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Use of economic instruments in biodiversity conservation projects: the sustainability of projects in the Ecuadorian Amazon

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The Use of Economic Instruments in Biodiversity Conservation Projects: 
The Sustainability of Projects in the Ecuadorian Amazon 

Amy Lyons 
Environmental Policy Honors Thesis 

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"The more other life forms are used and saved, the more productive and secure will our own species be." - E.O. Wilson, The Diversity of Life.
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Chapter 1: Introduction

Under what conditions do biodiversity conservation projects that use economic incentives promote the most significant and sustainable biodiversity protection? The study of how nations can best invest their resources to promote conservation while simultaneously encouraging a sustainable form of economic development has recently become a major focus for ecologically rich, less-developed countries. There have been many innovative and successful attempts at combining biodiversity protection with economic development, and others that have done more harm than good. Since there is no guaranteed recipe for a successful project, it is crucial to examine projects in detail to discern which type of project is best suited for a specific set of conditions, and to determine what influences a project’s success and sustainability. The Ecuadorian Amazon offers interesting case studies of attempts to integrate biodiversity conservation with economic development, providing important lessons applicable to future projects for how economics and conservation can reinforce each other. An investigation of sustainable agriculture, ecotourism, and bioprospecting, will reveal that under certain circumstances, each type of project can sustainably harmonize biodiversity conservation and economic development.

Biodiversity in the Ecuadorian Amazon

Ecuador is a less-industrialized country suffering from poverty, rapid population growth, an enormous foreign debt and the highest rate of deforestation in South America. The Western half of Ecuador has been devastated, with only 4% of its original forest cover remaining, 96% having been cleared for agriculture, mainly bananas, oil palm, soybeans and rice.¹ The loss is estimated to have extinguished or doomed over half of the country’s plant and animal species.

¹Wilson, E.O. The Diversity of Life. New York: W.W. Norton & Co. 1992 p. 244.
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for the highest percent of the world's biodiversity. It is recognized as the country with the highest level of biodiversity per unit area in the world, containing 25 of the 30 life zones identified by Holdridge. The country is home to more than 280 identified mammal species, 1559 bird species, 380 reptile species, 509 fish species, 402 amphibian species, 66 species of butterflies, and over 15,000 species of angiosperms, yielding a total of more than 20 thousand identified species and thousands more unidentified. In the Cuyabeno Wildlife Reserve alone, over about 500 species of birds have been reported. As for flora, the country has approximately 20,000 species of vascular plants.

Exactly why Ecuador is so biologically diverse, and how the biodiversity arose in the first place is somewhat of an enigma. Some believe that it is due to a complex geological history with substantial volcanic activity and tectonic movements which lead to a high diversity of soils and habitats. Ecuador's proximity to the Niño and Humbolt seacurrents also creates a striking gradient of ecosystems, with deserts and rainforests along the coast in the lowlands which rise to alpine paramo vegetation near the ice caps of the highest peaks, and then drop down to the dense rainforests and humid forests of the Amazon Basin to the east. In the Amazon area, the high year round temperature and frequent rains also promote biodiversity.

Amazonian Ecuador, locally called the Oriente, is perpetually wet, humid, and hot, with a mean annual temperature of 25°C. The dense rainforests and humid forests are separated by fast flowing white water rivers and wide, brown and blackish rivers like the Rio Napo. The total number of species in Ecuador's Amazon Basin is

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3 Alarcón, Rocío et al. Manojo de Recursos en el Bosque Tropical. p.29. my translation.
5 Vandermeer, John H. Breakfast of Biodiversity. p 23.
estimated to be between 5 and 30 million, only 1.4 million of which are identified. More than 3000 species of flowering plants have been identified, about 40% of which are trees. However, knowledge of the floral biodiversity is very limited, and some estimate that only about half of the plants in the Ecuadorian Amazon have been identified.

The Amazon Basin as a whole makes up only 7% of the Earth’s land surface, but represents over half of Earth’s life-forms. More than 35% of the world’s tropical forests are in the Amazon, and its rivers hold one fifth of the Earth’s fresh water. Ecuador has over 130,000 square kilometers that are part of the Amazon basin, or 50% of the country’s territory. The region is divided into five provinces: Sucumbíos, Napo, Pastaza, Morona-Santiago, and Zamora Chinchipe. The human population is mainly lowland Quichua indigenous communities living rural lifestyles. Nearly 400,000 people inhabit this territory, almost half of whom are indigenous. The largest indigenous groups are the Quichua (population 60,000), the Shuar (population 40,000), the Huaorani, (population 1,500), the Shiwiar (population 2,000), and the Cofan (population 600). The non-indigenous inhabitants are mestizos, and others employed with various oil, timber, and agriculture companies. As an example demonstrating how indigenous groups use biodiversity, a study done in a Cofan community revealed that in one hectare, 90% of the 159 identified species have a Cofan name, and 89% of them have some practical use for the community.

Amazonian Ecuador’s large areas of high biodiversity are under great pressure, mainly from oil mining and deforestation for agriculture, cattle ranching, and timber. The three predominant land-uses in the region are slash and burn

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agriculture (locally called "chacras"), coffee plantations, and cattle pastures. The protection of biodiversity in Ecuador's rainforests, like in all rainforest ecosystems, is critical not only because of the economic potential of rainforest products, their importance as a carbon sink, and their ecosystem and watershed functions, but also because they are home to most of our living relatives. E.O. Wilson described the conversion of Ecuador's lowland humid forests as "the silent hemorrhaging of biological diversity... anonymous extinctions, not open wounds for all to see and rush to staunch, but internal events, leakages from vital tissue out of sight."

Harmonizing Biodiversity Protection and Economic Development

Diversity is defined as "a measure of the number and types of components within a system, whether it be a natural or social system." McNeely et al. define *biodiversity* as "an umbrella term for the degree of nature's variety... encompass(ing) all species of plants, animals, and microorganisms and the ecosystems and ecological processes to which they are part." Wilson describes it as "our most valuable but least appreciated resource" and even suggests dividing environmental problems into two and only two categories. The first group would include activities that alter the physical environment to a state uncongenial to life, like pollution, or the loss of the ozone layer - trends which he claims can be reversed if we have the will. The second category is the loss of biological diversity - a loss which can never be redeemed, though its rate can be slowed. Wilson estimates that by the year 2022, 20% of today's global biodiversity will be extinct, if the present rate of environmental destruction continues.

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14Wilson, E.O. *The Diversity of Life*, p. 243.
16McNeely, Jeffrey et al. *Conserving the World's Biological Diversity*, p. 17.
17Wilson, E.O. *The Diversity of Life*. 
The traditional approach to biodiversity protection involved internationally-financed conservation projects which closed off the richest land as parks and reserves, in hopes that the people would live content and satisfied in the unreserved land and respect the reserve limits. In less-industrialized countries, however, this approach is impractical and has failed. Its failure is partly due to population pressures which lead to development around and infringement upon park borders. Limited financial and technical resources also cause ineffective management. Since economic activities are usually nonexistent within the reserves, their presence rarely benefits the people who may have originally have had access to the land. Herman Daly explains that in the past, environmental policies focused on how to protect all species except humans, and now we realize the need to improve both ecosystems and peoples lives. Not only have internationally financed conservation projects overlooked their negative affects on local welfare, but internationally financed economic development projects, which involve the construction of roads, and mining operations have also led to major destruction of biodiversity.

