This document is a part of The Osa and Golfito Initiative, INOGO
Iniciativa Osa y Golfito

The Social Landscape of African Oil Palm Production in the Osa and Golfito Region, Costa Rica

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“The Social Landscape of African Oil Palm Production in the Osa and Golfito Region”

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Acronyms

CANAPALMA	Cámara Nacional de Productores de Palma
CIPA	Consorsio Integral de Palmeros
Coopeagropal	Cooperativa Agroindustrial de Palma Aceitera
Coto 54	Compañia Industrial Aceitera, Palma Tica processing plant located at the Finca Coto 54
EBASA	Extractora de Baru S.A.
INOGOSR	INOGO Study Region: Cantons of Osa and Golifito, Brunca Region, Costa Rica
OP	Oil Palm

Osa and Golfito Initiative Overview

What is INOGO

The Osa and Golfito Initiative, "INOGO", is an international collaborative effort to develop strategies for sustainable human development and environmental stewardship in the Osa and Golfito Cantons of Costa Rica. The effort's core is a collaboration between people and institutions in the US and Costa Rica, facilitated by the Stanford Woods Institute for the Environment at Stanford University.

INOGO is designed to build on the many previous efforts in the region, working hand in hand with Costa Ricans in local communities, in the public and private sector, and with NGOs to create shared visions and long-term strategies for a sustainable future for Osa and Golfito. The project integrates the social, cultural, and economic dimensions of the region with both its marine and terrestrial ecosystems.

In addition to producing new studies and reports, the goal of this initiative is to generate a living process for sustainable development led by Costa Ricans, especially the people from Osa and Golfito. It also aims to provide information and products that will be useful to stakeholders in the region for their ongoing decision-making processes. We envision a two-phase trajectory for INOGO, Phase 1: Development of a Strategies for Action, and Phase 2: Socialization and Implementation.

Phase 1 of INOGO features four key components for the study region:

- Synthetic Analyses, written to pull together and interpret existing information, plus fill a few holes, and thus create a baseline for future work;
- Case Studies to address timely issues, where it was clear that local actors needed more information to advocate for community and environmental wellbeing;
- Interactive Co-development with stakeholders of scenarios depicting possible alternative futures, a process which in itself has value as it gives leaders the space to think about long-term goals alongside potential collaborators
- Design of strategic pathways towards sustainable development.

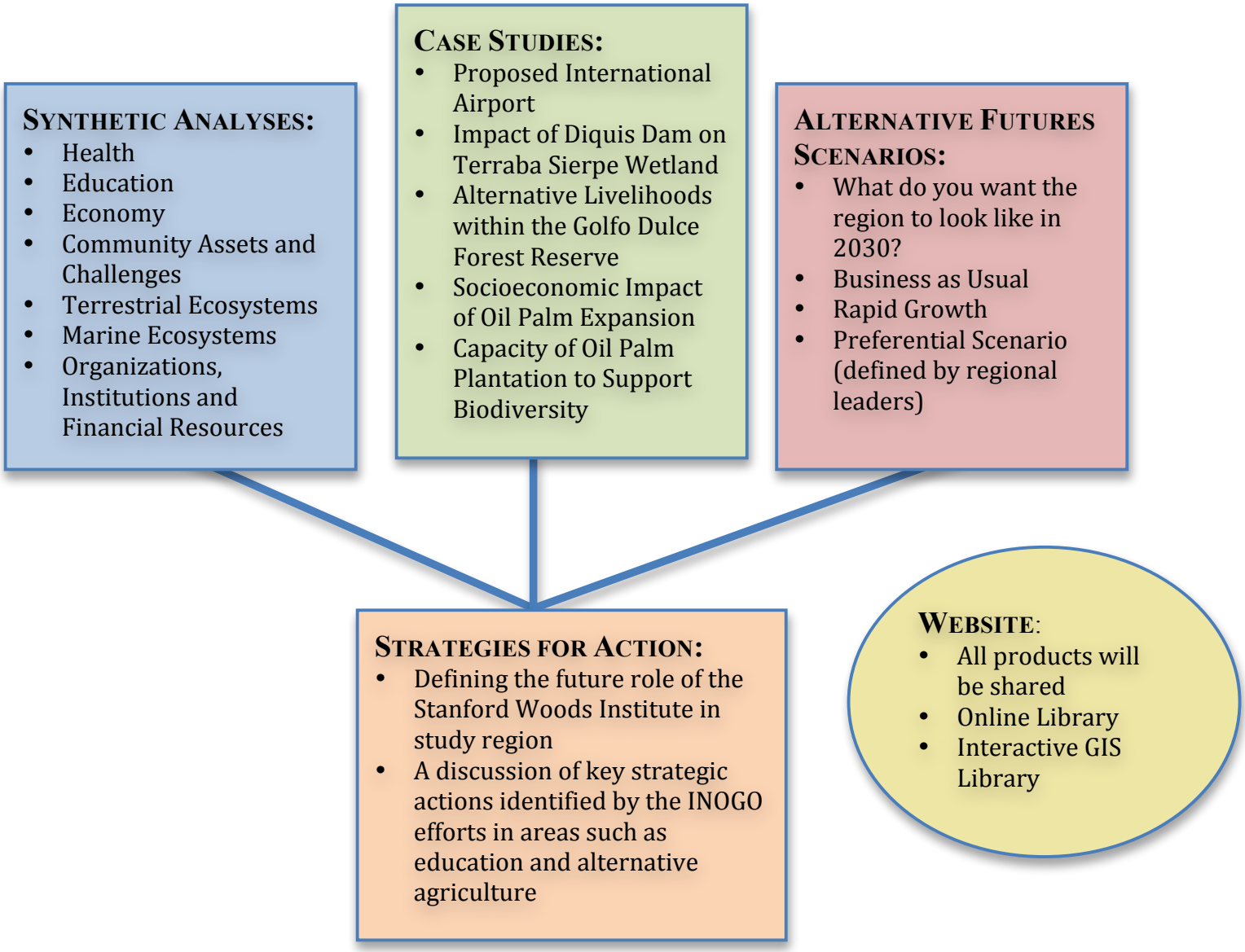
The full INOGO process is described in a document titled "The Osa and Golfito Initiative, INOGO: Building a shared dream".

Listening and consulting with stakeholders

An important goal of the INOGO process is to maintain an inclusive, participatory process that engages actors at the local, regional, and national levels. Throughout the initiative, INOGO has

been working to make sure that the local communities' concerns, aspirations and needs are heard, in particular those relevant for a more positive future, where families have a chance to improve their quality of life in healthy social and natural surroundings.

