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White Gold: Palmito Sustainability and Economics in Brazil's Atlantic Coastal Forest

By

Teresa Orlande, Jan Laarman,
and Jason Mortimer

FPEI Working Paper No. 55

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ABSTRACT

A number of palm species produce edible palm hearts, or "palmito" as it is called in Brazil. "Palmito jussara" (Euterpe edulis) is a favorite for both international export and Brazilian consumption. Extraction of wild jussara palmito (or just "palmito") from Brazil's Atlantic Coastal Forest is illegal. Yet palmito extraction in this forest continues on a major scale because of private profitability for palmito processors and merchants, ineffective government intervention, and relatively attractive earnings for low-income palmito harvesters ("palmiteiros").

Because most palmito cutting and transport is clandestine, virtually no information is available on the financial returns from palmito extraction. However, the question is central for discussions of sustainability in unmanaged vs. managed agro-ecological systems. While reliable data are impossible to obtain, we interviewed several individuals in Brazil in order to formulate scenarios of palmito production, prices, and costs. We simulate the uncertainties in assumptions and data to generate a range of estimates on the net value of palmito management alternatives.

Financial net present value (NPV) of palmito extraction is highly sensitive to the time value of money (discount rate). "Managed" extraction is more attractive than unmanaged extraction at low discount rates. As the discount rate increases, the attractiveness of sustainable palmito management decreases. All scenarios suggest that palmito cutting is very lucrative, explaining current institutional problems in controlling commerce of this "white gold."

INTRODUCTION

"Palmito" refers to the edible parts of several species of palms (family Palmae) found mainly in tropical and subtropical climates. Palmito, or hearts of palm, is the soft and fibrous mass of nascent white tissues found in the palm's stem. Palmito is eaten with salads, as an appetizer, and as a topping on pizzas. It is sold fresh, as well as in jars and cans.

In Brazil, the number of individual types of palmito palms is unknown. Palmito and related species grow in almost every region of the country, from the Amazon Basin of the North to the coastal estuaries of the South. Brazil may have over 100 species of edible palms and 23 million ha of palmito habitat (Macedo et al. 1983), although these figures are debated.

It is useful to discuss palmito in terms of two principal species, Euterpe edulis and E. oleracea. Each of these species has subspecies and regional variations. E. oleracea is primarily an Amazonian plant, while E. edulis (palmito jussara) occurs primarily in the Atlantic Coastal Forest from sea level to 750 m elevation. The multi-stemmed E. oleracea prefers direct sunlight and responds to control of plant competition. In comparison, the single-stemmed E. edulis germinates in the shade, and seems to reproduce best in forest surroundings.

In order to harvest palmito from E. edulis, the single stem is cut, effectively killing the plant. This contributes to the sustainability debate. In the case of E. oleracea, it is possible to cut all but one or two stems, thus leaving the plant for future regeneration. The quality of palmito from E. edulis normally is judged superior in taste to that of E. oleracea, and more of the fiber can be utilized from the former.

Palmito canning began some fifty years ago in the South and Southeast. Yet palmito canners continue to buy wild palmito extracted from the natural forest. The establishment of palmito plantations and palmito agro-forestry systems is trivial. A current debate pits proponents of palmito plantations against proponents of managing palmito in forest conditions, but with no reliable empirical basis to draw conclusions.

The present stocking and condition of E. edulis in the Atlantic Coastal Forest is a topic of considerable concern among environmentalists, palmito extractors ("palmiteiros"), and the Brazilian government. There are no biological inventories that give an accurate and comprehensive picture of the Atlantic Forest ecosystem. In the absence of biological

inventories, it is impossible to know whether palmito extraction has depleted palmito stocks to any significant degree. However, palmiteiros and environmentalists tend to agree that E. edulis is disappearing from some sections of the Atlantic Forest.

The consequences of this are both ecological and economic. Palmitos of the edulis species grow in concentrated areas ("palmitais"), where maximum density reaches 5-8 thousand individuals per ha when including seedlings and immature plants. They provide food for insects and animals, including several rare and endangered birds and mammals. Secondly, it is believed that palmitos have a regulatory effect on other plants. For these and additional reasons, biologists consider palmito a key species in much of the Atlantic Forest (SPVS 1991).

