extent to which its governmental bodies enforce/regulate the protected areas. Panama’s protected area system is characterized by with approximately 37.3% of land and 31.8% of water protected (ANAM 2011). The protected area management system in Panama has historically been one of command and control to mitigate, but at the expense of local communities (Oestreicher et al. 2009).

Santa Fe National Park (SFNP) was established in 2001 and is approximately 72,636 hectares. Government officials worked in conjunction with communities of Santa Fe and local authorities in seminars and workshops to help create the park. It is biodiversity rich with over 50% of mammals represented in the park and over 300 bird species have been identified in the park.

The land management techniques of smallholder farmers in communities around Santa Fe National Park and within the Santa Maria River watershed in central Panama have been identified as a causes of deforestation. This is an area of not only biological importance as it forms part of the Mesoamerican Biological Corridor, but also social and economic importance. To reconcile conservation and development needs around the park and within the watershed, reforestation projects targeting farming associations have been promoted by government agencies and organizations. These efforts are designed to protect biodiversity, conserve water resources, and improve livelihoods through income generation.

The debates regarding protected areas and the exclusion of people resulted in shifts in thinking about the relationship between conservation, people, and development. Agrawal and Gibson (1999) argue that protected areas arose from ideas that saw biodiversity conservation outcomes as achievable through state control and the exclusion of locals. The authors provide potential reasons for the shift away from top-down conservation management. They put forth that states' inability and limitations to coerce citizens relates to the tension between conservation and the use of natural resources for livelihood purposes (Agrawal and Gibson 1999). Focus on the community is an attempt to infuse conservation agendas with the participation of those whose livelihoods are directly linked to natural resource management. Moreover, both internal and external institutions influence the interaction and interests of actors within communities and their decision-making processes. These ideas are relevant to smallholder farmers as resource-

dependent users are often the targets of rural development initiatives that include ecological and social components, particularly sustainable development.

Drawing on semi-structured interviews and biological data, this chapter analyzes the environmental policies and institutions that act at various scales to influence environmental protection and land use in Santa Fe, the differing perspectives of farmers regarding the purpose and function of agroforestry, including perspectives from NGO and government agency personnel involved in agroforestry projects, and agroforestry's relationship to achieving conservation and livelihood improvement goals.

Buffer Zones

Buffer zones are transition areas located in the outskirts of a protected area where there typically are regulations regarding land use. Buffer zones are often areas where organizations implement integrated conservation and development programs (ICDPs). ICDPs focus on coupling conservation with development to achieve multiple goals to improve and the socio-economic status of people living within the buffer zone. Buffer zones may be areas of conflict/contention over resource use and, in the case of Santa Fe, a shining beacon for investment from NGOs and government agencies. Panama's Environmental Ministry defines a buffer zone as a strip of land surrounding a protected area that acts as a barrier to external influences and to absorb disturbances such as agricultural encroachment (ANAM 2006). The buffer zone around SFNP extends approximately 5 kilometers. Within the buffer zone, policies and political entities restrict and provide guidelines related to land use. Agricultural expansion in the

area of my study site should be constrained to the north and west by SFNP. However, the boundaries of the national park are not clearly delimited on the ground.

Political Dimension and Institutions

There are many policies, plans, and governing bodies that act at the national, regional, and local scales to influence the land management practices of *campesinos*, the implementation of development projects by the government and NGOs, and the narrative of stakeholders within the context of Santa Fe (see Table 15).

At the national level the executing agency of environmental policy is the Ministry of Environment (MIAMBIENTE) (formerly known as the National Environmental Authority). MIAMBIENTE is tasked with developing national environmental and natural resource policies, issuing rules and resolutions for the implementation of those policies, evaluating environmental impact studies, and imposing sanctions and fines. International and national environmental NGOs also influence the political, social, and economic atmosphere through their implementation of programs and projects while following the laws and regulations established by the Panamanian government.

Table 15: Policies and political entities that inform environmental legislation, forestry regulations, and land use at various scales.

Policy/Political Entity	Description	Level of Action
Law No. 41 of 1 July 1998	Comprises the General Environmental Law; creates the National Environment Authority (<i>Autoridad Nacional del Ambiente</i>) (ANAM)*	National
Executive Decree No. 59 of 2000	Regulates the article of the General Environmental Law in regard to forests	National
Decree Law No. 35 of 1996	Regulates the use of water	National
Law No. 24 of 1992	Establishes forestry incentives and regulates reforestation activity	National
Law No. 1 of 3 February 1994	Establishes forestry legislation	National
Santa Maria River Watershed Management Plan	Acts as a guide to inform the activities that take place in the watershed	Regional (Watershed)
Consejo de Desarrollo Territorial (CDT)	Focuses on rural development while taking into account Santa Fe's natural, human, and financial resources	Territorial (Santa Fe District)