Phase 1 Products
Osa and Golfito Initiative

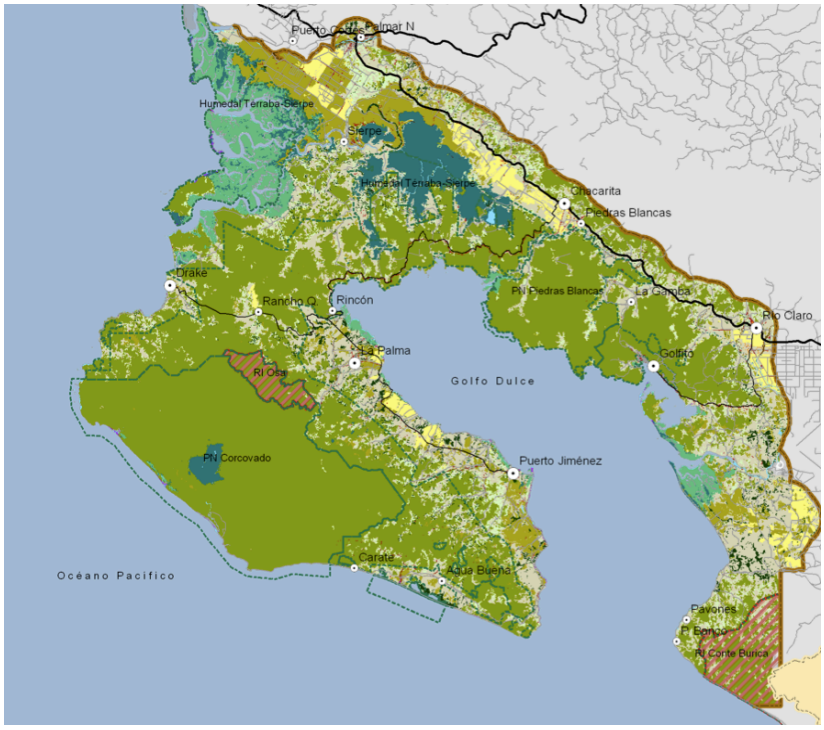


The INOGO Study Region

The study region of the Osa and Golfito Initiative was defined by ecological boundaries plus the Panamerican Highway. We initially considered a focus on the Osa Peninsula, but reflected that the Golfo Dulce logically needed to be included because of its importance to both human and natural processes in the region. Once the Golfo Dulce was included, it became logical to include surrounding communities and as much of its watershed as we could.

These ecologically-based boundaries include parts of the cantons of Osa and Golfito, and even include portions of some districts. While this provided a significant challenge in some data collection and analysis, we recognize that all boundaries have their own challenges. Our map thus shows the initial boundaries of INOGO: as a living process it is anticipated that these boundaries may change over time.

Boundaries of the territory covered by the Osa and Golfito Initiative, INOGO



Executive summary

Within the Cantons of Osa and Golfito in Costa Rica, a growing number of farmers are converting cropland and pasture to oil palm plantations. At present, oil palm is an attractive alternative to food crops of low market value in providing predictable, year-round harvests and equally consistent demand to date. Small and medium-sized plantations have become a prominent feature of agricultural landscapes within this biodiverse and economically marginalized region, yet the social, economic, and ecological implications of oil palm have yet to be assessed.

This study, one of a pair of INOGO studies of oil palm (see also Dirzo et al 2013 on ecological aspects,) explores the social and economic aspects of local oil palm cultivation from the perspective of growers. Interviews conducted with growers and agricultural association leaders are used to describe oil palm's role in rural livelihoods and agroecosystems, as well its influence on land use and labor markets. Using interview data, existing literature, and field observations, the study offers recommendations to maximize oil palm's economic sustainability while mitigating potential ecological consequences in the Osa-Golfito region.

General Framework

Introduction

Commercial African Oil Palm (*Elais guineensis var*.) has emerged as a major commodity crop in Costa Rica's Southern Pacific, Central Pacific, and Atlantic zones, with 60,000 hectares under cultivation in 2011, up 17% from 2006 (CANAPALMA 2012). In the same year, palm oil was reported to be Costa Rica's second most important processed food export (behind coffee), with Mexico as its primary importer (PROCOMER 2011).National trends in plantation expansion are mirrored in the cantons of Osa and Golfito where small holders and large landowners alike are reaping the benefits to date of predictable, year round harvests and equally consistent demand. Due to a history of crop failures and market vulnerability experienced with previous agricultural commodities in the region (cacao, banana, rice, cattle), oil palm (OP) is viewed as a driver of economic activity that may or may not be sustainable in the long term: socially, economically or environmentally. Nevertheless this sector continues to grow.

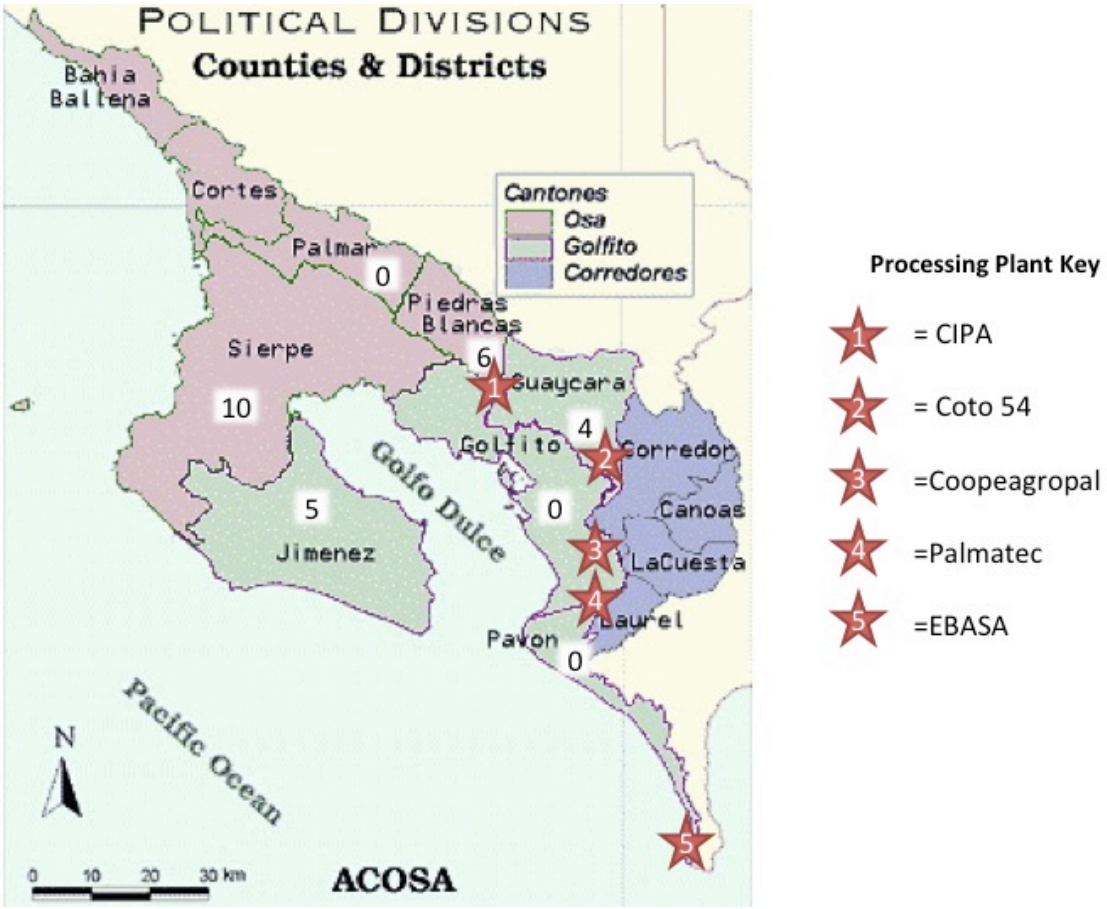
Oil palm expansion in the Osa-Golfito Region has occurred largely via contract agriculture established by Palma Tica, a member corporation of the agro-industrial conglomerate Grupo Numar, which introduced the current forms of plantation management to growers nationwide. Unprecedented economic stability, coupled with a lack of competitive alternatives within or outside of agriculture, makes oil palm cultivation attractive to growers. The data gathered here indicate that agricultural land will likely continue to be taken out of food crops and pasture to be replaced by palm plantations, a form of land use change with strong economic incentives to growers and moderate gains to landless workers. This study contextualizes the rise of oil palm in agricultural landscapes of the INOGO study region (INOGOSR) in an attempt to describe the local social landscape of African oil palm cultivation. Here we summarize data collected in the field from independent producers, coop members and coop officials on perceptions and drivers of plantation expansion, on the social and economic importance of oil palm, and on current farm-level management costs and practices.