Moreover, human encroachment in the forest to cut and haul palmito increases the disturbance of areas having important biodiversity functions. Eight percent of threatened Brazilian birds and 18 percent of threatened Brazilian mammals occur in coastal forests occupying only 0.04 percent of the country (SPVS 1991). At the recent Earth Summit in Rio de Janeiro, Brazil's Atlantic Forest was identified as one of the world's highest conservation priorities.

In response to international pressures which began in the 1980s, Brazil's federal and state governments have established a series of parks, reserves, and areas of total preservation in order to attempt to protect the remaining Atlantic Forest ecosystem. Most of these demarcations for protection exist mainly on paper, and they suffer from disputed boundaries and competing land claims.

In 1990, the federal government passed a law that bans all extraction from areas designated as part of the Atlantic Forest. Except on private lands, the cutting, transport, and sale of palmito and other forest products is a federal crime. Even on private lands, landowners

must obtain a license from the Brazilian Institute of the Environment (IBAMA) or from state environmental agencies before they are allowed to cut and sell palmito.

Despite the intention of the law, palmito extraction continues relatively unabated. Reasons include a general economic crisis that has weakened government programs, widespread corruption among government officials, and difficulties of interpreting and enforcing laws in a confusing legal setting (SPVS 1991).

Moreover, extensive illegal activity in palmito commerce is explained by its profitability. Because it escapes laws and taxes, illegal palmito production is lucrative, by some estimates twice as profitable as legal production. In regions such as Guaraquecaba on the coast of Parana state, palmito is one of the few commercial activities. There, 80 percent of employment and income derive from seven palmito processing plants. In Parana, smuggling of palmito as "white gold" is reported to involve not only the Forest Police, but also an important mayor. Yet charges against the mayor were dismissed by the state's governor (Dos Santos 1993).

Not surprisingly, the income generated by palmito is unevenly distributed. While the data are often falsified, financial records of palmito processors indicate that only about five percent of operating expenditures go towards palmito purchases. Thus it appears that palmiteiros receive just a small fraction of the gross income from sales of the final product.

PALMITO PROCESSING AND COMMERCE

Palmito is sold by street vendors and in supermarkets. It is not a food staple, but rather is eaten only by those who can afford it. Palmito is relatively expensive and low in nutrition. The deciding element in palmito consumption is taste, and Brazilians exhibit a marked preference for palmito from E. edulis.

The processing of palmito is similar for both E. edulis and E. oleracea. The cutting, cleaning, and packing of palmito is more or less the same everywhere in Brazil.

The objective is to cut palmito at its greatest diameter before the fiber toughens. As the palmito ages, the edible portion of its crown decreases, becoming almost non-existent in plants over 20 years old. In E. edulis, cutting age normally is between 5-10 years, depending on site and climate. At this age, diameter at breast height is 8-15 cm, and height is 10 m.

The entire palm is felled to obtain the palmito held in its crown. The base unit of palmito production is the "head," which is usually 60-80 cm long, depending on the plant's age and the amount of palmito that is edible. The outer layers of vegetative debris are removed from the palm head, but some is left to protect the fragile palmito at its core. Most of the stem, leaves, and seeds are left in the forest.

At the processing site, the palm head is peeled until its white inner core is exposed. The core is washed and cut into pieces of 10-15 cm in length, and 2-12 cm in diameter. These pieces are sorted into grades. The highest grades come from the newest parts of the stalk. Usually, two grades of whole palmito are recognized. A third and cheaper grade is used in cooking rather than eaten whole.

Raw palmito must be cooked before it is edible. After sorting and grading, the palmito is packed into jars or cans. It is then cooked at a temperature of 90-100 degrees C. for a period determined by the diameter of the palmito. The container is then drained and filled with a preservative solution, which is commonly a simple blend of water, salt, and citric acid. Palmito packed under sterile conditions remains stable for years. However, palmito cut illegally is often processed in covert operations and unsanitary conditions.

LIVELIHOOD OF THE PALMITEIROS

Along with artisanal fishermen and subsistence farmers, palmiteiros are among the poorest residents of the Atlantic Forest regions. Most are landless workers whose activity in palmito

extraction is less related to seasonality than to fluctuating needs for income. However, there is a preference for dry weather, when palmito is more easily carried and transported.