Recently, people have realized the need to unite the ideas of conservation and development. This is most often done by identifying win-win situations, where no trade-off between the environment and the economy that needs to be made, or where the trade-off is minimized. Biological resources are at the base of every economic endeavor, and although economic systems usually promote unsustainable exploitation of these resources, economics can also be harnessed to protect them. Tom Tietenberg explains that the power of the market can be used as a powerful ally to achieve environmental goals, by channeling economic growth into more environmentally benign paths. "Not only can economic incentives reduce the conflict between economic development and environmental protection, but they can

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also make economic development the vehicle by which greater environmental protection is achieved."19

Only solutions that enable local people to benefit, economically or otherwise, from the land in environmentally non-destructive ways can reconcile the conflict between biodiversity conservation and economic development. As Brian Furze et al. explain, "development is a conservation issue and conservation is a development issue."20 Ecuadorians should be given the opportunity to make a transition from using biologically rich lands for cattle-grazing and agriculture to using more environmentally benign alternatives that still improve their well-being. The future of Ecuador and other forested tropical regions depends upon whether available employment destroys the environment or protects it, as a more sustainable form of development.

A variety of innovative alternatives to deforestation exist and are currently practiced by rural communities in the Ecuadorian Amazon. Yet little is known about exactly how sustainable these projects actually are. Most of them promote the maintenance of biodiverse ecosystems, and can therefore be assumed as more environmentally sustainable than more popular land uses in the area. The economic sustainability of the projects, however, is less clear cut, and represents a serious gap in the literature on sustainable development projects. Even further lacking is a study on what leads to the sustainability or unsustainability of these projects. What elements of the project’s design and maintenance cause it to be economically or environmentally sustainable? The projects presented in this study comprise a very small portion of the land-use strategies in the Ecuadorian Amazon, where logging, cattle ranching, oil-drilling, and shifting cultivation dominate. Although these

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projects are still at a relatively early stage of development, more and more communities are realizing their importance and potential and are initiating similar sustainable development projects.

This study examines the sustainability of projects that achieve biodiversity conservation through various economic incentive structures. Known as Integrated Conservation and Development Projects, (ICDPs), or managed resource areas, they intend to provide the sustained production of various biological resources and uses.\textsuperscript{21} The number of ICDPs has grown dramatically over the past decade and has probably become the most common tool of biodiversity conservation. The projects look for ways to make environmentally sustainable uses profitable. They aim to improve the well-being of people and the diversity and productivity of ecosystems in a way that delivers sustainable economic benefits and maintains or restores natural ecosystems. Several types of ICDPs include ecotourism facilities, sustainable agriculture, extractive reserves, biosphere reserves, multiple-use areas, bioprospecting, and various other rural development initiatives along the bufferzones of parks and reserves. The success of ICDPs varies greatly, but it is unrealistic to assume that they necessarily guarantee the well-being of the ecosystem and the protection of biodiversity.

Three categories of ICDPs are studied in this project: 1) sustainable agriculture, 2) ecotourism, and 3) bioprospecting. These are the activities which most involve creating income and economic incentives for locals to conserve biodiversity. All three are seen by some as potential panaceas and by others as worthless, unfair, economically impossible or environmentally harmful. This project attempts to reveal the complex reality of these activities, some which have more potential than others.

\textsuperscript{21} McNeeley, Jeffrey et al. \textit{Conserving the World's Biological Diversity}. p59.
The general sustainability of each project is described, while paying particular attention to four key factors which might influence the sustainability of the projects: 1) local participation and decision-making power, 2) the social and cultural holism of the project, 3) the creation and distribution of local revenue, and 4) the source and amount of funding. The goal is to determine how these factors affect the sustainability of the projects, and to briefly assess whether these activities represent an environmentally, economically and socially viable alternative to the traditional forms of development that they replaced. After each factor is discussed, the case studies are presented with particular emphasis on how each of the each of the four factors influences the project's sustainability.

Defining Sustainable Development

In order to fully understand how these factors influence sustainability, it is first important to understand what sustainability means to this study. Sustainable development is an important concept in the discussion of conservation; however, it has become a popularized, overused, criticized, and romanticized buzzword that is ambiguous and means different things to different people. Billions of dollars have been spent on international aid projects in pursuit of the concept of "sustainable development." It is indisputable that sustainable development is a good thing. It is hard to define however, and even harder to implement. There is no model to make development sustainable, nor are there generally accepted criteria for sustainability. As Nancy Yeldezian Dufau points out, "calls for sustainable development have proliferated without consideration of its implications. What does a model of sustainable development look like? What does it imply for twentieth century social, economic and political institutions?"22 The World Commission on Environment and Development defines sustainable development as development which meets

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the needs of the present without sacrificing the ability of future generations to meet their needs. Few would argue that we should not work toward that. It is a somewhat utopian concept of a better future quality of life that is both environmentally sound and socially just - a truly immense and complex challenge.

Daly adds that sustainable development is "a process in which qualitative development is maintained and prolonged while quantitative growth in the scale of the economy becomes increasingly constrained by the capacity of the ecosystem to perform essential functions over the long run, that is, to regenerate the raw material input and to absorb waste outputs of the human economy." Development that is sustainable grows at a scale relative to the entire ecosystem, allowing the ecosystem to function and renew itself year after year, and it develops along the lines of each culture, not along a common, centralized line. It attempts to integrate into development the dimensions of environmental protection and consideration for the future.

Because of the importance of long-term thinking, sustainable development is particularly difficult to implement in countries where immediate subsistence is the priority. Short-term needs, however, are a criterion that must be met first in order to develop sustainably. Sustainable development therefore requires both short-term and long-term strategies as well as confrontation of external pressures, demands, and dependencies. The Commission on Development and Environment for Amazonia believes that sustainable development takes into account the needs of individuals in order for development to be more democratic and participatory.

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25 Daly, Herman, "The Role of the Multilateral Lending Agency". p.15.
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In sustainable development, the focus on human development is stronger than on economic growth, and it involves the expansion of skills, education, and health, while providing an opportunity to make use of those skills. It should not aim to modernize or industrialize traditional communities and homogenize cultural diversity like traditional development often does. Sustainable development requires complex strategies that take into account the whole web of interdependencies, including an understanding and consideration of social, economic, cultural, technological, environmental, and political spheres.

Sustainable development variables and their measurement

Overall, very few sustainable development proposals or projects in Ecuador have been comprehensive and lasting. The prevalent form of Western economic growth is usually not sustainable, which is why we cannot use traditional economic growth factors like GNP to measure sustainable development. These growth measurements do not take into account externalities. Instead of using traditional criteria to measure development, this project examines less quantitative and more qualitative and holistic indicators of sustainable development. Sustainability is measured by three criteria:

1) capacity building
2) environmental sustainability, and
3) economic sustainability.