Oil palm study area

The oil palm study was carried out in the Southern Pacific region of Costa Rica, in the counties of Osa and Golfito (see Figure 1). Once the center of expansive banana production, oil palm established itself as an important industry in this particular region in 1940s when the United Fruit Company (later renamed United Brands) first introduced oil palm as an alternative crop to a plague-decimated banana harvest. By 1952 there were approximately 4,000 hectares of palm in the north of Puntarenas Province (Canton Parrita), at which point expansion slowed considerably until its resurgence following the departure of United Brands in 1983 (Escobar &

Peralta, 2007).

According to CANAPALMA (Cámara Nacional de Productores de Palma), there are now over 60,000 hectares of oil palm in Costa Rica, 64% of which is currently located in the Southern Pacific region (CANAPALMA 2012). Of the remaining 86,400 additional hectares considered suitable for oil palm cultivation in Costa Rica, more than half are situated in the Southern Pacific region (Escobar & Peralta, 2007).



*See Appendix 1 for full name of processing plants

Source: Osa Conservation Area map, online at http://www.golfito-costa-rica.com/maps.html

Figure 1: Distribution of oil palm interviews by canton and district and oil palm processing plants in the region. *Research was conducted prior to the division of the district of Sierpe into Sierpe and Drake.*

Methods and Hypotheses

This study focuses on social aspects of oil palm production as part of a larger INOGO social analysis of the Osa-Golfito region (see Hunt et al 2012). A second, 'companion study' was

undertaken to focus on the conservation and biodiversity implications of oil palm cultivation in the region (see Dirzo et al 2012). In this report we explore the social and economic importance of oil palm in the region, and take a close look at the incentives and processes driving its continued expansion.

As we began this undertaking, we had four main hypotheses in mind, all derived from conversations with other INOGO researchers:

1.) *Oil palm production is spreading locally because of its strong economic incentives for independent producers, however the long-term social and environmental impacts are not well understood.*

2.) *Three factors explain African oil palm's special attraction for smallholders: (a) its reputation for high prices, (b) the existence of external assistance with initial set-up costs, and (c) the possibility of covering labor demands within the family unit.*

3) Producers are aware of common problems of plantation agriculture including boom and bust cycles, susceptibility to disease, market vulnerability, and economic dependence associated with extractive enterprise, owing to previous experience with bananas, cacao and timber in the region.

4.) *Nevertheless, independent producers see oil palm as worth the risk, because to date it provides a way to move into the middle class, as reflected in their increased consumer capacity*

This research was carried out in partial conjunction with a parallel effort to assess biodiversity in and around areas of oil palm cultivation (see Dirzo 2013). In many cases, we visited the same regions and many of the same farms; hence we view these results as fairly complementary. This case study was funded primarily by a Lang Fund Grant from the Department of Anthropology, Stanford, to W. Durham.

Fieldwork was carried out in August 2012 by the authors, with part-time assistance from C. Kortman and W. Durham. INOGO associate and forestry specialist Diego Garcia from Piedras Blancas helped in identifying local and regional producer cooperatives, associations, and independent producers willing to participate in the study, including four plantations that were also visited during the study by Dirzo et al (2013). Structured interviews were used to gather household and livelihood information from palm producing families, along with plantation management practices and producer's views on the role of oil palm in local economies, communities, and ecosystems. Over a three-week period, we used a snowball sampling procedure to interviewed 25 producers, cooperative and association leaders, and one farmer who chose not to grow palm, distributed spatially as follows:

Canton Osa, Sierpe area: 10 producers
Canton Osa, Piedras Blancas area: 6 producers
Canton Golfito, Guaycará area: 4 producers

Canton Golfito, Puerto Jiménez area: 5 producers

TOTAL = 25 producers

While interviews with coop and association leaders provided invaluable information for contextualizing oil palm production in the region, the analysis presented in this study focuses primarily on interviews with 21 independent oil palm producers. Small sample size is the primary weakness of the study, though we observed high levels of consensus across responses, indicative of the homogeneity and standardization of management practices, costs, and earnings characteristic of palm cultivation. In addition to interviews, existing literature relevant to the development of the INOGOSR's oil palm industry was reviewed.

Findings

Our sample thus provides a small but informative sketch of plantation-owning households in the INOGOSR. The Costa Rican Ministry of Agriculture reported that as of 2007, there were 260 growers in Osa and 249 in Golfito. The final sample for this study reflected similar proportions of growers relative to location, with roughly equal numbers of growers from each county, and includes a range of plantations varying in age (.5 to 26 years) and size (2 to 150 hectares). Basic quantitative attributes of our sample are shown in Table 1.

Table 1: Basic attributes of oil palm producers in the Osa-Golfito Region

Average total landholding in hectares	33 ha
Range of total landholdings	2 ha - 150 ha
Average hectares in oil palm	18 ha
Range of hectares in oil palm	2 ha - 55 ha
Average percent of total landholding in oil palm	55%
Range of plantation ages	.5-26
Average age of plantation	11 years
Average number of family members	6
Average number of non-family workers*	3

***Non-family workers include full time, part time and biweekly employees**

Source: calculated from survey data

For this analysis, we have used size of landholding to organize our survey data. Farm size categories were assigned on the basis of total landholding, of which variable fractions were planted in oil palm (see Table 2). There is a slight bias towards small and medium landholders, whom we defined as households with 31 hectares or less (14 households).