Palmiteiros typically work 15-20 days per month. When the palmitais are far from home, they camp in the forest under a plastic tarp and live on rice, black beans, and small animals they hunt. When the palmitais are closer to their residences, palmiteiros work 3-4 days per week, returning home periodically.

Many palmiteiros are self-employed. In other cases, they are contracted by palmito companies. Most palmiteiros work with one or more family members. The costs of food, tarps, and cutting knives usually are born by the palmiteiros themselves.

The life of the palmiteiro is arduous. Depending on the extent of police control, most of a palmiteiro's work occurs at night. Palmito usually is carried from the forest to secondary roads in bundles of 30-60 heads weighing about 60 kg, or the most that one man can carry. In the forest, steep slopes and the lack of interior trails generally make it impossible to carry palmito bundles on animals or vehicles. A palmiteiro typically begins cutting palmito as a teen-ager, and 20-35 years of carrying palmito bundles results in a high frequency of back injuries.

FINANCIAL RETURNS FROM MANAGEMENT ALTERNATIVES

Management Proposals for Palmito

Currrently, palmito is extracted with little regard for regeneration. Most palmito in the Atlantic Forest is an open-access resource, cut illegally on public lands. Under these conditions, the long-term sustainability of palmito production is doubtful. The search for models of sustainable palmito production is relatively recent, and is concentrated among just a few individuals.

Most biological research, theoretical discussion, and management projects for palmito originate at the Agronomic Institute of Campinas (state of Sao Paulo) and the Federal University of Santa Catarina (in the city of Florianopolis). In 1987, interested individuals from these two

institutions combined with EMBRAPA, the Brazilian agricultural research organization, to sponsor the first National Meeting of Palmito Researchers. The document of 30 papers from this conference represents the primary body of knowledge about palmito (EMBRAPA 1987).

To date, there is little support for cultivating E. edulis in plantation or agro-forestry systems. Most proposals call for natural regeneration of the species, which normally reproduces well and grows fast. However, a more deliberate plantation cultivation of palmito has been proposed for E. oleracea, which responds better to human manipulation and offers greater physical yields than E. edulis.

Even if it can be agreed that E. edulis should be managed for natural regeneration, information for management decisions is sparse. Models of sustainable palmito production require the following data (Floriano et al. 1987):

* seed-bearing palmitos to be left uncut, with due regard for their spacing, age (sexual maturity), and phenotype (i.e., leaving palmitos of superior form for the seed crop);

* diameter cutting limits, taking into account changes in both biological growth and financial selling prices as palmitos increase in age and size.

To date, most thinking in Brazil about palmito management parallels optimization principles for timber trees. Over a continuous time horizon, the greatest biological yield is produced when palmitos are cut at the age which maximizes their mean annual increment, i.e., total utilizable harvest per stem divided by years of growth (Nodari et al. 1987). In comparison, financial return is expressed in terms of discounted net present value. In the financial approach, future harvests are multiplied by a discount factor reflecting the time value of money. At any positive real time value of money, cutting cycles are longer in biological compared with financial cutting cycles (Bentley and Teeguarden 1965).

Ademir Reis, professor of biology and authority on palmito, compares two biological management prescriptions (Reis et al. 1992). For a cutting cycle of six years, Reis estimates that palmito will yield an average of 17 kg per ha per year. This is the cycle which maximizes mean annual increment. For a cutting cycle of 15 years, estimated yields decrease to 14 kg per ha per year. While the 6-year cycle has the highest apparent productivity, the 15-year cycle minimizes risks of regeneration failure. Also, a 15-year cycle generously allows for stand recuperation in areas of recent palmito extraction.

Flavio Kirchner and colleagues apply a different harvesting framework (Kirchner et al. 1987). For six classes of palmito defined by age and size, they propose harvesting classes 1-2 every 3.5 years, or classes 1-4 every 6.0 years. Classes 1-2 are the oldest and largest palmitos, having the highest percentages of fertile individuals (Figure 1).