*Source: ANAM 2007

The main policies and political bodies informing environmental legislation and forestry regulations, and land use in Panama and regionally in Santa Fe are included in the previous table. Land-use policies affect biodiversity status and the management techniques implemented by producers (Lambin et al. 2003). This idea is underscored in

the integrated management plan of the Santa Maria watershed, which was placed under resolution and made into law in 2010. The plan will regulate the use of water and land-use within the watershed (ANAM 2009). The concept of integrated watershed/water resources management incorporates the social and biological aspects of a watershed (Brooks and Eckman 2000; Jaspers 2003). At the regional level, the Santa Maria River watershed management plan acts as a guide to inform the activities that take place in the watershed. The perceived threats regarding the expansion of the agricultural frontier and the importance of the Santa Maria River resulted in the need to mitigate the perceived negative impacts of agriculture and protect the Santa Maria River watershed. As such, the watershed management plan was created. Despite apparently strong laws, policies, and guidelines that regulate land use, wildlife, forestry, and water use implementation of these policies is weak (they are strong on paper, but weakly enforced). However, they still exert a force and influence on farmers, particularly through the rules and regulations enforced through the local and provincial offices of MIDA and MIAMBIENTE regarding agricultural production.

An organized body in Santa Fe that acts at the territorial level is the *Consejo de Desarrollo Territorial* (CDT). It was established in 2007 as a model to be replicated in other districts throughout Panama. It focuses on rural development from a territorial perspective. All of the organizations in Santa Fe with legal status and all municipal government agencies are considered members of the CDT and representatives of these groups have the rights and responsibilities to attend meetings and guide the development of Santa Fe. The CDT provides opportunities for outside organizations to make *Santa*

Fereños aware of potential development, conservation, and economic opportunities as well as provide a forum for discussion. Many agroforestry project implementing organizations have attending meetings to share information about projects. The CDT is not institutionalized, but it is politicized and has, at times, lacked support from the municipal government and local organizations. The CDT has much potential in terms of being a decentralized platform to improve livelihoods as it provides an outlet to access and obtain control over resources and opportunities.

These policies and governing parties act together to inform, influence, constrain, and enhance the activities, funding opportunities, socio-economic, political, and ecological context in the Santa Fe area. Ultimately, they also influence who and what will benefit from rural development and agricultural initiatives such as agroforestry and may reinforce existing power dynamics. That is, the political and institutional forces acting at various scales influence land use and how benefits and costs are distributed among the residents of Santa Fe.

Agroforestry Definitions and Purpose

Farmers in Santa Fe have been practicing agroforestry for generations in the form of traditional shade coffee plantations, live barriers, wind breaks, home gardens, and intercropping. Because agroforestry is considered by outside organizations as a manner in which to integrate conservation and development objectives, it is important to explore farmers' understandings of the word as it sheds light on their perceptions of what agroforestry is, whether it contradicts or coincides with other definitions, and provides insight about how agroforestry relates to achieving conservation and livelihood

improvement goals. Leakey has defined agroforestry as “a dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels” (1997: 5). This definition reflects the conservation and livelihood improvement goals that NGOs and government agencies promote as part of agroforestry projects and agroforestry’s role in achieving them.

Interviews reveal that being a part of an agroforestry project does not seem to influence a farmer’s definition of agroforestry as both members and non-members had similar understandings of agroforestry. Farmers’ understandings of the word “agroforestry” are directly drawn from their experiences with and knowledge of agriculture. Working the land for agricultural production has shaped their understandings. Their definitions focus on the varieties of crops that can be cultivated and their consumption. For example, one farmer stated that agroforestry meant the, *“Planting of trees with basic grain crops for food. Such as kidney beans, rice, corn, coffee, oranges, chickens, animals also. Everything that one consumes, plantains, bananas.”*

Many members of farmer associations would call agroforestry *agroreforestation*, combining, reforestation and agroforestry. *“Agroreforestation. Where there are citrus, coffee, timber species, but at certain recommended distances. There’s a diversity of productive plants. It provides you coffee, resources, gives you guaba that one can sell...and you have a forest.”* This seems to be a reflection of their shared experiences

and participation in reforestation and agroforestry projects. For farmers these concepts are very similar. Also, noteworthy is his inclusion of “recommended distances.” Having been part of agroforestry projects and the required workshops/trainings, his statement highlights the findings from the previous chapter about ideas surrounding how agroforestry should look. This farmer combined all of the components that agroforestry project implementing organizations promote in Santa Fe in terms of planting coffee, citrus, shade tree species and timber species for multiple purposes (e.g., sale and consumption). This farmer takes the definition a step further by stating that these species together form a forest. Similar environmental sentiments are reflected by another farmer in the following statement about how he defines agroforestry, *“How you work to compose the environment, it’s where you are and what’s around you. To cultivate and improve the environment. Instead of destroying, I am constructing. For this reason, I plant.”*

All of the interviewees highlighted that the purpose of agroforestry is related to the conservation and protection of the environment, especially water. Several mentioned livelihood; if did only in terms of having production for consumption. Very few farmers explicitly stated that agroforestry had the goal of combining conservation and development, but did recognize that they could sell, consume, and protect the environment through agroforestry. These ideas were also reflected in statements made by technical staff. All actors recognize the role of agroforestry, reflecting the priorities of NGOs and government agencies implement these projects. Very few farmers explicitly stated that agroforestry had the goal of combining conservation and development, but

did recognize that they could sell, consume, and protect the environment through agroforestry. Similar to farmers, the majority of government and NGO personnel involved in agroforestry project implementation focused on what agroforestry entails in terms of its components. That is, their ideas regarding the purpose and function of agroforestry is similar to farmers.