Table 2: Sample of oil palm producers based on total land holding and percent in palm

Total land holding	Number of producers	Average area of holding in oil palm	Average percentage of total holding in oil palm
2 – 15 ha	n = 8	7 ha	78%
18 – 31 ha	n = 6	13 ha	57%
40 – 150 ha	n = 7	33 ha	48%

Source: calculated from survey data

Hypothesis I: ***Oil palm production is spreading locally because of its strong economic incentives for independent producers, however the long-term social and environmental impacts are not well understood.***

The data from our surveys with plantation owners from the cantons of Osa and Golfito show trends in oil palm expansion that parallel its growth at the national level. The first plantations in the region trace back to the United Fruit era (pre 1983) and many plantations are at least 12 years old. Of the 21 plantations in our final sample, only 7 (28%) were established in the past five years. Growers and coop officials observed that in 2011, local nurseries ran out of palm starts during the planting season, attesting to the crop's popularity. Environmental factors that facilitate local expansion include favorable climatic conditions and availability of degraded agricultural land. Mean annual precipitation in the region is 5500mm (Sanchez-Azofeifa and Rivard 2002) obviating a need for irrigation, while sufficient solar radiation at approximately 360 cal/cm²/day (Alvarado, Escobar and Peralta 2010) allows for average annual average yields of 17.5 metric tons per hectare (CANAPALMA 2012). Plantations yield fresh fruit bunches weighing as much as 130 kilograms each (Alvarado et al 2007), and unlike other crops, palm fruit is in constant demand. For all these reasons, producers were adamant that with mature plantations of palm, "*no hay meses malos" (*" there are no bad months").

Table 3. Plantation yields within the sample: production and prices in 2012

Average plantation age at first harvest	Average monthly yield per hectare	Harvest interval	Average price paid to farmers per MT 2012 YTD*	Average PO price per month 2012 YTD (Rotterdam CIF)*
2.6 years	2 metric tonnes	8-15 days	$128 USD	$1040 USD/MT

* Source: CANAPALMA 2012

In addition to environmental factors, growers identified economic forces that influence land use decisions. Palm oil's high demand coupled with a lack of economically attractive alternatives (Horton 2009) have popularized the crop within the region. When asked about future rates of expansion, growers most commonly emphasized the vigor of the national export and processing industry as the source of demand for their oil. Compañía Industrial Aceitera Coto Cincuenta y Cuatro S.A (Coto 54) owner of the processing plant where almost all interviewees sell fresh fruit bunches on a biweekly basis, is the second largest export enterprise

in the Costa Rican food industry (Calderón et al 2012). The company processes the fruit into two forms of oil, crude, which is extracted from the pulp of fresh palm fruit, and kernel oil, which is found in the seed or kernel of the fruit. Kernel and crude oil are used domestically for margarine, vegetable shortening, soap, and cosmetics (Grupo Numar 2012) and are also exported to other countries, primarily Mexico. Palm oil is currently used in various food products including groundnut butters, baked beans, sardines, cake mixes, soup mixes, breakfast cereal, bouillon and a multitude of snack foods consumed and produced worldwide (Nor Aini and Yusoff 2000). Demand for edible oils appears to be the primary driver of markets for Costa Rican palm oil; while crude oil prices fluctuate, demand remains elastic.

When we asked growers why they had converted their farmland to oil palm, a majority told us it was for lack of consistent markets and economically viable alternatives. Commonly we were told that palm is "*lo único que hay*", the *only* crop with potential to bring in consistent earnings. Producers' views reflect the findings of scholars who note that most other agricultural commodities, including cattle and rice production have "stagnated" in the region for over 20 years "in part because of government policies of trade liberalization and neoliberal reforms" (Horton 2009: 98). Prior to planting oil palm, 10 of 21 of growers reported that profit margins from all other crops were barely sufficient to maintain production, amounting to *less than 50%* of current income via palm oil. The average household size among growers is approximately six people and in many cases, multiple family members worked on the plantation. Not surprisingly, uptake is most commonly attributed to economic motives, often framed in the context of the region's enduring poverty and underdevelopment.

Many growers emphasized a reduction in labor (discussed further under hypothesis II) achieved through replacing cattle or other crops with oil palm, a time and cost-saving advantage. One elderly grower described managing the dairy cows he had owned prior to planting palm as a form of "*esclavitud*" or slavery, where ever-rising labor demands were met with only erratic opportunities to sell milk and cheese. Planting palm gives farmers the opportunity to reduce work hours and physical exertion. In fact, shifting to oil palm has allowed several growers to maintain agricultural livelihoods despite health challenges like hypertension and cardiovascular disease. In some cases, changes in on-farm labor may limit overall physical activity of farmers to an unhealthy extent: 3 (of 21 or 14%) growers reported that as a result of switching to oil palm, their lifestyle had become more sedentary. Interestingly, the same number (3 of 21) reported that their stress levels had decreased since securing a stable source of income through oil palm.

In addition to decreasing physical burdens and increasing economic gains, 11 growers (of 21 or 52%) felt that palm plantations were environmentally sustainable, in that they "*mantiene la humedad del suelo*[1]" and provide habitat for reptiles, birds, and mammals, some of who reportedly consume palm fruit. Sightings of native fauna reported by growers in oil palm plantations included puma (*Puma concolor*), ant eater (*Tamandua mexicana*), collared peccary (*Pecari tajacu*), tapir (*Tapirus bairdii*), white-headed capuchin (*Cebus capucinus*), jaguar

[1] "Maintain soil moisture"

(*Pantera onca*), and great currasow (*Crax rubra*). Unfortunately, we were unable to obtain reliable frequency estimates for these sightings, but farmers commonly perceived that their fields provided food for forest wildlife. Moreover, growers with experience in banana cultivation asserted that palm was the only crop that provides fruit suitable for consumption from soils where banana had previously been planted. Anecdotal evidence of soil toxicity among our informants is confirmed by Thrupp's study (1991) of the persistence of copper fungicides in former banana plantation soils. Indeed, many growers view palm as an avenue for making new productive use of land degraded by a previous monoculture.

Although human and environmental health impacts of palm oil production (including exposure to agrichemicals, soil degradation, and biodiversity loss) were not mentioned by farmers as a factor in their initial decision to grow palm, they generally agreed that oil palm plantations required lower chemical inputs than other crops. Few farmers viewed their plantations as environmentally detrimental and most saw the reduction in agrochemical use (compared to previous uses of the land) as positive. However, eight informants (of 21 or 32%) expressed uncertainty about oil palm's environmental impacts and turned the question back to the interviewer.

The majority of producers (18 of 21 or 86%) felt that oil palm had positively influenced their community, and 15 (71%) claimed there had been an increase in community wealth since oil palm's arrival. Almost as many, 14 (67%) reported that palm generated at least some additional employment in the area. However, none reported that such considerations had been among the reasons for their personal conversion of land to oil palm. Converting their lands to oil palm with few expectations other than larger, more stable household income, farmers seldom mentioned knowledge of long-term social, economic or environmental impacts. Indeed, two-thirds (14 of 21, or 66%) of the sample answered "yes" when asked if they would choose to expand their plantations if it were possible and six growers reported that they had plans (and land) to do so.