Management recommendations are based on limited observations of palmito regeneration capacity, growth rates, and diameter distributions. Kirchner's proposals refer to forests in the state of Parana, compared with Reis for Santa Catarina and Sao Paulo. In all of the Atlantic Forest, palmito inventories are few, and management concepts are still experimental. For the present, we have only wide ranges of information and assumptions on palmito stocking, condition, growth and yield to guide analysis.

Production and Costs

The net returns from palmito extraction are estimated, drawing upon the preceding framework. Three alternative formulations are the "Reis model," the "Kirchner model," and the "traditional model."

The traditional model represents pure extraction (clearcut) with no regard for palmito regeneration. We assume that palmiteiros remove all palmitos of harvestable size, or about 500-650

palmitos per ha. At yields of 300-400 g of utilizable core ("creme") per individual palmito, the one-time harvest is 150-260 kg per ha.

In the Reis model, palmito productivity is 17 kg per ha per year in perpetuity for a 6-year cutting cycle which maximizes average annual yield. Productivity is 14 kg per ha per year for the 15-year cycle which maximizes regeneration prospects.

In the Kirchner model, 90 palmitos in age-size classes 1-2 are harvested every 3.5 years. Alternatively, 266 palmitos in classes 1-4 are removed every 6.0 years.

The price of palmito received by palmiteiros varies by region, size, and quality in a range of US$0.50-0.90 per palmito head. Here we state the price in terms of the U.S. dollar, given that Brazil's currency has been wracked by severe inflation (Carneiro et al. 1993). The inflation makes it difficult to determine the time value of money as a guide for discounting cash flow. However, contacts in Brazil's banking sector suggest that real rates of interest have been about 6-12 percent.

Expenditures by the palmiteiros comprise their food, cutting knives, and a tarp for overnight camps in the forest. These are relatively insignificant costs in relation to the market value of their production. Knives and tarps can be considered annual fixed costs to be amortized against a year's palmito output. Output is assumed to be 100 bundles (5,000 heads) per palmiteiro for 200 working days per year. During these 200 working days, a palmiteiro consumes 25 kg of rice and 25 kg of beans. Summing these items, gross expenditure per palmiteiro per year is US$33.40, or just $0.007 per palmito head. This implies earnings of about US$12-23 per palmiteiro per working day, approximating the figures stated earlier as reported by the palmiteiros themselves.

Financial Criteria and Sustainability Issues

Table 1 shows estimated financial returns to the land under the various models of palmito harvests. The discount rate is irrelevant for financial returns under total extraction, since all harvestable palmitos are removed immediately. For sustainable management, financial yields fall

sharply when the discount rate increases from six to twelve percent. This reflects that deferring harvests into the future is increasingly less attractive for increases in the discount rate.

Figure 2 indicates this graphically when the discount rate is treated as a variable. Compared with palmito clearcutting, management for sustained yield is the superior financial option when discount rates are lower than six percent (Reis data) or three percent (Kirchner data). Total extraction is favored when discount rates are eight percent and higher. This very simple comparison ignores that management requires operational costs, and that even palmito clearcutting is likely to be followed by at least a minimal level of palmito regeneration. Thus by some unknown margin, the analysis overstates the financial attractiveness of sustainable relative to unmanaged extraction.

However, to emphasize discounted financial value may be wrong, both in concept and philosophy. The economics of "sustainable development" favor managing for non-declining stocks of natural capital, particularly in economically depressed regions. Interpreted within this framework, sustainable palmito management may satisfy several social goals (Pearce et al. 1990):

* Justice for disadvantaged socioeconomic groups.--As noted earlier, palmito harvesting and processing provide comparatively attractive daily earnings for numerous poor residents of Atlantic Forest regions. Many such residents have few income alternatives. Total palmito extraction risks sacrificing a potentially renewable and lucrative source of future income, even if short-term income falls due to imposition of harvest constraints.

* Justice between generations.--To the extent that palmito overharvesting can be prevented, Brazilians of the next generation retain development options that otherwise would be narrowed. The range of future choices is preserved, which has important ethical implications.

* Risk aversion and a wide view of benefits.--Wild palmito has multiple life support functions which are imperfectly known. The net financial revenues generated by palmito removal

overstate national benefits when considering possible negative impacts on wildlife populations, geochemical cycles, and other aspects of natural systems in the Atlantic Forest.