Overall, agroforestry is viewed by farmers as a source for resources used in development with a mixture of trees (fruit, shade, and crops the variety of fruit, coffee, crops.

Agroforestry in the Context of SFNP and the Santa Maria River Watershed

There is no discernable difference among farmer association members and non-members in the way they perceive the environmental benefits of agroforestry. There is a general, overall belief among members and non-members that their agricultural practices and use of agroforestry systems benefits and supports the Santa Maria River watershed and SFNP through the planting of trees. The majority of interviewed farmers thought that, through their actions of planting trees and agroforestry parcels, they were contributing to the conservation of SFNP and to the protection of the Santa Maria River watershed. This is captured in the statement, *“Pifá, bananas, oranges are our forests.”* The statement reflects farmers’ perceptions of their agroforestry parcels and, by extension, what they consider a forest. They recognized that they are, essentially, adding to the “forest” and contributing to the overall well-being through the conservation of natural resources and production for goods and services by planting trees and crops in their agroforestry systems. They also state that through their practice of planting they

protect water resources. Diminishing water resources has become worrisome for farmers in recent years, underscoring the need to protect and maintain trees, particularly in riparian habitats. They have a strong desire to protect the watershed in particular because “water is life” for them. Given the changes in the climate that they have experienced, protecting water sources has become a priority.

Although farmers do not know much about the official facts of SFNP such as the exact boundaries of the park, which are not delimited over its expanse, they have a generally positive outlook towards SFNP. To them, it is an expanse of forest, la montaña. At one point, I walked two and a half hours with a farmer who wanted to show me his farm located in SFNP (those who had farms within the park prior to its establishment were allowed to keep them, but not expand them). If the farmer hadn't have told me when we were inside of the park, I wouldn't have known. I noticed that when I spent time with interviewees on their farms and speaking about the national park, they paid particular attention to the importance that the forest has in providing ecosystem services. They especially focused on the supply of air and water as it related to their well-being and agricultural production. Farmers did not believe that the agricultural frontier is expanding into the protected area, which outside organizations believe is occurring. Several people said they were increasing the forest cover with their trees. The technical staff affiliated with agroforestry projects I interviewed were not as definitive in their answers as farmers. They felt that agroforestry is beneficial to the environment but need to do much more.

In contrast to the views of farmers, extension agents did not believe that agroforestry directly supported SFNP. However, they did believe that agroforestry was positive for the environment and it directly supported the Santa Maria River watershed through the planting of trees. They particularly focused on the action of planting trees near water sources and often spoke of agroforestry's role in soil conservation through the prevention of erosion, important factors given Santa Fe's mountainous terrain. Although the perspectives of farmers and extension agents do not completely coincide, all interviewees discussed the positive role that agroforestry plays in the context of Santa Fe.

When speaking with NGO and government agency technical staff, their opinions would make me feel conflicted because, to me, they seemed to minimize the role of farmers in the maintenance of the watershed, SFNP, and local biodiversity. Of course, any manipulation of the environment has ramifications, but they seemed to not consider the idea that farmers would want to protect the area where they live. The language that farmers used when reflecting on their own well-being is directly related to the health of the environment (e.g., pure air, clean water, rain for crops, shade, cool temperatures). The technical staff's insights about the role of agroforestry, deforestation, and the practices of farmers in Santa Fe were valid, but were tempered by my experiences and observations of their interactions with farmers. This included the little time they spend in the field with farmers and on farms, and, at times, the lack of respect for their knowledge and ways of life. Stories of project failures that included extension agents from

implementing organizations telling them to clear large swaths of land to plant trees to meet project requirements also colored my opinions about their perspectives.

Although there were project personnel who took into consideration the views and opinions of farmers, they considered the environment rather than farmer livelihoods a priority. With the number of projects implemented in the area, both agroforestry and reforestation, NGO and government staff have accrued a number of lessons learned and ideas for alternative strategies. Considering these lessons learned from previous reforestation project in Santa Fe, an NGO employee stated, *“The results of the experience we just finished confirmed to us that it probably would have been better to work with natural regeneration than reforestation. Because in some areas we saw that reforestation that was done grew much slower than native species.”* NGOs and government agencies seem to want to promote projects and consider alternative strategies that are best suited for the area and the people who live there. Natural regeneration, reforestation, and agroforestry each have different goals and objectives that must be evaluated prior to implementation. One farmer thought that it was absurd to reforest when natural regeneration would be more feasible and beneficial to the environment and farmers. Several interviewees suggested that payments for ecosystem services could be a potential solution. There currently aren't any institutions implementing such programs in the area, but farmers had heard of payments for ecosystem services in relation to carbon capture from staff of the Environmental Ministry. The idea of getting paid directly for protecting the environment and, in some situations, continuing to do what they already do, is appealing.