It is impossible to isolate any of these criteria completely because changes in one usually cause changes in the other systems. The sustainability of all three factors together signify a sustainable project. In short, a sustainable project involves the use of natural resources at a rate that the environment can maintain while providing lasting economic benefits to locals.
The first criterion for sustainable development, capacity building, examines how the community is actually developing, in well-being, wisdom, skills, organization, or other ways. Have participants developed their education, skills, or knowledge and put them to use since the project began? To determine this, the first consideration is whether there was a training program for participants, and whether there is any type of ongoing education. Participants were also asked what they know about, or know how to do, that they did not know before the project began, and what skills they use for the project that they did not use before it started. Also considered is whether the people involved in the project are motivated and enthusiastic about participating in the project. This was determined by interviews when possible. Overall, the capacity building criterion asks whether the community is creatively and productively using its abilities to improve its knowledge, skills, organization, morals, and general well-being.

The second criterion, environmental sustainability, attempts to examine whether the activity or resource is being used at a rate that the environment can sustain and reproduce over the long-term. Determining whether or not these biodiversity conservation programs are successfully protecting biodiversity, and how much the protection is worth would ideally require determining the amount of biodiversity being protected and assessing its value by converting it to economic terms. A bioeconomic analysis is often done to find the present and future values existent in any ecosystem.\(^\text{27}\) The value is often assigned according to human interactions, particularly economic uses of the specie or ecosystem. Looking for potential value in an ecosystem can be crucial in demonstrating that such areas can bring a positive benefit to the local communities, but it often ignores cultural, aesthetic, ethical, and scientific values. Furthermore, the statement that an ecosystem is worth a certain dollar amount is not only hard to believe, but it is not

\(^{27}\) Wilson, E.O. *The Diversity of Life*, p 319.
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necessary for this study, since environmental sustainability can be measured without it. Since the species in the relevant cases have probably not been inventoried, nor do they come with a price tag, these tasks are exceedingly complex and not a goal of this project. Therefore, no environmental impact statement or detailed ecological study was done, but rather a description of the activity and how it seems to be affecting several specific aspects of environmental quality is provided. This information was gained from studies or reports that have been done about the projects or activities, and by first-hand personal observation of the project sites coupled with general ecological knowledge when possible. For those projects that were visited, the speed and extent of resource exploitation, and the presence of monoculture cropping, deforestation, or other biodiversity depleting activities were examined. Centro Fátima, Capirona, and Jatun Sacha were visited, while the studies of SUBIR, Antisana, and the Ayahuasca Project depended more heavily on secondary sources and perspectives. Secondary environmental impacts were also investigated, such as signs of soil erosion, pollution, displacement of wildlife and other ecological problems. Whether the environmental impact caused by the project is significantly less than would have occurred in absence of the project was also investigated. Furthermore, participants' levels of environmental awareness and the presence of environmental education were observed and used as an indicator of environmental sustainability, based on the premise that an environmentally aware community is more likely to prevent and solve environmental problems.

The third criterion, economic sustainability, examines whether the project is based on sound economic principles and whether or not the economic benefits are significant, dependable and lasting. It looks at the product or service produced and examines its current and potential demand, considering whether it is vulnerable to fluctuations in world market prices and whether demand is likely to hold constant
through time. Secondly, it considers whether or not the project is financially self-sustaining, or whether it relies upon constant infusion of monetary resources. If the funding was withdrawn or decreased, could the project last? If it is not self-sustaining now, does it have the potential to be? This variable examines whether the project provides people with more money than alternative economic activities that are less environmentally sound. This was determined by previous economic studies done on the project or activity as well as interviews with managers and participants. Whether or not environmental externalities are being internalized is also considered, which is usually obvious by the nature of the activity. Negative environmental externalities are environmental “side effects,” or environmental costs of an economic activity that aren’t accounted for in the cost structure of the activity.\textsuperscript{29} The final consideration is whether or not short-term economic needs of the community are being met, since it is nearly impossible to plan for the future if immediate needs are not being met. This is determined by examining whether the community has “basic needs,” such as enough food, clean water, shelter, and basic health care.

To draw conclusions about which projects are sustainable and which are not, the number of positive responses in each category are added together resulting in a total score for each category. This total score represents the capacity building, environmental, or economic sustainability of the project. The highest score possible for each category is 10, and the lowest is 0, where 10 represents the highest sustainability and 0 is the least sustainable. Each category, as explained earlier, is divided into certain criteria. For example, to determine environmental sustainability, there were four criteria: 1) whether resource use is sustainable, 2) whether secondary environmental problems are prevented, 3). the level of

\textsuperscript{29} For example, a possible environmental externality of ecotourism may be erosion, or wildlife disturbance. To internalize these externalities, the cost of the tourism may be raised, to fund increased erosion control and wildlife conservation.
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Community environmental awareness, and 4) whether the project involves an environmental education program. Each of these criteria are given a score, either a positive (+), negative (-) or a neutral (n). Although ideally, even these criteria would be rated on a continuum or a more nuanced scale, the simplicity of the positive, negative or neutral answer eliminates much of the subjectivity in assigning scores on a more complicated scale. These responses are recorded in the result tables as either positive, negative, or average/neutral (see example table in figure 1). The factor receives a positive score if the project displayed a high level of environmental awareness, had an environmental education program, etc.

Figure 1: Sample result table for environmental sustainability of Project X

<table>
<thead>
<tr>
<th>sustainable resource use?</th>
<th>avoiding secondary environmental problems?</th>
<th>Local environmental awareness</th>
<th>environmental education?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>7.5</td>
</tr>
</tbody>
</table>

The positive, negative, and neutral scores are then added up to arrive at the 0-10 score for each sustainability criteria. How much each positive response counts for depends on the number of factors used to determine the criteria score. For example, in the environmental sustainability category, since there are four factors to determine environmental sustainability, each factor counts for 25% of a total of 10 possible points, or 2.5 points each. Each negative response receives no points, and each neutral or average receives half of the points (or 1.25 in this case). Therefore, if a project has three positive responses for environmental sustainability and one negative response, it receives a score of 7.5, like in the sample table above (Figure 1).

The evaluation options are only negative, neutral, or positive, so only certain scores can be obtained, like 0, 1.25, or 2.5, in this case. There is no gradation between 1.25 and 2.5 because an exact measure of participation or holism is too difficult to assess.
If it received one positive response (worth 2.5) two neutral responses (each worth 1.25), and one negative (worth 0), then the score would be a 5 because 2.5 + 1.25 + 1.25 + 0 = 5.

When each of the criteria has its overall sustainability score, those three scores (one from capacity building, one from environmental sustainability, and one from economic sustainability) are then averaged together to come up with the overall sustainability score for the project. Trade-offs between which factor is more important than another do not have to be made, since most factors count equally. Several individual factors, however, are considered necessary for a project to be sustainable. A project must be using natural resources in a sustainable way, providing more money or other benefits to the community than they had before, and it must be meeting the immediate needs of the community. Any project which fails to meet one of those criteria receives a score of 0 for the relevant category and is considered unsustainable overall. Although the project is considered unsustainable overall, during the cross-category comparisons that compare the sustainability of sustainable agriculture, ecotourism and bioprospecting, the 0 scores are simply averaged in with the other positively scoring factors to determine the total sustainability score for each project.