That the discount rate determines the rate of harvesting directs considerable attention to its empirical determination and conceptual foundation. Contrary to frequent practice, it is not conceptually correct to reduce discount rates as a means to allow for either environmental risk or intergenerational justice. Both are legitimate concerns, but should be handled through analytical devices other than adjusting discount rates (Pearce et al. 1990).

On the other hand, economists and environmentalists agree that we make private decisions for individual interests differently than we make public decisions for collective interests. That is, a market discount rate exists separately from a social discount rate for private and public contexts, respectively. Social discount rates are below market rates because of expectation that governments should guard the welfare of future generations. Thus some observers contend that discount rates as low as one percent are realistic for evaluating public efforts in environmental conservation (e.g., Helliwell 1975). The acceptability of low discount rates for environmental investments is an empirical question to be tested against experience in Brazil. Sustaining the palmito resource generates both private and public benefits, so the issue is complex.

Critically important for the discussion of discount rates and harvest timing is the "assurance argument" (Sen 1967). Accordingly, individual palmito harvesters behave differently if they are assured that their actions are imitated by others. Palmito companies and workers may be willing to give up a margin of current income for the expectation of a larger income to be obtained later, but only if everyone acts in unison. If collective action is not possible, individual willingness to sacrifice for the future is jeopardized. That huge quantities of palmito are cut clandestinely is not encouraging for assured future harvests, implying high private discount rates and rational palmito "mining." This frames a familiar gap between public and private interests.

THE ROLE OF INSTITUTIONS

Ultimately, the rate of palmito extraction comes down to a matter of property rights: "access to everyone means property to no one" (Gibbs and Bromley (1989, p. 24). When members of a society fail to subscribe to the rules governing resource use, anarchy prevails. Anarchy contributes to impatience with the future, in turn explaining unwillingness to invest and wait. Palmito poaching and overharvesting in Brazil's Atlantic Coastal Forest is a classic "tragedy of the commons" (Hardin 1968) arising because of three interrelated explanations:

* Market demand exceeds sustainable levels of harvest, given current inability or unwillingness to implement palmito management systems;

* Use rights in terms of laws, regulations, and other controls are poorly defined and impractical; and

* Government authority in Brazil has been unable to limit access and enforce use rights.

Regarding this series of predicaments, experts in property rights maintain that little will improve until access is controlled and use rights are enforced (e.g., Berkes 1989). In this era of ideology favorable for decentralized decisionmaking and self-governance, public officials have the opportunity to consider institutional instruments other than government-funded policing. In particular, community-level forest management attracts strong philosophical endorsement (Ascher 1994), even if accomplishments to date fall short of expectations (Wells and Brandon 1992).

Along with enforcing property rights, a co-equal step is determining allowable palmito harvests. Here there is a conceptual progression from biological maximization to financial maximization, and then to optimization which integrates economic, social, and environmental criteria. In Figure 3, the optimal number of palmitos to extract is "B" to maximize biological production over time. However, extraction increases to "O" under conditions of open access (Gordon 1954). Removals of "F" maximize financial net revenues, assuming constant unit revenues

for all levels of biological production. Optimum extraction falls to "S-E" when allowing for unknown and largely undefined social-ecological costs on top of purely financial costs.

For palmito in the Atlantic Forest, virtually none of the necessary detail is available to apply this framework. Knowledge is still fragmentary at the level of biological management. Appropriate financial models have been available for decades (see Bentley and Teeguarden 1965), but have yet to be applied for palmito. At the highest level of optimization, multi-criteria indicators of socially and environmentally "sustainable development" are relatively new and theoretical (e.g., Kuik and Verbruggen 1991). The possible adoption of multi-criteria techniques for palmito management is constrained by deficiencies which are both conceptual and informational.

Importantly, workable models of palmito management depend on institutional changes in a larger context. As perceived by Guimaraes (1991, p. 184), Brazil's problem is not a shortage of either legislation or planning, but of relevance. Development in the Brazilian reality is the domain of too many economists and lawyers, and environment is the province of too many sanitary engineers. That Brazil's politicians choose legal rather than economic approaches to address environmental issues is deeply ingrained. Deeply embedded, too, is the frontier view of abundant land and natural resources. Moreover, generations of bureaucratic compartmentalization and top-down technocratic authority explain "outdated" institutional processes which cannot be reconstructed rapidly. In the final analysis, order and progress in palmito management move no faster than governing institutions.