His statement has implications for both farmer livelihoods and the ecology of the area. If implementing organizations were to change their strategy to natural regeneration it would mean less intensively managed systems. This strategy would make sense in some situations particularly if a farmer wanted to leave land under natural regeneration. However, land under production would decrease, which would create socioeconomic ramifications, including increased food insecurity and decreased income generation.

Trees on Farms

Farmers plant and maintain a variety of trees on their farms, which underscores and emphasizes their definitions of agroforestry. They have selected a combination of fruit, timber, and crop species that contribute to their livelihoods and the ecology of the area.

Overall, farmers manage over 140 species of trees, with association members maintaining an average of 18.27 and non-members maintaining an average of 16.68 trees. The majority of them are native species (as considered by farmers) that farmers manage for multiple purposes. The tree species that are promoted in agroforestry projects is limited, but also the implementing organizations have focused on those species that farmers consider important to their ways of life, reinforcing the cultivation of these crops and the land management techniques associated with their cultivation. These species include coffee, oranges, mandarins, bananas/plantains, timber species such as Spanish cedar and mahogany, and other fruit tree species. The diversity of crops help to meet the needs associated with household uses and has the potential to provide economic returns through their sale. Farmers are also minimizing risk through the

production of a diversity of crops, which over the long-term, stabilizes yields (Altieri, Funes-Monzote and Petersen 2011).

The species that comprise farms create different vegetation strata. However, the majority of the agroforests in this study have a structure and floral composition based on understory tree crops. The management strategy of farms allows for sufficient light to enter for crops in the understory to develop (Schroth, Harvey, and Vincent 2004b). Agroforestry project implementing organization staff are attempting to impart their prescribed knowledge to farmers, but they are making their own determinations regarding embracing what they are taught. In one sense these outside organizations are shaping the landscape and land use, in another sense farmers are still in control by choosing which techniques they wish to implement.

Camera Traps and Animal Testimonies

One of my favorite aspects of my research was setting up camera traps with farmers and SFNP staff. Using the cameras was a great way to open conversations about natural histories of animals, agricultural production, food preparation, and land use change. Farmers and park staff were excited to see what we had captured on the cameras on farms and in the national park. I don't know how many times farmers laughed with delight at seeing a photograph of an armadillo or paca on their farm. Studies show that agroforestry parcels are important in providing habitat for species outside of protected areas (Williams-Guillen 2006), particularly in shaded coffee agroecosystems (Somarriba et al. 2004). According to Somarriba et al. (2004: 216) "the ability of coffee plantations to harbor wildlife depends on a variety of factors, including the diversity and density of

trees, the presence of wild plants in the understory, plantation management (especially the use of agrochemicals), and the composition and structure of the surrounding landscape.”

Farmers who were part of this study employ a number of traditional and organic agricultural techniques on their farms. They typically use minimal quantities of agrochemicals to fumigate for plagues and pests as well as chemical fertilizer such as urea. They explained that they recognized that the chemicals were bad for the environment and didn't want to use them constantly as to protect the surrounding water sources from contamination. Agrochemicals can also be cost prohibitive for farmers, so even if they wanted to use them, they are constrained economically from purchasing them. Farmers also use conservation techniques to reduce erosion and maintain soil nutrients. The majority also use organic fertilizer such as chicken manure for their crops.

Given the importance of SFNP and studies showing the relevance of agroforestry parcels in providing habitat and sustaining biodiversity, I placed camera traps in SFNP in 7 locations and on 13 farms in 28 locations in the outskirts of the park within the watershed to gain a better understanding of the animals located in these habitats. Through purposive sampling I selected participants for the placement of cameras based on interviews and farm location. Participants were members and non-members of farmer associations who all practice agroforestry. With the guidance of farm owners and/or park guards, we placed cameras in strategic places where there was evidence of animals in the area (e.g. game trails, footprints) (Srbek-Araujo and Chiarello 2005). We mounted the cameras at the base of trees or firm structures for an average of six days in each location.

Table 16: Species captured by cameras placed in SFNP and on farms.

Scientific Name	Common Spanish Name	SFNP	Farms
<i>Agouti paca</i>	Conejo pintado	Yes	Yes
<i>Aramides cajanea</i>	Cocaleca	No	Yes
<i>Arremon aurantirostris</i>	Piquimarillo	No	Yes
<i>Cathartes aura</i>	Gallote	No	Yes
<i>Coragyps atratus</i>	Gallote	No	Yes
<i>Dasyprocta punctata</i>	Ñeque/kinko	No	Yes
<i>Dasybus novemcinctus</i>	Armadillo/armado	Yes	Yes
<i>Didelphis marsupialis</i>	Zorra	No	Yes
<i>Eira barbara</i>	Mielero	No	Yes
<i>Panthera onca</i>	Jaguar/tigre	Yes	No
<i>Pitangus lictor</i>	Pechimarillo	No	Yes
<i>Puma concolor</i>	Puma/león	Yes	No
<i>Sylvilagus spp.</i>	Muleto	No	Yes
<i>Tinamou major</i>	Gallo de monte	Yes	No
<i>Ave morena</i>	Not identified	Yes	Yes
<i>Felino</i>	Not identified	No	Yes
<i>Paloma</i>	Not identified	Yes	Yes
<i>Rata</i>	Not identified	No	Yes

The camera traps captured more species on farms than in SFNP, but that is most likely because we placed cameras in more locations on farms than inside the park. Table 16 shows the species captured by camera traps placed in SFNP and on farms. We were unable to identify several species that included two birds, a feline, and rats due to the low image quality.

