CAN WE SAVE TROPICAL FORESTS BY HARVESTING NON-TIMBER PRODUCTS?

by

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MESSAGE FROM USAID

This Case Study is a product of the Environmental and Natural Resources Policy and Training (EPAT) Project funded by the United States Agency for International Development (USAID). It is part of USAID's effort to provide environmental policy information to decisionmakers and practitioners in developing countries. The objective is to encourage the adoption of economic policies to promote sustainable use of natural resources and to enhance environmental quality.

EPAT Case Studies are written for development professionals and policymakers in developing countries who are responsible for establishing and implementing policies on the sustainable use of natural resources and for civil servants, project officers, and researchers who are directly involved in the implementation of development activities. This Case Study deals with vegetable ivory production in western Ecuador, one of the largest extractive industries in the hemisphere. Extraction of non-timber products is considered to be an important, but unstudied strategy for conserving tropical forests. This study shows how the economic returns are concentrated at the top of themarketing chain. Although producer-level prices are increasing, this study questions whether collection of non-timber products can save tropical forests. Policymakers need to be more aware of the economic feasibility of alternative uses of tropical forest resources.

The contribution of USAID toward writing, printing, and distributing this document is estimated to be $4,000. The document is being distributed to more than 2,000 policymakers and professionals in developing countries. We will assess its effectiveness by soliciting the views of recipients. An evaluation sheet is enclosed with each mailing of EPAT documents for that purpose.

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ABSTRACT

Many people believe that tropical forest conservation strategies for Latin America should focus on extracting non-timber products.

However, very little economic research has addressed the activity.

This paper presents the results of a study of vegetable ivory, or tagua (Phytelephas aequatorialis), production in western Ecuador.

It is one of the largest extractive industries in the hemisphere.

We found that, until recently, households collecting tagua received payments that barely covered the value of their harvest labor. By contrast, a few firms that slice tagua into disks that are exported to overseas button manufacturers have captured sizable profits. This concentration of economic returns at the top of the domestic marketing chain has been typical of non-timber extraction throughout Latin America.

Processing and exporting are becoming more competitive. As a result, producer-level prices are increasing. Nevertheless, our research findings lead us to doubt that collecting non-timber products will save vast tracts of tropical forest.

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CAN WE SAVE TROPICAL FORESTS BY HARVESTING NON-TIMBER PRODUCTS?

Converting tropical moist forests into cropland and pasture causes profound environmental change. Quite often, local precipitation regimes change. In addition, clearing tree-covered land appears to contribute to global warming (Detwiler and Hall 1988). Undoubtedly, clearing land diminishes biological diversity since tropical rainforests harbor a large share of the world's plant and animal species (Wilson 1988).

It is difficult to force agricultural colonists and loggers to pay for the environmental impacts of deforestation. Therefore, efforts to save rainforests in Africa, Asia, and Latin America have focused on altering government policies that promote land use change. For example, in the late 1980s the Brazilian government cut back various direct and indirect inducements for agriculture in the Amazon Basin, which World Bank economists had criticized (Mahar 1989). At the same time, donor organizations and national governments have promoted economic activities that make use of tropical forests. These activities include ecotourism (Boo 1990), selective timber harvesting with managed regeneration (Tosi 1982), and collecting fruits, medicinal plants, and other commodities.

A two-page case study published in 1989 (Peters, Gentry, and Mendolsohn, 1989) enhanced the appeal of non-timber extraction. A simplistic reading of that study gives an exaggerated impression of tropical forests' value as a source of non-timber products. A survey of individuals and firms that collect and process those commodities shows a more accurate view. We used this approach in our study of vegetable ivory production in western Ecuador.

Workers obtain vegetable ivory from the seeds of a hardy tagua palm species (Phytelephas aequatorialis). It is native to the humid and seasonally-dry tropical forests of northwestern South America. Available research suggests that the tree can live for more than a century and that its seeds can lie dormant for well over a year (Acosta-Solis 1944, Barfod 1991).

The study focused on three groups:

* the firms that process and export vegetable ivory,
* the intermediaries who move the product from the countryside to processor-exporters, and
* the rural households that collect the ivory.

We found that, until recently, intermediaries and households were barely paid enough to cover labor, fuel, and other expenses they incur while gathering and marketing vegetable ivory. By contrast, processor-exporters have been earning sizable profits. This income pattern is consistent with that for other non-timber extraction elsewhere in the Western Hemisphere.