Although quantifying sustainability with a score of 1 through 10 may seem unnecessary and even shocking, the scores prove to be an important way to measure the correlation between project sustainability and the factors that influence the sustainability. Proving the correlation would be much more difficult without the use of some tool of comparison, such as a numerical score.

A basic review of biodiversity in Ecuador, and Integrated Conservation and Development Projects, has provided the background to understand sustainable

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31 Necessary criteria for sustainability are marked with a * in the sustainability charts.
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agriculture, ecotourism, and bioprospecting projects in the Ecuadorian Amazon. An understanding of sustainability as measured by capacity building, environmental sustainability, and economic sustainability, serves as preparation to confront the more specific issue of what makes IDCPs sustainable.
Chapter 2: Factors that Influence Project Sustainability

If the necessary components of sustainability are defined as capacity building, economic sustainability, and environmental sustainability, it is important to examine what leads to each type of sustainability and the overall sustainability of the project. The following four factors are examined to determine how they influence project sustainability:

1) local participation and decision-making power,
2) the creation and distribution of local revenue,
3) social and cultural holism, and
4) the source and amount of externally generated funding.

These factors, among others, have often been suggested as possibly influencing project sustainability. However, whether they do actually influence sustainability and which factors have the strongest influence has not been known. Each factor is examined in detail and applied to case studies to determine how - if at all - it influences sustainability, and which factors have the strongest influence.

Participation, revenue and social and cultural holism are rated the same way as the criteria for sustainability are rated: the number of positive responses in each category are tabulated and added together to come up with a total score for each category. Each positive response counts for a certain percentage out of a highest possible score of 10, and the percentages are tabulated to determine the overall score (0-10) for each factor. The overall sustainability ratings of the projects are then compared to the scores for participation, revenue and holism to determine which factors are most strongly correlated with sustainability.

Although the correlation between certain variables and sustainability will be referred to, it is important to realize that although there is a direct correlation, it is not necessarily statistically significant, since the number of case studies of each category is only 2.
Local Participation and Decision-Making Power

This project concentrates on local-level development, a type of development that assumes that the decision-making and project implementation inherent in the process is best undertaken by local people. "At its best, development can provide a way in which all people are recognized for what they are: legitimate actors in social, economic, and political processes which will impinge on the ways in which they live." The success of local development projects depends largely on the relation that is established with the community, and participation is the basis of that relationship. Local participation empowers people to make meaningful decisions about their own lives rather than being passive recipients of others' actions and decisions. Imposition of development on others without their consultation or participation is undemocratic. People should be allowed to determine their own future by participating in decisions that will affect their lives.

All of the case studies in this project take place in indigenous communities. Indigenous people have often been seen as obstacles to development. The knowledge, culture, technologies, and social organization of indigenous groups, however, should be celebrated and preserved, with forms of development that integrate easily with their way of life. They are inherently as capable of participating effectively in conservation and development projects as are non-native locals. It is largely agreed that the participation of those who depend on, live on, and are responsible for an environment increases the sustainability of conservation and development projects. When locals emerge from the home to mobilize collectively in a community development project, particularly when they can

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participate in the decision-making process, they often better understand the project’s objectives and importance.\textsuperscript{37} The participants become more dedicated to the project’s success, especially when their financial security is partly determined by the success of the project. Susan Casey argues that in general, citizens should be involved in priority setting, monitoring, and inspection, as well as the use of citizen complaint and enforcement mechanisms.\textsuperscript{38}

It is commonly held that programs designed by outsiders that ignore local knowledge or culture or underestimate their abilities to solve problems have been much less successful despite high levels of capital input. They often disrupt local institutions, which frustrates locals and decreases their desire to cooperate. They can change preexisting social structures which often leads to conflict and less productive programs. John Browder argues that more attention should be paid to indigenous knowledge, particularly since many indigenous practices show the way toward techniques that may be able to overcome ecological and financial constraints.\textsuperscript{39}

Involving locals in only the initial implementation of a project may not be enough; it may also be important to give them the power to suggest and create changes and to include them in the design and follow-up, as well. The knowledge and beliefs of locals should be respected and their ability to make decisions should not be underestimated. On the other hand, Harold Brookfield and Christine Padoch feel that the use of traditional knowledge "is somewhat in danger of being treated as a new solution to all problems of development, ...it is more valuable to discuss ... using farmers’ knowledge in parallel with ‘scientific’ knowledge."\textsuperscript{40}

\textsuperscript{37} UNEP. National Biodiversity Planning. p.25
It is certain, however, that the extensive use of local common knowledge and open communication between the donors and the participants facilitates cooperation, understanding, and achievement of the goals. As suggested in *National Biodiversity Planning*, communication and negotiations may be integral to the biodiversity planning process, and through participation, all involved in funding and implementing the project can share a common vision of meaningful change and a common understanding of the purpose, problems and solutions.  

One could also argue that local participation in the project complicates things, and could create barriers to efficient and successful implementation. Participation could be particularly difficult when the design and implementation of the project involves very complicated, highly scientific technologies. Although this could be true and increase project sustainability in some cases, it is doubtful that it would have an overall significantly positive effect on economic sustainability of most projects, since few rural projects that are highly-scientific and technological have been sustainable. Others have argued that local practices were developed in precapitalist and pre-market context, and indigenous knowledge cannot adapt to these modern conditions.

We can not ignore the fact, that the local level does not function flawlessly, and it should not be romanticized and perceived as a panacea. Rocio Alarcón et. al. explain that leaving a project in the hands of the community does not necessarily result in sustainability. If the community is not sufficiently prepared, trained and organized, difficulties will probably result. The fact that something is aimed at the local level does not automatically result in the equitable representations of all interests. Communities do not harmoniously agree on all

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41 *National Biodiversity Planning* is the result of a cooperative effort between the World Resource Institute, United Nations Environmental Programme, and the World Conservation Union to implement the 1992 Global Biodiversity Strategy.
42 UNEP, *National Biodiversity Planning*, p. 34.
courses of action, since they are hierarchical systems that face serious economic and social realities. Particularly when community participation involves the generation of income, it often turns into control of those community members with the most power. As Furze asks, "If we only listen and pay attention to those who can speak for (the entire community), have we fulfilled our goal of local level development?" Conversely, for a project to involve community participation, it is certainly not necessary that all community members participate. Participation is usually more successful if it starts by involving the community members most interested in the project, and then more people become involved and their responsibilities gradually increase over time.

Involving locals in project design and implementation can be particularly difficult when locals prioritize income generation while the project donors' priority is the conservation of global biodiversity. Southgate and Clark emphasize that one of the major pitfalls that projects face is that they often reflect wishful thinking about local communities' regard for natural ecosystems. Not all communities are truly interested in habitat protection. When the local priority is not conservation, it is unrealistic to hope that environmental damage will not continue unless the economic activity itself promotes conservation.