On the other hand, a few social and environmental concerns were identified that may play a more prominent role in future land use decisions. One concern mentioned by growers and others involved locally in agriculture is increasing land scarcity and local land speculation driven by oil palm prices and the continued success of oil palm cultivation. Several farmers were concerned that their children's generation would not be able to afford to expand family land holdings or to purchase land of their own. One grower affirmed that while "*la palma ha sido un alivio para la comunidad,*[2]" he was concerned that "*no hay suficiente tierra para que mis hijos siembran palma.*[3]" Questions about sustainability, social and/or ecological, are complicated by the relatively recent arrival of the cultivar. Nevertheless interviewees emphasized the regional and national economic success of oil palm and reported no regrets or desire to return to the traditional cultivars they had previously grown.

[2] "A relief for the community"

[3] "There isn't enough land for my children to grow palm."

We conclude that the first hypothesis is supported by the field data collected for this study: *Oil palm production is spreading locally because of its strong economic incentives for independent producers; however, the long-term social and environmental impacts are not well understood.*

Hypothesis II: *Three factors explain African oil palm's special attraction for smallholders: (a) its reputation for high prices, (b) the existence of external assistance with initial set-up costs, and (c) the possibility of covering labor demands within the family unit.*

While Palma Tica and individual contract farmers have been cultivating palm in abandoned banana lands in the INOGOSR for upwards of three decades, the price of palm oil and poor road conditions remained, until recently, major obstacles to expansion in much of the region. Now that both conditions have improved, especially with the paving of the road to Puerto Jimenez, the INOGOSR is an emerging frontier for oil palm expansion within the Southern Pacific (Brunca) region. Interviews point to a rapidly increasing rate of expansion during the past six years.

The continued preference for converting to palm plantations in Golfito and vicinity, as well as the growth observed in the Osa Peninsula is influenced by the crop's reputation for high prices, as well as promises of generous financing for startup costs, and low labor demands. Interviews with producers in communities in Golfito and Osa reflect both the perception and reality of oil palm as an attractive option for the region's farmers.

A farmer's decision to invest in oil palm can be explained in part by the crop's reputation for high prices on the international market (see, for example, UCS 2012). However, as previously mentioned, interviews with growers also point to the lack of strong livelihood alternatives as a driver of palm expansion. When asked why they chose to change to oil palm production, 14 (of 19, or 74%) cited low prices for cattle and a lack of market for other crops, including rice and cacao, as the driving factor behind their decision. Producers indicate that palm cultivation seemed to them the only viable option. In the words of one farmer, "*Nosotros hemos pasado por cacao, ganado, arroz, y ahora la palma. Es lo que está de moda… es lo que está ganando ahora.*[4]*"* Only three of the producers interviewed stated that they had a new target income in mind when they made the switch, but many expressed that their decision was influenced by the visible economic success of friends, neighbors, and family who had invested in palm.

Palma Tica plays an important role in providing farmers of limited means with the resources necessary to begin planting oil palm. Because farmers spend an average of 1,993,441 CRC[5]

[4] "We have gone through cacao, cattle, rice, and now palm. It is what is in style… it is what is making money now."
[5] 1 CRC = .0020 US Dollars approx., or 500 CRC = $1.00 US.

(approximately $4000 USD) per hectare during the first five years of cultivation (Ministeria de Agricultura y Ganadería, 2007), securing outside financing is often a necessity.

In signing a contract with Palma Tica, producers gain access to low interest loans of $1,000 per hectare, which they can use to cover monthly expenses such as labor, fertilizer and herbicide during the first three years. During the fourth year producers begin to pay back the accumulated debt. A contract with Palma Tica also provides the producer with free palm seedlings from Palma Tica nurseries. In return, producers sign a contract agreeing to sell exclusively to Palma Tica for the first 12 to 14 years. Of all producers interviewed, 15 (of 21 or 71%) currently have a contract with Palma Tica, all of whom cited financing and debt deferral as the primary benefits. Additional benefits included low interest rates and the assurance of a consistent market in which to sell their product.

Entering into a contract with Palma Tica stipulates that farmers sell all of the fruit produced on their plantation for the duration of the contract or until the initial loan has been paid off. The terms of the contract require producers to mortgage their land, either in the first or second degree depending on the amount of financing required. For example, producers seek out first-degree mortgages when they need both monthly financing and palm seedlings. Second-degree mortgages are required when the producer has the capital for the monthly expenses, but still requires that Palma Tica provide the plants. For producers with first-degree mortgages, noncompliance with the contract results in the repossession of the mortgaged land and legally authorizes Palma Tica to recuperate all debt owed, including the cost of the seedlings, which are estimated to cost between 8-10 dollars each. In the case of non-compliance with second-degree mortgages, Palma Tica has the right to charge the farmer the cost of the plants. The majority of the farmers interviewed had a 12 or 14-year contract with the company. When the contract expires, the farmer can sign a renovation or, if he is not interested in continuing the relationship, he may proceed to finalize it.

While the producers interviewed appreciated that Palma Tica provided a reliable market, many told us they were looking forward to the end of their contract, at which time they will be able to obtain a slightly better price for their fruit by selling to one of Palma Tica's competitors in the region.

Both the CIPA facilities at La Guaria de Piedras Blancas), administered by the Cooperativa Agroindustrial de Palma Aceitera (Coopeagropal R.L.) and Extractora de Barú S.A. (EBASA), a Panamanian company, are processing palm oil in the Southern Pacific Region. Other farmers planned to continue with Palma Tica in order to have access to the financing necessary to remove senescing palms with low production and replant. Additionally, these farmers stated that Palma Tica offered producers bonuses of $1000 to continue their contract with the company. Even though the majority of farmers spoke favorably of their relationship with Palma Tica, it clearly remains a relationship borne of necessity. As one producer stated "*Uno con dinero, no firme contrato con Palma Tica.*[6]"

[6] "Someone with money doesn't sign a contract with Palma Tica."

Oil palm is considered by many of the producers interviewed as a crop that can be cared for and harvested almost exclusively with family labor. One producer told us that,*"lo ideal es que la palma fuera un trabajo familiar.*[7]*"* CANAPALMA and Palma Tica reinforce this idea, while simultaneously endorsing palm production as a job creator. Written materials from either entity always include data on the 8,000 direct and 30,000 indirect jobs created by oil palm production in Costa Rica, side by side with language promoting palm cultivation as an activity apt for the small family farmer (CANAPALMA 2012; Nuñez et al 2012).

Interviews in the region also reflect this duality. Of the producers interviewed, 13 (of 21 or 62%) hire laborers who are members of their family, but only five (of 21 or 23%) are able to exclusively employ family members. In the majority of cases, even producers with less than 15 hectares must hire outside help on harvest day, which generally takes place twice a month. Just six (of 21 or 29%) of producers hire full time outside labor.

While considered by farmers to be less physically demanding than other crops, oil palm plantations do require consistent manual labor, especially in the early stages of cultivation. Farmers with plantations younger than four years old highlighted the need to spend long hours in the field as palm plants require manual vegetation control of the one to two meter radius around each trunk. Time spent on plantation maintenance decreases with the age of the farm, as shade created by the palm tree serves to slow the growth of invasive understory plants that hinder harvest. Producers also cited manual vegetation control, herbicide and fertilizer application, as well as annual frond pruning as the principal tasks of oil palm plantation maintenance.