Vegetable ivory production provides poor communities in the study area with cash income and has probably saved some renewable resources from destruction. In addition, processing and exporting are becoming more competitive and producer-level prices are increasing. Nevertheless, findings like ours indicate that collecting non-timber products will not save vast tracts of tropical forest.

The Mishana Case Study

For many individuals and groups working to stop habitat loss in the developing world, the Peters, Gentry, and Mendelsohn (1989) article contained encouraging results. For several years,

researchers have measured yields of various non-timber commodities on a one-hectare plot near Mishana, Peru. They multiplied the yields by market prices in the Amazonian port city of Iquitos, close to Mishana, and made a 40% allowance for harvesting and transportation expenses. Significantly, the resulting estimate of income from extraction, $420/hectare/year (in 1987 US$), was greater than most loggers and agricultural colonists in the Amazon Basin earn from their holdings. Suddenly, many people thought they had found a way to keep rainforests intact while simultaneously raising forest-dwellers' incomes.

The authors of the Mishana case study acknowledged that it had important limitations. For one thing, they did not consider post-harvest losses. This is an important omission since many fruits and other jungle products are perishable. If, for example, a third of the potential harvest is lost due to rot or mishandling, then annual harvest income would be $190/hectare, not $420/hectare.

We should also remember that the Iquitos area is an unusually strong market for jungle commodities. It is isolated, with poor road connections to the outside world and its products. Also, many residents are descendants of Indians and Rubber Boom colonists and are familiar with and like rainforest fruits, medicines, and other forest products. Recent migrants to the Amazon Basin may not share those traits.

Furthermore, Peters, Gentry, and Mendelsohn (1989) did not try to determine the price impacts resulting from expanded collection and processing of non-timber forest products. Undoubtedly, those impacts would be negative. They also did not address marketing difficulties. Those problems are important as entrepreneurs have discovered when trying to sell non-timber products in markets outside the Amazon Basin.

Regrettably, enthusiasts have forgotten these limitations when they advocated establishing extractive reserves to save rainforests. Not considering post-harvest losses is careless. More importantly, the results of a single case study can never be used to justify the value of dedicating large tracts to non-timber harvesting.

Vegetable Ivory Production in Western Ecuador

We should not determine the true benefits of extractive activity by calculating the income that a single hectare of rainforest could generate under ideal circumstances. A better approach is to examine real-world experience with that activity. Western Ecuador, the main source of vegetable ivory in the world, is an excellent setting for this sort of research.

In all but the driest parts of western Ecuador under 1,500 meters altitude, tagua is an important secondary succession species. That is, most productive stands grow from plants emerging in land that had recently been cleaved. Local people plant little, if any, tagua.

Historical Trends in Exports

Ecuador began to ship vegetable ivory abroad about 1900. Central Bank annual reports show that exports peaked during the 1920s and 1930s. Button manufacturers in Italy and other European countries were the principal market. Ecuadorians sold more than $18 million (in 1992 US$) of tagua in 1925. Exports slipped during the late 1920s and fell to just $2 million in 1932. However, exports recovered during the 1930s and reached $16 million in 1937 although they rarely exceeded $4 million during the Second World War. Shortly afterward, the introduction of plastic buttons further reduced demand. For 30 years, beginning in the early 1950s, vegetable ivory sales were negligible.

The tagua industry has rebounded in recent years. International button manufacturers find it is more appealing than plastic to many up-scale clothing buyers. In addition, the handicraft market has strengthened because of the ban on international trade in products derived from elephant tusks. Exports rose from $1.5 million in 1987 to $3.5 million in 1988. Foreign shipments were $6 million in 1991 and are staying at or above $4 million a year.

(The true value of overseas shipments is probably much higher since Ecuadorian exporters commonly under-invoice exports.) Italy is still the main importer, purchasing 81% of Ecuador's production in 1991.

Modes of Production and Marketing Channels

Most tagua stands were established during the 1920s and 1930s when overseas demand for vegetable ivory was strong. Maintenance involves little more than the occasional removal of dead fronds. Since tagua yields other useful products, including roofing materials and livestock fodder, few people uprooted trees during the years when Ecuador exported almost no vegetable ivory.

After harvesting, rural people sell the tagua to intermediaries. There are no significant barriers to entry at this stage in the marketing chain. Traders only need a small truck or boat so that they can buy supplies from individual collectors and sell to other intermediaries, directly to processor-exporters, or both. There is no evidence of intermediaries establishing local monopolies. However, such behavior remains common in many parts of the Brazilian Amazon (Schwartzman 1989).