Since all communities differ in equality levels and social situations, we cannot assume a romanticized vision of community. No one knows better than the community members themselves what their realities are, and they are best able to guess how successful certain activities might be, and to help shape the activity to fit within existing frameworks. Furze explains the importance of having all "parties involved in the development process ... acknowledge each other's strengths and limitations, goals and wants, and construct models of development around this"

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4Furze, Brian, et al.. Culture, Conservation and Biodiversity, p.9.
understanding which are meaningful to all. It is important to work with the strengths of a community while being cognizant of its flaws, since communities are the base for ICDPs.

To determine the level of local participation of the projects in this study, five factors are examined: 1) the percentage of local population involved, 2) the average number of hours per week that participants are involved in the project, 3) community involvement in the project design and implementation, 4) the level of communication between the participants, managers and donors, and 5) decision-making power of locals. To acquire this data, it was necessary to make general estimates based on available written information about the projects, and in some cases, to infer the level of a certain variable. This was only done if it was very obvious (for example, if it was known that managers live at the project sites, it was assumed that communication was relatively high). More precise data including percentages and numbers was gathered during the field-study component, and interviews were conducted with managers and participants to more adequately determine levels of communication and decision-making power.

The Creation and Distribution of Local Revenue

There is a general consensus that when local people benefit economically from a project, the success and sustainability will be greater. The first guiding principle for biodiversity planning outlined in National Biodiversity Planning is that biodiversity programs should improve the economic opportunities and well-being of the community. If people are being paid to contribute to a project, they have an obvious economic incentive to work toward its success and sustainability.

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47 Furze, Brian et al. *Culture, Conservation and Biodiversity*, p.11.
One could also argue that economic revenue is not important to the success of a program. Other non-economic benefits to local people could also serve as incentives to participate and support the project. For example, if the project provides people with clean drinking water, health care, or improved environmental conditions, these benefits could be enough to promote sustainability. This project attempts to determine whether the creation of income for the local community is necessary for a project to be successful and sustainable.

Some question the entire foundation on which ICDPs are conceived, and thus question the creation of local revenue. For example, as Posey asks, "by establishing mechanisms for just compensation of native peoples, are we not also establishing mechanisms for the destruction of their societies through the subversion of materialism and consumerism?" Although this question raises valid concerns, Posey acknowledges that these concerns are romantic given current realities. Their culture and environments are being destroyed by forces that will not go away anytime soon. Considering these overwhelming forces of modern global reality, indigenous groups must work to find alternatives that allow them to live in an environmentally, economically, and socially sustainable a way as possible, whether they become part of the forces or not.

Six specific factors were examined for each case study to estimate the creation and distribution of local income: 1) the percent of total revenue created by the project that goes to the community-members vs. other groups, 2) the average amount of money local participants make per week, 3) whether or not the project provides the primary source of income for the participants (not necessarily for the entire community), 4) whether there are non-monetary benefits in addition to, or in place of revenue, and 5) whether the distribution of benefits within the community is

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relatively equal. The distribution of benefits is determined by literature about the community, project, or activity, as well as by interviews and observation when possible. Also important is deciding whether or not there is an socio-economic stratification within the community that is obvious to an observer. In short, are the projects providing significant and sustainable local revenue as an incentive to conserve biodiversity?

Cultural and Social Holism

The conservation of biodiversity involves the complex interaction of many systems and actors. It has a multilevel and multidimensional nature, and to be environmentally successful and sustainable, it may be important for projects to consider the structure of the many forces that influence and are influenced by the project. Since there is no recipe for a successful ICDP, community-specific information particularly concerning social and cultural systems is highly important. When the social and cultural systems are respected, it often becomes easier and more natural to appropriately integrate other systems - the economic, political, religious, and ecological systems into the project. Particularly when levels of local participation are high, it becomes crucial that the projects are in touch with, and part of the local reality, rather than working on their own with no real connection to the community. Determining whether the projects are holistic in this way involves examining whether they seem generally in harmony with the social and cultural structures and systems of the community.

The goals of many past ICDPs have proven incompatible with the cultural and social structures within a community. Despite much higher levels of capital input, these programs have failed because in disrupting local institutions, they frustrate local people and decrease their desire to cooperate. Their lack of foresight has also led
to unintended consequences, when the donors neglect to realize the interdependence of various social and cultural systems with economic or ecological systems. Institutional strengthening and building can often lessen these problems, but equally important is adjusting the goals and processes of the program to fit existing community structures and acknowledging their interdependence.

To determine a project's cultural and social appropriateness, it is necessary to examine whether the new activity is obviously changing values within the society. For example, some types of projects often make people begin to prioritize income generation when it previously was not the priority. Others can change the way that people relate to each other. For example, major changes in income distribution might create class stratifications where they didn't already exist, which would be considered a negative impact on social and cultural appropriateness. Social changes can be positive or negative, although at times the effect is sometimes mixed, and neither positive nor negative. For example, if the former economic activity was dominated by men and the new activity empowers women to bring home income and makes them feel that they should have more control at home as well, this can cause problems in marital relationships. Although the relationship problems are a negative social impact, this change is considered positive overall, because the empowerment of women in less industrialized countries leads to higher social equity. Defined in this way, the correlation between project sustainability and social and cultural holism is examined.

Another key factor in social and cultural holism is whether the project uses appropriate local technologies, resources, and labor rather than applying potentially inappropriate technologies and materials and hiring outsiders to build the infrastructure or perform other jobs that could be satisfactorily completed by locals. Using native people and resources may make them feel that the project is really theirs - part of their community, rather than imposed on them by external sources.
The presence of buildings made of non-native materials and styles, which may house computers, machines, and other signs of the industrialized world not only makes locals feel discontented, but can also increase their dependence on external funding which may not be perpetually available. Furthermore, if technologies and machines are introduced that locals do not fully understand and know how to repair, this can generate more problems than solutions.

It may seem hypocritical to some to speak of trying to preserve societal systems while simultaneously initiating a major transition within the community, but if the initiated change is justified as an economic transition to a more sustainable society, preserving culture and social systems becomes part of sustainability.

Five factors are looked at to estimate cultural and social holism. These include: 1) whether or not the project preserves social systems, 2) whether or not the project promotes social equality, 3) whether or not any new technology or resources used in the project seem appropriate (do locals understand the technology and know how to use and maintain it, and is it keeping with their life-style?), 4) whether or not the project is culturally appropriate (does it work to reinforce and preserve cultural systems and traditions or expose the society to new influences that challenge might transform culture like some ecotourism projects), and 5) whether the project preserves value systems. Each of the above criteria are applied to the cases in this study to determine the importance of social and cultural holism in a project's sustainability and success.