Labor costs are also impacted by the age of the palm plantation. Farmers who had palm less than 4 years old reported having significantly higher labor costs per hectare than those with mature plantations. Three of the plantations between 40 – 150 hectares are not producing a profitable harvest, while labor costs are at their peak. Data from CANAPALMA confirms that labor costs for new farmers are highest during the first two years, increasing again slightly during the fifth and sixth years as harvests become larger and more consistent (CANAPALMA 2012). Survey data also suggests that labor costs incurred by small and medium farmers are similar, however a larger percentage of small farmer's monthly gross income is spent on labor.

[7] "Ideally, palm is a family business."

Table 4: Income and Labor Cost by Size of Total Land Holding

	2 - 15 ha (n = 8)	**18 - 31 ha** (n=6)	**40 – 150 ha** (n = 7)
Average age of plantation	**14**	**11**	**6**
Average hectares in palm	**7**	**13**	**33**
Average monthly gross income (in 000 CRC)	**860**	**1,460**	**2,400**
Average monthly cost of labor (in 000 CRC)	**116**	**136**	**506**
Percent of gross income spent on labor	**12%**	**9%**	**21%***

*Labor cost is particularly high for this category because four of the plantations are new (> 4 years old) and three are not yet producing fruit

Source: calculated from survey data

From our interviews it is clear that smallholder oil palm production is neither exclusively a family endeavor, nor a major source of employment. The majority of producers interviewed do not provide full time work to individuals outside of their family, while they do hire harvesters on a biweekly basis and laborers to control invasive weeds and apply fertilizer periodically throughout the year. Women and some men are occasionally employed as *colloleros*, paid by the bushel to collect fallen palm fruit. Even with limited offerings for farmworkers, the ability of palm production to provide even part time employment is considered to be of great benefit to communities who face the highest rates of poverty and unemployment in the country. When asked how palm had impacted their community, 13 (of 20 respondents or 65%) of those interviewed said that palm provided more or many more employment opportunities than pre-palm economies, but less employment than banana plantations provided previously. Numerous palm producers also commented that they were pleased not only to have secured a stable source of income for their families but also to be able to employ men and occasionally women in their community.

The data collected from our sample of Osa and Golfito palm growers readily confirm parts (a) and (b) of hypothesis III: we do find that *three factors explain African oil palm's special attraction for independent producers: (a) its reputation for high prices, (b) the existence of external assistance with initial set-up costs, and (c) the possibility of covering labor demands within the family unit.* Part (c), however, met with mixed results. In the majority of cases, even producers with less than 15 hectares hire help outside the family on a regular basis.

Hypothesis III*: Producers are aware of common problems of plantation agriculture including boom and bust cycles, susceptibility to disease, market vulnerability, and economic dependence associated with extractive enterprise, owing to previous experience with bananas, cacao and timber in the region.*

As an official agricultural frontier until the 1960s, the economy of the region surrounding the Osa Peninsula has largely been organized around agricultural production. While off limits within national parks, land was readily available for colonists arriving in the early and mid twentieth century. By 1979, 24% of what would become Osa Conservation Area's (ACOSA) land cover was cropland, pasture, or palm plantation (Casaretto 2004), with most households participating in some form of cultivation. Geographic isolation has made agriculture a household necessity yet generally an unstable source of income in the region where boom and bust cycles of production are all too familiar: from bananas to cacao to cattle, dissipating markets have hindered economic development. Through prior experience with export-oriented production, our interviewees were familiar with numerous hazards of commodity crops and monoculture, many describing palm as simply the latest link in a chain of fleeting opportunities. Growers described a history of economic failures in the agricultural sector attributed to a lack of national and international market integration and highly variable demand. Agricultural production has been further undermined by crop disease and the withdrawal of public and private investment in agricultural development.

A grower in the former United Fruit company town of Sierpe insisted that "*la gente ve que nos va bien ahora, pero no saben que es lo que hemos pasado*,"[8] contextualizing the visible economic success of palm-oil producing households within a tumultuous and poverty-stricken past. While contract agriculture, which has emerged in the region with the rapid spread of palm in the last 25 years, is currently minimal, regional commodity crop plantations date back to the advent of the banana industry in 1920s (Ankersen et al 2006). In addition to banana plantations, six (of 21 or 29%) interviewees had experimented with cacao plantations at some point in their agricultural career. Multiple interviewees spoke of the devastation caused by fungal outbreaks that have compromised cacao production in the Americas for decades. Latin American cacao plantations have been repeatedly attacked by black pod (*Phytophthora palmivora*), Monilia pod rot (*Moniliophthora roreri*), and witches' broom (*Crinipellis perniciosa*) (Fulton 1989). These outbreaks have proven extremely difficult to control in a tropical climate and their etiology remains poorly understood by growers, a factor which they acknowledge as having increased transmission in their plantations. Seven growers (of 21 or 33%) mentioned concern over palm diseases known locally as "*flecha seca*" and "*pudre-collol.*" Four growers (of 21 or 19%) reported having diseased palms in their plantations, yet agricultural specialists (e.g., Chinchilla 2008) remain skeptical about the cause of rots and discolored palm fronds visible in some plantations around the INOGOSR. According to Chinchilla, no pathogen has been identified as the cause of the disease growers refer to as "*flecha seca*" and symptoms may simply indicate environmental stress (Chinchilla 2008).

[8] "People see we are doing well now but they don't know what we've been through."

Economic incentives are so strong and persistent that despite awareness of hazards associated monoculture, 38% (eight of 21) of farmers converted their entire landholding to plantation. For producers with the least amount of land (15 hectares or less) who comprised over one third (38%) of the sample population, this figure was 63%. While profitable, OP cultivation on seven hectares or less incurs many of the same costs as larger farms without the capacity to generate the same profits, increasing risks among those most vulnerable to poverty and food insecurity. Small, medium, and large landholders alike are aware of international competition and global forces that impact profits. As of October of 2012, crude prices had dropped to a three-year low, reduced by 25% over the past five months (USDA 2012). Falling prices have been attributed to growing stocks in Malaysia and Indonesia, the current world leaders in palm oil export (USDA 2012). Regional competition also produces uncertainty. "*Tengo miedo que todos van a sembrar palma*[9]" one grower reported, echoing a pervasive sentiment among farmers who believe that palm's popularity may create uncertainty in future demand and earnings. Several growers expressed concern about plantation expansion in the Brazilian Amazon and decided to postpone further palm planting until the impact of these projects was known. (Vale), one of the world's largest mining corporations has recently purchased Brazilian palm oil producer Biopalma and announced plans to produce 500,000 tons of oil per year by 2019 (Biofuels Digest 2011). Relatively high production costs due to comparatively high land and labor costs, place Costa Rica at a disadvantage in global markets (CANAPALMA 2012) and producers may experience economic downturn as plantation expansion continues at local, national and global scales.

The region's persistent poverty and underdevelopment, coupled with palm's steady rise to prominence in domestic and international markets, has facilitated rapid and widespread agricultural transition to a relatively unknown crop with a distinct production style. Despite experience with volatile markets, the cost of crop maintenance in an environment favorable to plant diseases, and a general awareness of the risks of monocultures, growers report high levels of satisfaction with their decision to start OP plantations.