I also asked farmers to list from recall, with the aid of a pamphlet with many of the common species in Panama, which animals they directly saw or saw evidence of on their farms. Farmers directly saw or saw evidence of the presence of 85 species. The

average number cited by association members is 11.2 and the average number of non-members is 12. The majority of farmers focused on the presence of mammal (citing 22 different mammals) and bird (citing 42 different birds) species, while very few described the presence of reptile or insect species. The most common species are displayed in Table 17. These species aren't necessarily of conservation concern, but demonstrate that animals are using and inhabiting farmers' parcels. Included on the list are species that are appreciated, considered nuisances, and also consumed by farmers.

Table 17: Common species described by farmers as having seen or seen evidence of on farms.

Common Spanish name	Common English name	Scientific name	Percentage of farmer association members who mentioned animals	Percentage of non-members who mentioned animals
Ardilla	Squirrel	Not identified	53.85	40
Armadillo	Nine-banded armadillo	<i>Dasyus novemcinctus</i>	61.54	80
Changame	Great-tailed grackle	<i>Quiscalus mexicanus</i>	30.77	20
Conejo pintado	Paca	<i>Agouti paca</i>	69.23	60
Muleto	Rabbit	<i>Sylvilagus spp.</i>	38.46	40
Ñeque/kinko	Agouti	<i>Dasyprocta punctata</i>	80.77	80
Paisana	Grey-headed chachalaca	<i>Ortalis cinereiceps</i>	69.23	60
Pechimarillo	Kiskadee	<i>Pitangus lictor</i>	38.46	25
Tigrillo	Ocelot	<i>Leopardus pardalis</i>	30.77	30
Venado	Deer	Not identified	23.08	45
Zorra	Opossum	<i>Didelphis marsupialis</i>	53.85	75

It is likely that the presence of SFNP influences the presence of animals on farms and their ability to travel among different landscape habitats (Schroth et al. 2004b). The close proximity of SFNP to the farms that I visited suggests that the park may be influencing the abundance and diversity of fauna in coffee agroforests. The agroforests may be acting as stepping stones that provide connectivity to SFNP. This isn't to say that agroforests are substitutes for forests or SFNP. However, given that agroforests are can be "reservoirs of biodiversity" (Méndez et al. 2010: 369), their existence may provide extensions of habitat useful to many species. There really hasn't been a strong strategic ecological strategy to the implementation of agroforestry projects. NGO and government agencies contend that they are increasing tree cover and mitigating deforestation, but where they have selected farmer association members to participate in projects is not based on a farm's conservation potential. That is, NGOs and government agencies give equal consideration to all farms for inclusion in agroforestry projects. Because the farmer association is the target, the implementers of projects are constrained in how they deploy development. If there were a strategic plan to the implementation of projects using a selection criteria based on criteria other than farmer association membership, perhaps the ecological impact of the projects would be greater.

There are many criticisms about farmers, their practices, and lack of concern about biodiversity. Another motivating factor for this component of my research was to demonstrate which animals are using farms, farmer knowledge about animals, and their environmental stewardship.

What Does this all Mean?

Data show that farmers perceive that they are supporting the protection of the Santa Maria River watershed and SFNP through their involvement in agroforestry. Their farms represent extensions of SFNP's forests. Why wouldn't they want to protect the place where they live? Because climate change has become a growing concern among farmers, they have become increasingly aware of the importance of maintaining trees, particularly near water sources. I've noticed that in the last three years that I've been going to Santa Fe, farmers have spoken more about the changing climate and are seeing water sources dry up that have not dried up in generations. Although agroforestry is considered a more sustainable land use practice compared to others, research shows that implementation of agroforestry does not mean that less deforestation will occur (Schroth et al. 2004c).

Socioeconomic conditions influence the implementation of agricultural practices. The current socioeconomic conditions (age of farmers being the exception) in Santa Fe favor the continued practice of agroforestry on current lands. The combination of their socioeconomic characteristics, the type of agroforestry that farmers practice, the investments in agroforestry implementation make it less likely that the agricultural frontier will expand. Reduction of deforestation becomes more effective in contexts where farmers use labor or capital intensive techniques in addition to long-term land investments that reduce risks associated with production and the need to clear excessive land coupled with other forest conserving practices (e.g. enforcement of protected areas, ecotourism), reduction in deforestation becomes more effective (Schroth et al. 2004b;

Schroth et al. 2004c). This idea somewhat reflects the situation in Santa Fe for those involved in agroforestry projects, suggesting that deforestation and the expansion of the agricultural frontier may not occur in the future. However, with changes in market prices of cash crops like coffee and oranges, the future expansion of agricultural parcels is uncertain.