Source and amount of funding

There has recently been a realization that since the cause of biodiversity loss in less-industrialized countries lies not totally within the countries themselves, the prevention and control of biodiversity loss requires the confrontation of social and
economic injustices that are partly global in nature. Multilateral lending institutions and non-governmental organizations have invested enormous resources for the conservation of Ecuador's biodiversity. Most of the highly industrialized countries have relatively little biodiversity and are willing to pay for biodiversity protection, while the biodiversity-rich countries are economically the poorest and cannot afford to finance conservation. Those who happen to live near ecologically rich areas are not solely responsible for the loss of biodiversity, since the economic systems that promote biodiversity loss are frequently national or global in nature. The World Bank suggests that local, non-transboundary environmental problems be dealt with by national governments, and that global environmental issues be financed through international support, since governments in Latin America lack the resources to deal with those concerns.\(^5\)

It makes more sense for national governments to spend their limited resources addressing domestic environmental issues while leaving the global issues to those who are at the very root of many of the problems - the North. It makes even more sense considering that the global benefits of biodiversity protection will be shared with the countries in the North. It therefore seems important to finance biodiversity protection in the South with funding from the North.

The application of such funding, however, is complicated, and the success varies greatly. Contributions that are carefully channeled can be effective, but it often turns out that projects funded by local NGOs or private sources have been more successful and sustainable than others that are heavily funded by well-endowed multilateral organizations. Large amounts of funding can provide the resources and technology needed for projects, fund infrastructure development, and provide the long-term financial support that many projects need. Many heavily funded projects are less successful, but it is reasonable to assume that their failure is not directly due

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to the large amount of funding. It may be some other problem in the way the projects were designed, implemented or managed that led to decreased sustainability. The solution would certainly not be to decrease funding while keeping the design, implementation and management of the projects the same as before. This presents a major dilemma for international development and conservation programs: how to take advantage of the important capital flows from the multilateral programs in a way that promotes sustainable community development and environmental protection.

There is a substantial amount of literature regarding the roles and effectiveness of various donors. Large, multilateral assistance organizations such as the World Bank, are frequently criticized for cultural inappropriateness and not encouraging local participation, among other things. Despite much higher levels of capital input, they often negatively influence cultural and social systems, which makes cooperation more difficult and leads to less productive and sustainable programs. Intervening in another society's development, as Furze et al. explain, is a process based on, and subject to, power relations between competing interests. This power can create communication problems and reinforce inequalities if the donor's role is not well defined, agreed upon, and carefully maintained. Vandana Shiva explains that these donors often have the attitude that "the mind and the solutions are in the North, while the matter and the problems are in the South...However, not only is erosion of diversity as great a crisis in the North, it is also in the North that the roots of the South's crisis of diversity lie." There is a general consensus, as expressed in National Biodiversity Planning, that "external agencies should be on 'tap', not on top," that they should help the

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51 Daly, Herman. "The Role of the Multilateral Lending Agency". p13.
community or the country develop its own capacity to develop sustainably and conserve natural resources. It is also widely held that lower level, continuous support for a long time is better than a large amount for a short time, because money needs to be saved for effective management of the project after the implementation. Continuous funding, however, can breed dependence rather than self-reliance. 55 McNeely argues that most projects do not require heavy funding, but rather effectively targeted funding aimed at very specific targets. Thus, to attain the magnitude desired by multilateral organizations, support for a significant number of small, community-level projects may be preferable to one large project. 56 Southgate agrees, arguing that since the conditions for success and sustainability are primarily in selected "niches", there are limited opportunities to promote environmentally-sound commercial activities in forested areas through large multilateral projects. He favors the selective support of smaller projects with limited amounts of financing and technical assistance. 57 As Rocio Alarcon et al. explain, "it seems that smaller projects with lower levels of funding and limited staff are able to attain a more open and close relationship with the locals, to better understand the issues and problems the community faces,... and to gradually create a local capacity to carry out the projects on their own, which leads to long-term sustainability." 58 Whether working on many smaller projects or one larger project, donors should commit themselves to long-term campaigns and maintenance of their projects, which has been a major weakness for many donors. The World Bank, for example, admitted not maintaining projects enough and tending to finance projects here and there rather than committing themselves to long term programs. 59 Furthermore, it seems preferable for projects to

55 UNEP. National Biodiversity Planning. p.27
56 McNeely, Jeffrey et al. Conserving the World's Biological Diversity p.21.
have diversified sources of funds, so that they do not depend completely on one source whose future plans or ability to continue funding may be unpredictable.

Projects examined include those funded and supported by large, multilateral organizations, local and international NGOs, private sources, and projects which involve cooperative bilateral funding or any combination of donors. Many of the projects are implemented by local NGOs who are funded by multilateral assistance agencies. This approach is growing in popularity because multilaterals see NGOs as a vehicle of grassroots empowerment able to implement programs which the state cannot. They appreciate the honesty, efficiency, lack of corruption, and process of democratization that NGOs often promote. Local NGOs are also more in touch with local situations than are international organizations. This study examines which type of funding source works best under which circumstances, and questions whether a project needs to be expensive and fully funded to be sustainable.

A major limit to using the source of funding as a potential indicator of sustainability is that due to the diversity of projects often funded by one type of donor, and their varied levels of success, it is difficult to predict the success of a project solely by the funding source and amount, and dangerous to blame the failure of a project on the type of donor. Similarly, it is difficult to ascertain whether a project’s success can be attributed to the source or the amount of funding. Since most projects funded by multilateral assistance agencies are heavily funded and local NGO projects usually have less funding, and variation is difficult to find, separating whether it was the amount or the source that most significantly influenced the success is nearly impossible.

Examining the various types of donors and what their strengths and weaknesses are, however, helps determine under what local conditions might one

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type of donor, or combination of donors be best suited to achieve maximum and sustainable biodiversity protection. Multilateral assistance organizations, government agencies, the private sector, and NGOs can and should all play an important role in conserving biodiversity and promoting sustainable economic development. The following three factors are examined for this category: 1) the source of funding (whether it is funded by a multilateral organization, local or national NGOs, private sources or some combination thereof), 2) the amount of funding, and 3) the amount of time that funding has lasted to date.

This category is rated somewhat differently than the other categories. It is high, low, or average for both the amount of funding and the length of funding. However, for the source of funding, it is impossible to determine what the "favorable" or "high" answer would be. For example, a project funded multilaterally should not necessarily receive a higher score than one funded locally. Therefore, the type of funding is simply be described and used to compare the projects to determine whether or not there is a correlation between sustainability and the source of funding.

Local participation and decision-making power, the amount and distribution of local revenue, the social and cultural holism, and the amount and source of funding are all factors which may have a significant role to play in determining the sustainability of integrated conservation and development projects. In the next chapters, the framework of theoretical understanding that has been laid is applied to case studies of sustainable agriculture, ecotourism, and bioprospecting, to reveal which projects are the most sustainable, and which factors most strongly influence sustainability.
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Chapter 3: Sustainable Agriculture

This chapter examines the main issues surrounding sustainable agriculture in the Ecuadorian Amazon, its strengths and weaknesses, its economic potential, and its overall feasibility as a way to harmonize biodiversity protection with economic development. Two case studies are investigated, which demonstrate typical characteristics of sustainable agriculture. The sustainability of the projects, and what most strongly influences their sustainability will be discovered.