The indicators obtained in our fieldwork thus offer compelling support for hypothesis III, *Producers are aware of common problems of plantation agriculture including boom and bust cycles, susceptibility to disease, market vulnerability, and economic dependence associated with extractive enterprise, owing to previous experience with bananas, cacao and timber in the region.* Nevertheless, the economic advantages described above are sufficient to incentivize ever more oil palm cultivation in the Osa-Golfito Region.

[9] "I'm afraid that everyone is going to plant palm"

Hypothesis IV: Independent producers see oil palm as worth the risk, because to date it provides a way to move into the middle class, as reflected in their increased consumer capacity

Interviews with producers, coop and association leaders in the INOGOSR reinforced CANAPALMA data, which all regard oil palm production as one of the single most important economic activities of the region (CANAPALMA 2012). As mentioned above, many of those interviewed highlighted the departure of United Brands and more recently, the post-2008 decrease in tourism revenue, as examples of why the rate of palm oil cultivation has continued to grow. Farmers are also attracted to oil palm because of consistent, year round production made possible by environmental factors which support yields considered to be particularly high among palm oil producing countries.

As discussed above, farmers in the INOGOSR have been subject to boom and bust cycles of production characterized by the government's promotion of various non-traditional exports after the departure of United Brands in 1983. These experiences serve to contextualize palm producers' hesitation to describe oil palm cultivation as the figurative "*huevo de oro*[10]". Instead, many of those interviewed expressed a more moderate outlook. For example, when asked how much they expected to earn growing oil palm, 9 (of 18 or 50%) of producers simply stated that they hoped that it would provide a better quality of life. The majority palm producers emphasized the economic stability that oil palm cultivation provides, highlighting the benefits of a consistent, monthly income.

Questions remain, however, regarding how much independent oil palm producers actually earn and how earnings are reflected in consumption patterns. When considering net oil palm revenue, it is necessary to take into consideration the expenses incurred by the producers. While pesticide use and resulting biocide cost is low, respondents claimed it was important for them to invest in fertilizer and manual labor or herbicides in order to ensure consistently high yields and healthy palms. As indicated above, manual labor costs depend in large part on two principal factors: the number of hectares planted with palm and the availability of family laborers.

Labor costs are also impacted by the age of the palm plantation. Farmers who had palm less than 4 years old reported having significantly higher labor costs per hectare than those with mature plantations. Data from CANAPALMA confirms that labor costs for new farmers are highest during the first two years, increasing again slightly during the fifth and sixth years as harvests become larger and more consistent. On the other hand, the cost of materials per hectare, including herbicide and fertilizers, stay relatively constant during the first six years of cultivation. Interestingly, the purchase of fertilizer accounts for more than 90% of total costs for a plantation's 30-year period of productivity (CANAPALMA 2012).

[10] "Golden egg"

Table 5: Plantation maintenance cost per hectare / CRC

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Labor	125,000	87,280	58,400	61,100	64,900	64,900
Materials	238,000	240,000	240,000	240,000	240,000	240,000

Source: CANAPALMA 2012

In addition to the cost of chemical inputs and labor, producers must pay for the transportation of the palm fruit to the processing plant, a considerable expense, especially for those producers on the edges of the oil palm frontier (see Table 4). Five of the seven industrial plants in Costa Rica where the palm fruit is deposited for processing are located in the districts of Golfito, Guaycara and Pavon. The producers we interviewed sold their fruit at the Palma Tica processing plant locally known as Coto 54, and at the Valle del Coto Sur de Laurel de Corredores (administered by Coopeagropal) processing plant, locally known as CIPA, both located in Guaycara. Despite the ongoing expansion of palm production in the districts of Sierpe and Puerto Jimenez, there is no industrial plant on the Peninsula (See figure 1).

Table 6: Transportation costs by canton and district

Canton, district	Average monthly transportation cost per MT	Percent of average monthly gross income
Osa, Sierpe	13,000 CRC / $26.00	19%
Osa, Piedras Blancas	4,500 CRC / $9.00	10%
Golfito, Guaycara	3,000 CRC / $6.00	5%
Golfito, Puerto Jimenez	10,000 CRC / $20.00	18%

Source: calculated from survey data

Producers in Osa, Sierpe sample include the communities of Drake Bay, Progreso and Rancho Quemado, which are located on the far side of the Peninsula and lack a paved road leading out of the district. For producers in Golfito, Puerto Jimenez, partly unpaved road combined with the distance to palm processing plants are the primary explanations for high transportation costs. An independent producer in Drake Bay reported paying 20,000 CRC (approximately 40 dollars) per metric ton (MT) for transportation to the Palma Tica industrial plant in Coto 54. Despite spending more than 30% of his gross income on transportation costs, this grower believed that converting pastureland to oil palm offered better economic rewards and increased income stability.

Finally, as previously mentioned, the majority of farmers receive financing from Palma Tica in order to pay the initial costs of oil palm production. Producers begin paying back this loan during the fourth year, which coincides with the plantation age at which palms begin to produce. Farmers interviewed described this process as paying Palma Tica "*con la fruta*" or "with the fruit" from their plantation. On average, Palma Tica deducts 30% of the producer's total fruit tonnage per month, in order to pay back the loan, which occurs over the course of 12-14 year contracts. When possible, producers will pay more than 30% in order to accelerate debt cancellation.

Despite considerable expenses, producers, small, medium and large producers experience increased income and stability from palm production, which has in turn impacted over-all wellbeing, as well as consumption. All households with productive plantations have experienced at least some measurable gain in income since planting palm, ten (of 21 or 48%) of which have *more than doubled* previous earnings from ranching, food crops, or timber plantations. Instead of farming at a near subsistence-level, many palm-producing families now have the opportunity to purchase non-essential goods and amenities. Plantations also offer opportunities to gain access to healthcare, transportation, education, and other goods and services that are highly prized by rural families. While ten (of 21 or 48%) of farmers reported spending their increased income on home improvements and vehicles, a quarter of producers stated that oil palm income was modest, covering only basic necessities including food and clothing.

The differences in increased wellbeing and consumption among palm producers in the INOGOSR depend on numerous factors, including location, age, and size of plantation. For example, farmers located close to production facilities have an advantage in that they are able to avoid high transportation costs. We found good indications that economic stability increases as one's plantation matures; however, it is estimated that producers must have at least 8 hectares under oil palm cultivation to enjoy luxuries like home improvement projects or pick-up trucks.

Overall, palm cultivation is profitable for small, medium and large farmers and is rightfully considered to be one of the most viable livelihood opportunities currently available in the region. In the words of a prominent producer in the town of Piedras Blancas, "*palma es el motor de la economía del sur; es lo que jale el tren; también hay turismo pero todo depende de la palma.*[11]" Despite incurring considerable expenses, especially during the first four years of palm cultivation, our data suggests strong support for hypothesis IV; *nevertheless, smallholders see oil palm as worth the risk, because to date it provides a way to move into the middle class, as reflected in their increased consumer capacity.*

[11] "Palm is the motor of the southern (Costa Rica) economy; it is what pulls the train; tourism as well, but everything depends on palm."