A more strategic plan that also increases the scale at which organizations are implementing projects and obtaining the participation of farmers could be beneficial to all actors (human, floral, and faunal). The diversity of trees that farmers maintain in their parcels also contributes to the maintenance of habitat for various animal species. Agroforestry itself may serve as a buffer zone to protect forests (Cullen et al. 2004). Furthermore, promotion of habitat and species can occur through reforestation in the form of agroforestry.

The long-term sustainability of agroforestry projects is aided by the promotion of crop species that are considered useful by farmers. That is, farmers may be more likely to maintain trees that are important to their livelihoods and meet multiple needs rather than species that do not. The maintenance of the diversity of trees contributes to the environmental quality and biodiversity of Santa Fe and the health of its residents. Agroforestry project promoting organizations may be able to scale up the adoption of agroforestry projects and the promoted benefits of these projects by making more of an effort to take into consideration the needs of farmers. The increased use of native trees in projects is of particular interest to farmers and can inform the future planning and implementation of agroforestry projects.

Additionally, I recommend increased integration of management and collaboration between SFNP staff and farmers in the buffer zone. This would mean improved communication among stakeholders and project implementing organizations and a greater understanding of the local context by project implementing organizations, agricultural practices, livelihood strategies, environmental laws, and the priorities that influence all involved actors.

CHAPTER VI

CONCLUSION

“El regalito no ha sacado nadie a la pobreza.”
-Farmer Association Member

Concluding Remarks

In this dissertation, I compared the views of farmers who practice agroforestry as part of sponsored farmer association projects with those of farmers who practice agroforestry individually (i.e. outside of sponsored projects) as well as NGO and government staff about agroforestry. My aim was to gain insight into the objectives and impacts of agroforestry projects. I probed about the intended goals of agroforestry projects, the agricultural practices of farmers, the perceived costs and benefits of agroforestry, and how agroforestry is expected to support the national park and watershed. The differing and shared perspectives of national NGOs, the Panamanian government, and farmers revealed how agroforestry projects affect local livelihoods and conservation in the Santa Maria River watershed and Santa Fe National Park.

With its high incidence of poverty and ecological significance, Santa Fe has attracted government agencies and NGOs to implement development and conservation projects. Agroforestry projects are meant to provide resources to farmers such that the costs and benefits associated with agroforestry are allocated in an equitable manner. These projects are promoted by NGOs and government agencies as a strategy to conserve natural resources and improve livelihoods. Promoters of agroforestry are

piggybacking on the social networks of farmers to achieve objectives that conservation focused while providing minimal focus on the alleviation of poverty over time.

Nevertheless, farmer associations are also using these organizations to access resources that they otherwise would not be able to access had they not been affiliated with an association. With these resources farmers are able to improve their farms and/or establish new agroforestry parcels in the short-term, while also obtaining personal and professional skills that can be used in the long-term. Through agroforestry, particularly in the long-term, they can potentially generate sufficient production for both consumption and sale to meet household needs. Agroforestry projects further support livelihoods through the promotion of species that are important to the ways of life of farmers. Maintaining a variety of trees helps ensure production throughout the year, but also the generation of other goods and services to meet other needs. However, farmers, in the long-term also bare much of the responsibility in supporting the environment and conservation of natural resources by planting and maintaining trees in agroforests. They also may be constrained in the long-term by difficulties associated with market access and, therefore, may not be able to generate sufficient income from their agroforests.

Farmers, NGOs, and government agencies participate in and promote agroforestry to meet their own needs and objectives. The data from observations and interviews of farmer association members, non-members, and NGO/government agency staff also reveal contradictions and affirmations related to the attempt to achieve sustainable development and livelihood improvement through the implementation of agroforestry projects. Agroforestry project implementing organizations place priority on

biodiversity and natural resource conservation, but what they promote is influenced by market forces. Farmers' agroforestry parcels also reflect the desire of farmers to maintain their livelihoods and generate income. Farmers, NGOs and government agencies, also place importance on agroforestry's role in conservation particularly in protecting water sources. Furthermore, farmers believe that through the planting of trees they are supporting the watershed and SFNP. While staff of NGOs and government agencies believe that agroforestry could be scaled up to provide even more environmental benefits. Taken together, research shows that there are conflicting and overlapping expectations about outcomes between farmer association members and outside organizations.

Project participants show that they are picking and choosing which types of knowledge promoted by these organizations that they implement to work their land. They are exerting their control over their resources. However, knowledge acquisition in relation to the development of personal and professional skills as part of agroforestry project participation was highly valued by farmers.

The farmers with whom I work provide insight into how agroforestry shapes livelihoods and landscapes in particular ways. The research shows that the way that development is deployed has short and long-term ramifications for the people and environment of Santa Fe. Analyzing the influence of agroforestry projects on farmers and the environment in Santa Fe through the lens of farmer association members, non-members, and NGO/government agency staff reveal the complex interactions of macro and micro level factors that include market forces, international funders, environmental

policies, agricultural practices, social networks, and livelihoods. There are varying perspectives about what agroforestry is, how it's practiced, the distribution of costs and benefits, and its relationship to livelihood improvement and conservation. All farmers have adopted agricultural strategies that are influenced by household needs and market considerations. The implementation of and participation in agroforestry projects is a mixed-bag in terms of costs and benefits. However, these projects provide the greatest long-term benefit through the development of professional and personal skills.