The top end of the domestic marketing chain is much more concentrated. Only a few firms slice dried tagua seeds into disks and sell them to overseas button manufacturers. The two largest processor-exporters handled about 45% of total shipments in 1991 and another three firms shipped 30%.

The value of operating at a large scale does not explain the lack of competition. Any business can expand capacity simply by installing more slicing machines, hiring other operators, and by enlarging the drying yard. Instead, production is held in check by barriers to marketing. Historically, it has been nearly impossible to export tagua without having good contacts among Italy's button manufacturers.

A current initiative to promote tagua production in Ecuador (Calero-Hidalgo 1992) seeks to develop new markets. Both Conservation International (CI) and the U.S. Agency for International Development (USAID) have supported the effort. But market development is proving to be a challenge. Clothing manufacturers that have never used tagua must be assured that they can import large volumes of high-quality vegetable ivory before they will stop using plastic buttons.

A Survey of the Vegetable Ivory Industry

Our study sought to determine the current distribution of benefits from tagua production in western Ecuador. We surveyed collector households, intermediaries, and processor-exporters to estimate each group's earnings. Our findings form a basis for discussing the future course of vegetable ivory production and renewable resource management.

Procedures

In early 1993, we began preparing separate surveys for collectors, intermediaries, and processor-exporters. To identify firms that made tagua disks and marketed them internationally, we examined Central Bank records and consulted with the Fundaci¢n de Capacitaci¢n e Inversi¢n para el Desarrollo Socio-Ambiental (CIDESA). This organization is responsible for locally implementing the CI-USAID Tagua Initiative mentioned above. Interviews with five enterprises, with offices in Manta (a coastal port city) and Quito (the national capital), began in January and finished in May. In addition to yielding the data needed to estimate processor-exporter income (see below), those interviews showed how domestic marketing of raw tagua worked. This was important to consider before planning the intermediary and collector surveys.

We developed the instruments used in those surveys in February and March, working closely with CIDESA, which has had much field experience in the study area. CIDESA arranged to pre-test the questionnaires in mid-March with 20 households and three intermediaries in Esmeraldas Province in northwestern Ecuador. After the pre-test, we modified the questionnaires.

Surveying began in Esmeraldas in April. Based on CIDESA's recommendations, we sent small teams to three districts to interview 59 collector households. Interviewers used canoes to reach one group of small communities on the Cayapas River and another on the Santiago River. They walked to a third group of communities, located inland from the Santiago River.

An interruption in funding prevented surveying in Manabi Province, which is drier and has better roads than Esmeraldas, until November 1993. Interviewers questioned 22 households near Jun¡n, Portoviejo, and Jipijapa, which are northeast, east, and southeast, respectively, of Manta.

The collector pre-test and survey covered 21 intermediaries in both Esmeraldas and Manabi. The sample included small business operators and truckers operating in or close to the communities where the collector sample resides.

Sample Descriptions

The collector sample is representative of the rural poor who populate northwestern Ecuador and other areas producing non-timber forest commodities. The typical household has 4.4 individuals in Esmeraldas and 6.4 people in Manabi. Four-fifths of household heads were born in the same community where they now live. Most of the rest came from another part of the same province. Only 3% of the household heads in Esmeraldas had immigrated from another province. Education levels are low. Adults in Esmeraldas completed 4.2 years of primary school and those in Manabi only 3.0 years.

The interviewees did not identify tagua collection as their main income. Instead, 83% of the household heads described themselves as farmers. Most others reported that their primary occupations were fishing and small-time commerce. Earning about 5,000 Ecuadorian sucres (equivalent in 1993 to $2.63) a day plus lunch, 6% of the sample worked off-farm. Daily earnings vary with agricultural labor demand, rising slightly during the rainy season and falling a little in the dry months.

Most households in the sample have one "tagual" (tagua orchard), averaging 9.7 hectares, where only family members may collect vegetable ivory. One-third of the interviewees own two such sites and 13% own three. Farmers practice agroforestry on 90% of the sites by inter-planting bananas, cocoa, coffee, and oranges (in Manabi) with tagua. On 14% of the Esmeraldas "taguales," the farmers do not inter-plant. Five percent of the Manabi households described their harvesting sites as communal forest.

Patterns of tagua collection in Esmeraldas are distinct from those in Manabi. Harvesting occurs in Esmeraldas about once a month all year round. Typically, 2.9 household members (including the head) visit a site and work four to seven hours. Median harvests are higher (400 pounds/day/site) during the peak season, late December through May, than during the rest of the year (300 pounds/day/site). In Manabi, households collect tagua at various times, depending on their labor constraints. A typical single-day harvest involves 2.0 person-days of work. Also, median production (200 pounds/harvest/site during the peak season) is less than in Esmeraldas.