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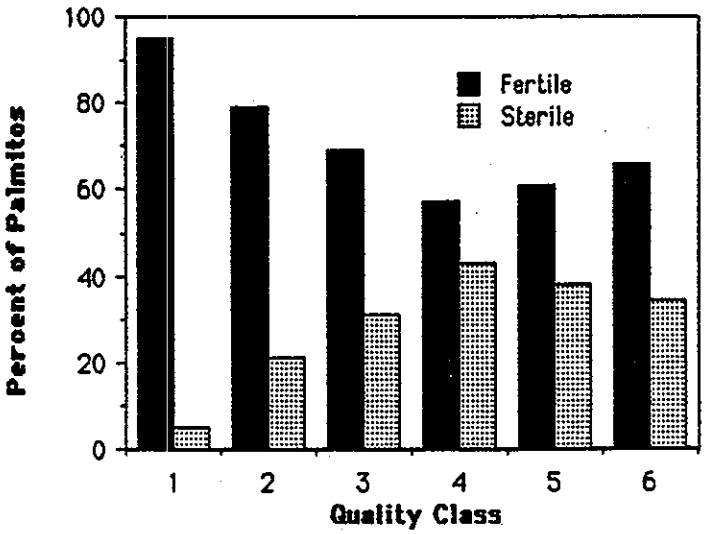
Table 1. Financial Returns for Alternative Models of Palmito Harvesting.

Models	Net Present Value per Ha (US$) ----(Annual Discount Rate)----	
	6 percent	12 percent
A. Biological Data from Reis:		
Total extraction (clearcut)	353	353
Sustainable management, yield maximization, 6-yr cycle	487	210
Sustainable management, minimize risks of regeneration failure, 15-year cycle	302	92
B. Biological Data from Kirchner:		
Total extraction (clearcut)	424	424
Sustainable management, harvest classes 1-4, 6-yr cycle	445	192
Sustainable management, harvest classes 1-2, 3.5-yr cycle	358	167

Assumes average price is $0.70 per palmito head (all classes), but $0.90 per head for classes 1-2.

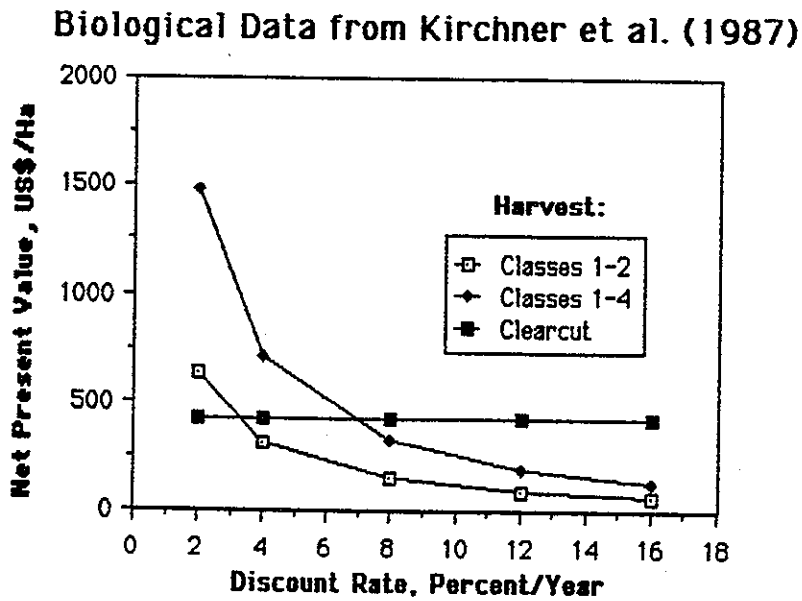
Sources: Reis et al. (1992) and Kirchner et al. (1987).

Figure 1. Palmito Fertility in Relation to Age-Size ("Quality") Class.



Source: Kirchner et al. (1987), p. 122.