Overall, I can conclude that projects are supporting livelihoods and conserving natural resources, but have yet to alleviate poverty. If organizations are going to continue to use agroforestry as a strategy to achieve conservation and development goals the used blueprint needs to change. In the following section, I provide recommendations to address these issues.

Recommendations

Conducting this research in Santa Fe and has left me with more questions than I had when I began my research and made me revisit the broader questions that inform my work. The biggest one being, how do you achieve rural sustainable development?

Panama has found a way to decrease national poverty levels, but still needs to continue to find ways of protecting and improving ways of life while also continuing to conserve natural resources and biodiversity. The burden of the responsibility to protect natural resources and biodiversity is heavily placed on farmers, while they feel the consequences on their livelihoods. The solution to establishing better strategies for development isn't solely an economic or technical one, but one that involves greater

access to resources. There is a power regime that confines farmers to act within a system narrated by a discourse on poverty that makes it difficult to improve their well-being.

Escobar (2011: 44) writes, “the most important exclusion, however, was and continues to be what development was supposed to be all about: people...development was conceived not as a cultural process (culture was a residual variable, to disappear with the advance of modernization) but instead as a system of more or less universally applicable technical interventions intended to deliver some “badly needed” goods to a “target” population.” We see this set of goods reflected in the agroforestry projects, machetes, and other inputs (the goods) that are delivered to the farmer association members of Santa Fe (the target population). Perhaps contesting the discourse on poverty and development, integrating farmers’ ideas about what factors influence their well-being, and having development be about more than “projects” would create changes surrounding development. This would provide better understanding of how multiple goals (conservation and development) can be achieved simultaneously.

That is, scaling up agroforestry projects so they actually improve livelihoods, protect natural resources, and conserve biodiversity, will require changing the development paradigm. All development that uses an agroforestry implementation strategy basically looks the same: 1) work with farmer association members, 2) conduct capacity building workshops, 3) give them machetes, a shovel, and some fertilizer, and 4) hope they achieve the goals of the project while ensuring people are complacent with the status quo. Is this how we want development to continue to look?

This dissertation calls into question the way development is designed, implemented, and replicated. In many ways development through the promotion of agroforestry has many benefits to farmers. It contributes to sustaining and enhancing their livelihoods. And to the environment, agroforestry helps sustain soil nutrients and forest cover while also providing habitat for animals. The farmers who participated in this study want to protect the natural resources of Santa Fe, as their livelihoods are directly tied to them. There are also costs associated with agroforestry and project participation creating a situation where farmers are both embracing and ignoring the messages of environmental NGOs, government, and other outside actors.

Development workers and conservationists need to end the business of poverty such that development goals are set and achieved by farmers themselves. If they are to continue along the same tack of using projects as a form of development, NGOs and government agencies need to develop activities in collaboration with *campesinos* such that the people who the projects are designed to benefit, actually benefit. Projects should no longer be implemented, but ideas created and skills strengthened to build the capacity of the people.

One of the problems with the development approach illustrated here is that it's easy for farmers to become dependent on these projects. A shift in the design of development to one where farmers take ownership and management of opportunities that they have helped to inform and would be more sustainable. Then, farmers would not wait for projects to come to them or be affected by the fickleness of shifting fads in development. Because farmers feel pressure to obtain resources and income quickly, the

sales pitch about the benefits of agroforestry projects appeals to farmers. Creating more sustainable strategies using the implementation of agroforestry among smallholder farmers for rural development also means focusing on the long-term benefits that agroforestry can provide and not the short-term resources they provide.

A management and policy recommendation for project implementers wanting to continue working in Santa Fe, is to focus on what the farmers feel is needed to improve their own well-being and consider how they define their own livelihoods and ways of life. This may mean a more integrated approach to conservation and development that includes stronger institutional support and greater access to resources such as health services, education, job creation, credit, agricultural extension, community organization, and environmental management.

A second management and policy recommendation is to shift the way funds are allocated, with the majority of funds going to the people to strengthen their own organizations. Development organizations can guide local organizations in how to use their social capital to obtain economic power in the form of access to markets to sell produce, and by providing more technical assistance in the long-term with support in the form of workshops and trainings.

Another recommendation is to strengthen local institutions as a strategy to for residents to solicit projects that interest them so that they may collaborate with other organizations. The greatest opportunity for this to happen occurs within the body of the *Consejo de Desarrollo Territorial* (CDT). The CDT was created in conjunction with local organizations with a vision toward rural development. The CDT provides outside

organizations with the platform to present opportunities with residents deciding from among the potential investments. If the CDT could be strengthened and institutionalized, local organizations would be able to better guide the territorial development and provide opportunities for the benefit of all residents of Santa Fe. The CDT could become a mechanism for rural sustainable development and conservation at the territorial scale while giving residents power and control over resources.