Discussion and Conclusions

Oil Palm cultivation among farmers of the Osa-Golfito region has transformed livelihoods and agricultural landscapes. Palm oil-producing households have increased earnings and economic outputs for the region, as have those households who provide labor and transportation for plantations. At the time of this writing (Fall 2012), little can compare with the earnings from oil palm cultivation and surely none of the historical mainstays of Old-Golfito smallholder production (cattle, maize, rice, other fruits). It is no wonder then that increasing areas are being converted into OP, especially given the cost-sharing assistance of a 12-14 year contract from Palma Tica. Although our study illuminates aspects of change in the region, significant gaps remain in understanding the socioeconomic and environmental impact of plantation expansion. Whether or not plantations are compromising local ecosystems and biodiversity remains unknown (but see Dirzo et al 2012). Other uncertainties include the impact of OP on future food insecurity and its potential to permanently alter lifestyles and community dynamics.

Before palm, all but one producer we spoke with grew food crops and/or raised livestock, the latter being the most common pre-palm economic activity. This tentatively suggests that ranchers disproportionately enter into oil palm production due to having with more land and capital and because pasture requires little modification before a plantation can be established. If demand and prices remain steady, pasture is likely to decline in the wake of new plantations. The conversion of food crops and rangeland to plantations may have implications for food security as Ticos turn away from ranching, subsistence farming and home gardening in order to make way for palm. Six growers (of 23, or 26%) had abandoned all household food production (home gardening and animal husbandry) in favor of maximizing plantation area. Changing the dynamics of an agricultural mosaic that once favored crops such as corn, beans and manioc (yuca) alters both the agro-ecosystem and availability of locally produced foods. Based on our findings, however, producers are eager to emphasize the dietary benefits of increased earnings thanks to oil palm. Though many are aware of the perils of a monoculture that excludes the possibility of intercropping[12] or diversification, cash income allows families to avoid the food insecurity that they experienced in the past.

Interviews with producers and coop officials alike generated a picture of a changing foodscape, the "food environment" (Lake et al 2012) that encompasses the dietary choices, challenges and opportunities that communities face. Health consequences resulting from the switch to palm oil in Costa Rican kitchens have been documented (Kagambe et al 2005), yet changes in diet and lifestyle brought on by agricultural transitions within the study region require further physiological assessment.

[12] Several of the farmers we interviewed reported intercropping beans, rice, and bananas during the first 3 years after palm was planted. Intercropping is not possible after the first 3-5 years due to canopy cover and because it would impede harvest.

Along with inquiry into wellbeing of growers and their families, research on plantation soil health and long-term ecological sustainability is needed. Many informants echoed beliefs that in the long run, palm "*esteriliza la tierra,*" or "sterilizes the land" by stripping it of nutrients. Interestingly, palm may be an important means of increasing productivity of former banana plantations and the most appropriate crop to plant in toxic soils. All plantation transitions observed by researchers and described by growers took place on former pasture and cropland and did not involve replacing native forests. How long will the availability of pastures, former banana plantations and areas heavily impacted by nearly a century of conventional agriculture displace pressure on native forests? Is palm oil production a socially, economically and environmentally rational land use in the INOGOSR? Longitudinal data from a larger sample population coupled with agro-ecological research could provide answers to these and other questions of sustainability.

Land use change has important implications for development and conservation in the INOGOSR. Oil palm's increasing prevalence calls for more complete understandings of rates of expansion and how they can map on to markets, policies and farmer's decision-making processes. Spatial analysis used in conjunction with further economic and ethnographic research could provide insight into the proximate drivers of land use change associated with oil palm expansion. Our study suggests that farmers perceive palm to be the only viable option for economic success in the agricultural sector; however, a host of factors are likely influence their conversion. Can rates of expansion be linked to crude prices? How will the EPA's recent rejection of palm oil as a "renewable fuel stock" impact expansion worldwide? In 2011, Mexico received 70% of Costa Rican palm oil exports (PROCOMER 2011), a country that does not currently produce palm oil-based biofuel. It is therefore unlikely that fuel stock markets exert a direct influence on demand for Costa Rican palm oil. On the other hand, biofuel development has increased demand for edible oils worldwide, as witnessed during the food crisis of 2006 when crude prices increased by 80% (Naylor et al 2007). Identifying and disaggregating demand systems for Costa Rican palm oil would help to clarify and predict patterns in changing landscapes of the Osa Peninsula.

Outside of economic factors, processes that encourage and enable farmers to convert their land to plantation are a critical component of agricultural development in the region. Many farmers described the importance of friends and neighbors in their decision to cultivate oil palm, highlighting the role of "local ambassadors" or prominent, successful oil palm growers who appear to be important in promoting expansion. An analysis of social networks among farmers could illuminate networks of knowledge, practices, and incentives among growers. In addition to incentives signaled by the visible material gains of oil palm growers, Palma Tica provides information about earnings and practices which play a key role in capacity building and formulation of grower expectations. Since Palma Tica declined an interview with us, its practices are not analyzed here. Whether or not contract agriculture will remain an efficient and mutually beneficial arrangement for farmers and Palma Tica will require future study. As a central agent in Costa Rican oil palm cultivation, Palma Tica's involvement in the region will have a continuing influence on long term trends in livelihoods and land use change in the INOGOSR and thus merits further assessment.

Recommendations

If African oil palm is to help the citizens of Osa and Golfito steer toward a sustainable future, this study prompts us to offer the following recommendations:

1. The establishment of a "model farm" with demonstration fields would help with the dissemination of current best practices in the region, both for OP (oil palm) production and for enhancing biodiversity in the region (on which, see Dirzo et al 2013).

2. We recommend experiments with intercropping (for example, with papaya and mammon chino/lychee) to buffer the single-crop dependence on palm and to provide back-up resources in case of pestilence or disease to the OP.

3. An agricultural zoning system generated through community-based, participatory processes should be implemented to assure that agricultural development does not sacrifice the mosaic nature of the regional ecosystem.

4. Improvements to failing infrastructure, including damaged roads and decrepit bridges, should be made as soon as possible given the increased traffic of heavy vehicles transporting palm fruit on the road. Simultaneously, wildlife crossings should be developed to reduce road-kill and increase habitat connectivity.

5. A modest palm oil processing facility should be built on the Osa Peninsula to cut transportation costs as measured in *colones* and carbon, and to ensure that small and medium oil palm farmers earn a living wage reducing the need for further expansion of plantations into buffer zones or for the replacement of food crops with oil palm.

6. Collaboration between governmental agencies such as the ministries of agriculture and the environment, CANAPALMA, Palma Tica, grower coops and associations, and local NGOS could generate norms and guidelines for best practices in sustainable oil palm production. Optimally, a certification process could be developed to incentivize plantation management for conservation of natural resources and biodiversity maintenance, as well as high yield. This process could link growers to more lucrative markets for "sustainable" foods and cosmetics.

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