Figure 2. Decreasing Financial Returns in Relation to Increasing Discount Rates.



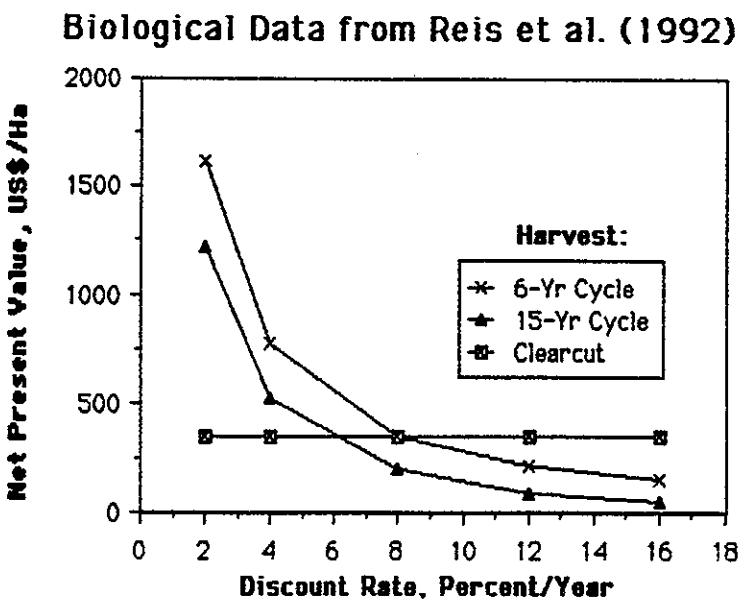
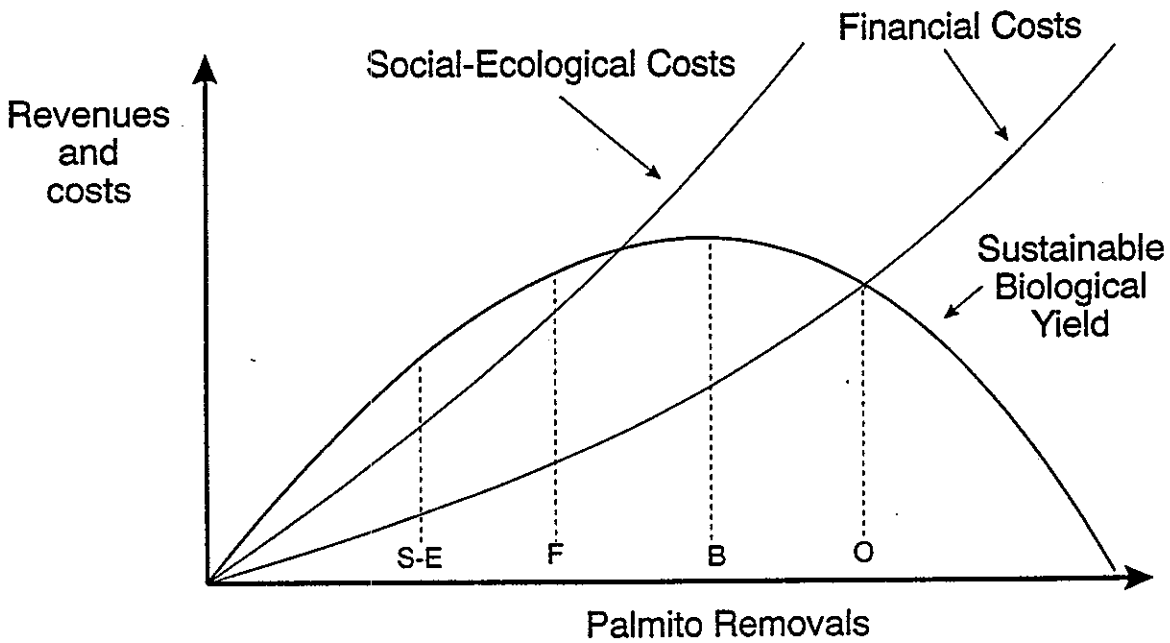



Figure 3. Optimal Palmito Extraction for Biological (B), Open-Access (O), Financial (F), and Social-Ecological (S-E) Criteria.