To take into consideration the voices of *Santa Fereños* to achieve development and conservation goals, policy recommendations would include strengthening the CDT, strategically planning development and conservation initiatives in collaboration with stakeholders (farmers, exploring investment in research on coffee diseases, exploring payments for ecosystem services), and changing how agroforestry development is practiced. Table 18 summarizes the opportunities and limitations to improve agroforestry in Santa Fe.

Table 18: Opportunities and limitations to improve agroforestry in Santa Fe.

Opportunities	Limitations
<ul style="list-style-type: none"> • Strengthen institutional capacity of CDT • Experience and training in agroforestry practices • Strategic location for sustainable development initiatives • Increasing agrotourism interest and implementation • Conservation incentives • Well established cooperative with coffee processing plant • Strong environmental awareness 	<ul style="list-style-type: none"> • Steep slopes • High levels of erosion • Degraded soils • Diseases and pests have reduced coffee yields and have impacted orange production • Minimal access to markets • Increased land sales • Poor market prices

In January of 2016, another organization began working with farmers in Santa Fe promoting agroforestry projects, with a focus on a microwatershed within the Santa Maria River watershed. Their implementation strategy is participatory and includes more involvement on both sides in the development of agroforestry parcels. They had planned on working with farmers to understand their visions for their farms. This is an opportunity to incorporate many of the general recommendations put forth by farmers about agroforestry projects including improving the selection of tree species, better/true coordination of activities among government institutions, NGOs and project personnel, greater community involvement in developing solutions to environmental problems, using extension agents from the area as they are knowledgeable about the local tree species and local environmental conditions, and providing support to mobilize themselves for market access.

Agrotourism and Rural Development

Santa Fe has received support from international NGOs to grow its rural tourism industry. Farmers are trying to piggy back off of the benefits of projects in the form of farm improvement by exploiting the tourism industry to generate business in the agrotourism sector.

Santa Fe has potential for continued agrotourism development. Agroforestry lends itself to agrotourism, which is considered a sustainable development strategy. This is relevant as the linkages between agroforestry and tourism can lead to more sustainable sources of income and employment and management of natural resources. Furthermore, as the agrotourism industry continues to develop, this could provide more opportunities

to involve women in income generating activities and the opportunity to share cultural, natural resource management, and aspects biodiversity conservation with tourists.

Study Limitations and Future Research

A more thorough understanding of the contribution of agroforestry projects to the livelihoods of farmers could be provided by continuing to monitor agricultural production yields, income generation, market access, and institutional influence of natural resource management over time. Given the relevance of farmer associations in the execution of development projects, further understanding of the social capital and knowledge among them could provide greater insight into collective action and traditional knowledge's relationship to natural resource management and conservation.

I recommend conducting a GIS and remote sensing analysis using images from time periods before and after projects were implemented to better understand to what extent there has been increase and/or decrease in forest cover in areas where agroforestry projects have been implemented and non-agroforestry project implemented areas. This information would contribute greatly to understanding the (lack of) contribution that agroforestry projects and agroforestry practice in general provides to forest cover. It would also provide a greater understanding of what is happening at the landscape level. This analysis would strengthen my own findings about what is happening on the ground with farmers and NGOs and government agencies, allowing for increased insight to better inform policies and practices related to land management, conservation, and livelihoods in the area.

Further studies on the presence or absence of faunal communities will help provide more insight into the conservation value of and inform policy decisions and land use management of SFNP and surrounding agroforestry areas within the Santa Maria River watershed.

Intellectual Merit and Broader Impacts

This research contributes to literature on development and agroforestry systems showing how and why farmers engage in natural resource management. The research shows the social and ecological influences that outside organizations can have among farmers. The evaluation contributes to literature on local institutions governing resources in agricultural landscapes (Vadjunec and Rocheleau 2009). This project increases knowledge about the complexities of managing natural resources for conservation outcomes while improving livelihoods in landscapes in which agricultural production and conservation initiatives are implemented (Utting 1994). The research will also contribute to the anthropology of development literature and provide insight into the environmental and social consequences of development (Gow 2002) and contribute to a better understanding of micro-macro issues (DeWalt 1985).

Although there have been many critiques of development (Crewe and Harrison 1998; Escobar 1991; Escobar 2011), this research process has allowed farmers themselves to participate in a critical analysis of agricultural development and give voice to local perceptions and experiences of agroforestry. The study has policy implications in that it could help to effectively implement activities as outlined in the Santa Maria River watershed management plan and influence policies that address issues regarding

natural resource management and poverty. This in turn could contribute to the sustainable development of and conservation efforts within the watershed while supporting the national park and the people who live around it. The voices and experiences that I shared in this study also have the potential to contribute to a larger social change agenda, one that is socially and ecologically just and equitable. I demonstrated how benefits from agroforestry are produced, allocated, and how these benefits can help scale up the use of agroforestry and be promoted as a viable livelihood strategy. The results of this study will also be presented to Santa Fe area community members and NGO and government staff.

“I feel that with this not only you will hear me, right? Many people will hear me. I hope that what you have recorded there is motivation...”
-Santa Fe Farmer

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