Defining Sustainable Agriculture

Managing and harvesting native flora and fauna in a sustainable manner provides a way to internalize the external benefits of biological diversity. Sustainable agriculture does just this, using forest land for the semi-domestication and harvest of a variety of useful native species. As long as the harvesting does not have long-term negative effects on ecosystem structure and function, significantly decrease the biodiversity, or prevent the long-term reproduction and regeneration of natural populations, it is considered sustainable agriculture. The predominant monoculture agriculture is usually not sustainable because it homogenizes the biological base making it vulnerable to disease and change, and seriously degrades the soil and its long-term productivity. The most common type of sustainable agriculture in the Amazon basin is agroforestry, which is considered sustainable when the degree of intervention is relatively low and the conservation of native forest structure and function is high. It becomes unsustainable when non-native

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61 Hall and Bawa, 1993
species are introduced and the plots must be maintained against weed and pest infestations. This intensive agroforestry is rare in the Ecuadorian Amazon.

The key concept to sustainable agriculture is "the acceptance of a multiplicity of useful species and a rejection of monocultures." This allows the level of risk to be diffused through biodiversity and a wide range of commodities to be produced. Vandana Shiva explains that "sustainability and diversity are ecologically linked because diversity offers the multiplicity of interactions which can heal ecological disturbance to any part of the system. Nonsustainability and uniformity means that a disturbance to one part is translated into a disturbance to all other parts." Sustainable agriculture does, however, alter the distribution of species toward a higher representation of the commercially viable species. It can lead to unintended extinctions, alter trophic relationships, and decrease the ecosystem's ability to recover from disturbances.

Sustainable agriculture requires a sophisticated understanding about the physiology, sociobiology, and ecology of the relevant plants or animals. For example, the optimum sustainable yield, the forest's response to various disturbances and the natural distribution and abundance of native species needs to be known. It is important to constantly monitor the ecosystem and compare its health and population levels over time. Since this knowledge is highly specialized, it should be widely shared so that other farmers can use the knowledge to advance the field, which would better promote the commercialization of native species. As Vogel explains, "the challenge for sustainable agriculture is to understand sufficiently well the husbandry and cultivation of these species in order to maximize sufficiently well the profitability of such farms without degrading the regenerating forest."
Sustainable agriculture is being successfully run by indigenous groups all over the Amazon basin who face a restricted land-base, limited labor, low capital, a lack of technical support, unpredictable and often distant markets, and competing economic activities which are often more profitable. Sustainable agriculture can protect biodiversity, prevent erosion, safeguard water sources, and rescue traditional indigenous ecological knowledge. Furthermore, it produces many more useful species than other land-use practices. One sustainable agroforestry plot can provide dozens of food sources, (vegetables, fruits, meats, and even grains), medicines, construction materials, arts and crafts items, and more. The low labor and capital inputs of sustainable agriculture make farmers able to take advantage of other economic opportunities while being ensured of subsistence when jobs are not available.65

The Economics of Sustainable Agriculture

It seems that the greatest challenge that remains to be overcome for sustainable agriculture is its economic profitability compared to competing economic activities. Unfortunately, some forms of sustainable agriculture, like that of Centro Fátima, appear to be limited to a well-funded, highly educated minority of the population under specific conditions, rather than being applicable to the population as a whole. Unless the goal is simply household or community use of the crops rather than commercial production, or the farmers are funded or content living on a subsistence income as in the case of Centro Fátima, the financial returns to the families are meager for many types of sustainable agriculture.

Despite the low financial returns of sustainable agriculture, the employment opportunities can be great. If the harvest is not focused on very specialized

knowledge and experimental research, like at Centro Fátima, and is rather something that most people can do, the employment opportunities can be enormous. For example, 68,000 Brazilian households gain income from the collection of rubber, most of which is wild.\textsuperscript{66} However, there are few species that could provide such significant employment without destroying the natural biodiversity and creating a monoculture (and whether rubber collection is a form of sustainable agriculture is debatable).

If the goal is commercial production, it is important that the farmers live near or have easy access to markets, since most fruits and products produced are perishable or bulky, which makes them difficult to transport. It is also economically important that the product being grown is not a product that is also grown in modern monoculture systems, since the sustainable product could not compete with the economies of scale of monocultures. The profitability depends largely on the demand. If the demand is strong and the distribution is limited, the potential to benefit rural households is strong by filling that niche\textsuperscript{67}. However, as in the case of Centro Fátima, the demand for the animals was high, but the limited growth and reproductive capacity of the animals made profitability impossible.

Much of the profitability and success of sustainable agriculture projects depends on the biology and ecology of the particular species and how quickly and environmentally safely it can be harvested. The success also depends largely on local circumstances, whether the people are more conservation driven than economically driven, whether other activities are more lucrative, whether the employment levels can be high enough, and whether the project is generally compatible with local social and economic systems.

\textsuperscript{66}Southgate, Douglas. \textit{Alternatives for Habitat Protection}. p.19.
\textsuperscript{67}Southgate, Douglas. \textit{Alternatives for Habitat Protection}. p.25.
The following case studies demonstrate the benefits and difficulties inherent in trying to sustainably harvest native species. Both projects are small-scale community-based projects that take many of the same steps to ensure sustainability. Their sustainability varies dramatically, however, and an examination of the factors influencing sustainability reveals how. The first is an example of a new, experimental type of sustainable agriculture: the sustainable harvest of native fauna.

**Case Study #1: Centro Fátima:  
"Project for the Domestication, Management and Harvest of Seven Wild Mammal Species and Three Bird Species of the Ecuadorian Amazon."

**Project description**

The Centro Fátima in the Ecuadorian Amazon is a small, experimental station run by the Organization of Indigenous Peoples of Pastaza, (OPIP) and is dedicated to the development of efficient, sustainable agriculture. The goals of OPIP are to “fight for land rights of indigenous communities in the province, protect our indigenous culture, language, and way of life, and to work together by unifying and organizing all the indigenous communities of Pastaza....to develop sustainably with the use of native resources.” Centro Fátima works in investigation, conservation, education and the search for economic alternatives using native biological resources. It aims to develop its own form of sustainable development based on local knowledge and resources of secondary tropical rainforest. The Centro serves as a local focal point of community political action and education. It holds frequent seminars for community members and local farmers, workshops for ecology students and

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biologists presenting their work, and has a curriculum involving field trips for school all school children of Pastaza.

Fátima was opened in 1986 in collaboration with OPIP, the Polytechnic School of Chimborazo, and the Provincial Council of Pastaza. It is located on 28 hectares of secondary tropical forest in the uplands of the western Amazon, on land that was formerly used for cattle grazing but was naturally re-seeded from small patches of primary growth. The focus of Fátima’s efforts is an undertaking called the “Project for the Domestication, Management and Harvest of seven wild mammal species and three bird species of the Ecuadorian Amazon.” The goal of the project is to use and protect biodiversity by studying valuable endemic fauna species in order to cultivate and commercialize them with the technology of sustainable polyculture, and to disseminate knowledge and technology of sustainable agriculture to surrounding communities, providing a sustainable economic alternative.