Collectors devote very little effort to marketing raw tagua. In Esmeraldas, 94% of the interviewees sell to local business operators, who contract truckers to deliver vegetable ivory to processor-exporters. The other 6% sell directly to truckers. In Manabi, 64% of the interviewees sell to intermediaries and 36% sell to truckers. Since there are better roads in Manabi, transporters find it easier to buy tagua and other commodities directly from rural households.

Buyers pick up the product at the collector's residence 90% of the time. In Esmeraldas, if farmers take raw tagua to

intermediaries, they can charge 22% more. The premium compensates for the expenses, mostly travel time, which averages five hours. However, in Manabi, there is no difference between farm-gate and delivered prices. There the average distance between a collector household and an intermediary's place of business is just 20 minutes.

Gains from Collecting, Marketing, and Processing Vegetable Ivory

There are hundreds of tagua extractors in western Ecuador. As a group, we can regard them as a competitive industry. Accordingly, any difference between the payments they receive and the expenses of labor and other inputs devoted to collection and related activities (such as baskets and burlap bags to store and carry raw vegetable ivory) is a return to tagua resources. That residual return reflects the scarcity value of those resources.

To determine whether or not tagua is indeed scarce (at least from the perspective of extractors), we used household survey data to estimate an implied daily payment for time spent collecting vegetable ivory. That payment is defined as follows:

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    median harvest per site/hundred pounds
  x farm-gate price (sucres/hundred pounds)
  ---------------------------------------------
    gross revenues (sucres)
  - median expenditures on other inputs (sucres)
  ---------------------------------------------
    net revenues (sucres)
  ö median person-days per harvest
  ---------------------------------------------
    median compensation (sucres/day)
  ö exchange rate (1,900 sucres/dollar)
  ---------------------------------------------
    median compensation (sucres/day)
```

As mentioned earlier, harvests are higher during the peak season than the rest of the year: 400 pounds versus 300 pounds/site in Esmeraldas. Also, there are differences in labor inputs between the two provinces: 2.9 person-days/harvest in Esmeraldas versus 2.0 person-days in Manabi. Furthermore, producer-level tagua prices rose between April 1993, when interviewers surveyed Esmeraldas households, and November, when they surveyed Manabi. CIDESA employees and individuals involved in the vegetable ivory business suggest that prices went up in both provinces about 80%.

We calculated daily payments for labor used in tagua collection for median peak-season harvests in Esmeraldas and Manabi. Calculations reflect both the lower April prices and the higher late-1993 values. Estimates in table 1 show median daily returns to labor used in non-timber production ($2.36 in Esmeraldas and $2.32 in Manabi) compared poorly with off-farm wages -- $2.63/day plus a lunch (see above) -- before vegetable ivory prices rose. After the price increase, the daily returns to tagua collection -- $4.40 in Esmeraldas and $4.37 in Manabi -- rose well above usual rural wages.

Table 1. Daily Payments for Peak-Season Tagua Collection

	Esmeraldas [note a]	Manabi [note b]
At April 1993 Prices [note c]	$2.36	$2.32
At November 1993 Prices [note d]	$4.40	$4.37

a. 2.9 persons harvest 400 pounds in a day
b. 2.0 persons harvest 200 pounds in a day
c. 3,500 sucres ($1.84) per 100 pounds in Esmeraldas and 4,900 sucres ($2.58) per 100 pounds in Manabi
d. 6,300 sucres ($3.32) per 100 pounds in Esmeraldas and 8,800 sucres ($4.63) per 100 pounds in Manabi

Source: Household Surveys

Because the returns to collection have risen in recent months, incentives to manage tagua resources better have improved. Interestingly, 70% of the collectors interviewed in Esmeraldas said they would respond to higher prices by increasing the productivity of tagua stands. They could do this by pruning more carefully and frequently. (The other Esmeraldas households said they would use additional earnings to try to raise agricultural output (15%), to increase consumption (11%), and to pay for children's education (4%).) Clearly, collectors in Esmeraldas, where earning options are few, regard higher prices as a signal that tagua is scarce and they should manage it better.

In all likelihood, producer vegetable ivory prices (and tagua resource values) have not been held down in the past because truckers and other intermediaries were earning exorbitant profits. As has been mentioned, domestic marketing of tagua is competitive. We can expect that margins between intermediaries' revenues and their costs are modest. This turns out to be the case.

Intermediaries in Manabi sell raw tagua to disk-makers at a price about 8% higher than that paid to collectors plus limited fuel costs and other business-related inputs. The difference between revenues and expenditures in Esmeraldas is 21% mainly because of its poor transportation infrastructure and its remoteness from processing and export facilities.

If high profits are occurring in vegetable ivory production, processor-exporters are receiving them. That stage of the marketing chain is highly concentrated, with the five largest firms accounting for three-quarters of all exports. Concentrating appears to be associated with high profits. Table 2 shows this clearly.

Table 2. Revenues, Costs, and Profits in Ecuadorian Tagua Processing [note a]

Gross Revenues	$645,880
- Sales of 225,000 Pounds of Disks	640,497
- Sales of Tagua Flour and Other By-Products	5,383
Costs	$255,079
- Purchases of Raw Tagua	89,905
- Wages and Salaries	102,337
- Capital, Administrative, Electricity, and Other Expenses	62,837
Profits	$390,801
Profits as a Share of Revenues	61%

a. calculated using April 1993 prices in US$

Source: Industry Interviews

Responding to the profitability level indicated in table 2, more processors-exporters are entering the industry. Several new enterprises began operating in Manta and Quito in the last two or three years. Undoubtedly, greater competition helps explain recent increases in the raw material prices that collector households receive. We can expect similar adjustments in the future if processor-exporters continue to earn high profits.

Non-timber Extraction and Rainforest Conservation

Especially during the late 1980s and early 1990s, many people were optimistic about the contribution of non-timber extraction to tropical forest conservation. Experience has tempered this optimism as that activity is examined more closely.

Browder (1992), for example, draws on available research to show that collecting non-timber forest products does not benefit rural households much. Research shows living standards among the rubber tappers of Bolivia and Brazil are miserable, comparing poorly with the meager socioeconomic norms of the rural Amazon. By contrast, profits from non-timber extraction usually lodge at the top of the domestic marketing chain. The Manaus Opera House is evidence of the wealth exporters earned during the Amazon Rubber Boom.

Higher prices for fruits, medicinal plants, and other commodities in rural areas do not always encourage collectors to manage renewable natural resources better. Browder (1992) stresses that non-timber extraction can result in environmental damage. We need to remember that one of the authors of the Mishana case study has warned that wild fruit populations "are being rapidly depleted by destructive harvesting techniques as market pressure begins to build" (Vsquez and Gentry, 1989:350). This example shows what can happen when demand increases for a product collected in tropical forests where local people do not have defined property rights.

General analyses of the limited benefits of non-timber extraction apply in Ecuador. Before the recent increase in vegetable ivory prices, median daily returns to tagua harvesting were below other rural wages. Only in some parts of the country are daily payments beginning to rise above labor and other expenses. Another parallel between Ecuador's vegetable ivory industry and non-timber production elsewhere in South America is the concentration of economic returns among processor-exporters.

It is fortunate that tagua collection, which takes place primarily on private holdings, involves no significant environmental damage. However, the same is not true of past extractive activity in Ecuador. Harvesting of "cascarilla roja", the natural source of quinine, is an example. At least one of the English botanists who collected "cascarilla roja" seedlings on the western slopes of the Andes in the 1850s reported that extractors killed trees by stripping the bark, which contained quinine (Spruce 1970: 240-241).

Finally, lasting increases in the value of non-timber products might not help tropical forests and their inhabitants even if we resolve the open-access problems of destructive harvesting. History shows that, whenever an extractive commodity grows scarce, farmers usually cultivate outside of natural ecosystems. For example, Spruce and other English botanists went to Ecuador because the demand for quinine had risen substantially in British India. As a result, their employers established quinine plantations in India. The most famous episode of domesticating a scarce rainforest product occurred in the early 1900s. Entrepreneurs smuggled plants out of the Amazon Basin and established rubber plantations in Southeast Asia. Since Asian production costs were less than they were in Amazon rainforests, world prices fell and the Amazon rubber boom ended.

Setting up or strengthening markets for non-timber commodities can help encourage renewable resource conservation and can raise rural incomes. This is happening in some parts of western Ecuador where farmers collect vegetable ivory. However, for non-timber extraction to save large tracts of rainforests, collectors will have to resolve the problem of weakened property rights. This is also true if they want to conduct logging or any other economic activity in an environmentally-sound way. Furthermore, attempts to raise the market value of non-timber products and rural incomes might not succeed if farmers begin to produce commodities originally found in the wild.

Extracting non-timber resources may, indeed, contribute very little to rainforest conservation.

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