Their hypothesis is that "it is possible for indigenous communities to increase native animal populations for their own use without damaging the jungle ecosystem." Although the Centro is not yet financially self-sustaining, it aims to generate enough information regarding useful species so that it, along with other farms, can become financially self-sustaining.

Centro Fátima studies the ecology of tapirs, capybaras, collared peccaries, pacas (large rodents), black agoutis, Salvin’s currassows, guantas, guatuzas, paujils, and mountain turkeys, and conducts systems analyses of the material-energy flows of the station. Thus far, the Centro has generated some important and useful biological information, and some species seem potentially profitable. In terms of financial potential for sustainable agriculture, the most important information gained regards

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71 Lodoño, Tanya et al. "El Centro Fátima“ p. 84 my translation.
72Vogel. The Successful Use of Economic Instruments, p.27.
the ecology and socio-biology of the tapir and the capybara. Tapirs are a large, pig-like animal which graze on undergrowth, and do not uproot the plants they eat. At Centro Fátima, they have been observed to eat over 100 different plant species. An adult is worth about $330 US in the local market. They require no inputs in terms of bought food, medicine, or parasitides, and demand very little labor. They are sociable, docile, and easy to manage, and the young mature in about two years. When suffering from parasites, they choose certain plant species. The revenue generated per year by tapir culture is approximately $100 per hectare. The value of degraded pasture land is as low as $160 per hectare, and the land used for tapir culture can also be used to manage other species that co-exist with the tapir. The efficiency, low labor input, and low environmental impact of tapir-culture, as well as the delicious meat, makes the animal potentially very profitable. However, the tapir culture has thus far not been as profitable as expected, since the animals reproduce and grow relatively slowly.

Capybaras, also called chiguires in many areas, are the largest rodent in the world, like a rat the size of a Golden Retriever. Although biologically they are rodents, the pope has deemed them fish, since they reproduce and spend much of their time in the water, and are therefore permissible to eat during Lent. The meat is delicious, and contains much higher protein levels than pork or beef. Capybaras reproduce and grow significantly faster than tapirs. A study done on an experimental capybara farm in Venezuela revealed that the average meat production level for capybara is 63 kg. per hectare per year, compared to cattle, which produces only 14 kg. of beef per hectare per year. They sell for between $180 to $200 locally. Unlike the tapir, capybaras have been previously raised in farms, particularly in the Venezuelan Amazon.

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74 Vogel, The Successful Use of Economic Instruments p.27.
75 Lodoño, Tanya et al. "El Centro Fátima" p. 92 my translation.
The amount of time spent researching and figuring out how to harvest animals that have never been managed is immense. The profitability therefore depends on upon how much data can be produced and shared between farms. The Centro has already begun to involve other indigenous communities in capybara culture, and has established a network of sustainable fauna harvesters with about ten farms. Unfortunately, however, the sharing of good data concerning tapirs and capybara is almost non-existent, and the Centro has not had much luck with the sale of these animals as of yet. The Centro has only sold one tapir (which was not sold for meat, but to another farmer to start tapir culture himself), and about a dozen capybara, some for meat, but most to other farmers.\textsuperscript{76} Medardo Tapias, founder and director of the Centro, admitted that to his disappointment, tapir culture does not have much potential as an economic alternative that could be practiced profitably by many, mainly because tapirs simply do not grow and reproduce fast enough. He feels that capybara, however, have much greater potential, and is confident that Centro Fátima will be able to successfully demonstrate this.\textsuperscript{77} Danillo Reascos, a graduate student who has been working at the farm for several years, feels that the problem is not a lack of demand for tapir or capybara, but the fact that "there just aren't enough animals to keep a healthy population here and sell them at the same time, because they do not grow fast enough and they are good at escaping from the reserve. It is also difficult to sell them because I do not want these animals to be eaten - I know them too well."\textsuperscript{78}

Since the money made from tapir and capybara culture obviously cannot support the farm, the Centro has shifted its focus slightly toward educational ecotourism, and a large portion of its income comes from the entry fee charged to


visitors and from fees for the classes and workshops offered. The entrance fee is $2 for foreigners, $1 for Ecuadorians, and free for children. The financial goal of the project is to achieve self-sufficiency, and it seemed to me that they are far from achieving that goal. Medardo Tapias explained that the Centro could not survive without the heavy external financing it receives, and that the economic benefits from the education project alone are not sufficient to keep the project going. He also explained that since the earlier days of the project, funding has increased significantly rather than decreased, though funds are still too low to expand the project. He would like to expand the project, buy more land and hire more workers. He does not plan on ever exporting the animal products, even if it became profitable. The goal is to benefit local indigenous communities and to protect the biodiversity of their forests, a goal they feel would be incompatible with production for exportation.79

Analysis of sustainability variables

The capacity building of Centro Fátima is very strong, resulting in a score of 10 (see table 1,a).80 This is mainly because of the thorough ongoing community education and the fact that it is developing a completely new form of animal harvesting, which involves continuous creativity, hard work and experimental learning. The participants explained that they have learned incredible amounts from the project, as have many of the local people who have been involved in the workshops and seminars. The training program for the workers was intense and ongoing, and they are putting their skills to use daily as are many of the participants in the workshops who have begun raising native fauna. All of the participants and managers said that they are very enthusiastic about working at the Centro and plan to spend the rest of their lives there.

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80 As a reminder, the score is 10 because each of the four criteria to determine general capacity-building were scored positively. Since there are four criteria, each is worth 25% of 10, or 2.5, so 2.5 multiplied by 4 is 10.
The environmental sustainability of the project is also very high. The resource use is completely sustainable, and the environmental impact is minimal, since all the animals they are harvesting are native to the area and their populations are still low enough so that other populations are not disturbed. Local environmental awareness is very high because of the environmental education program, and the managers and several local visitors agreed that the level of environmental awareness has significantly increased due to the outreach efforts of the project. Medardo Tapias feels that the best thing that the Centro has done is protecting the forest and letting it and all its inhabitants recuperate. There is no sophisticated ecological monitoring system, but employees know the approximate population levels and ecosystem health and can compare this to what they remember the forest to have been like forty years ago. An analysis of Centro Fátima in Management of Tropical Forest Resources: Lessons Learned asserts that the Centro has prevented environmental impacts such as loss of soil fertility, extinction of species, or biodiversity loss in general. The environmental impact of the trails that run through the land are minimized with erosion control systems. Sr. Tapias felt that the most negative impact that they have had was through their program of rescue and reintroduction of wounded animals. They helped a sick family of monkeys from another adjacent forest recuperate and then reintroduced them into their own forest. The monkeys ended up eating almost all the bird eggs of several dozen species and seriously damaged the bird populations. However, since this impact is not directly related to the sustainable agriculture project, this impact does not effect the Centro's positive score for avoiding secondary environmental impacts.

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The overall environmental sustainability is very high, receiving a score of 10 (see table 1b).

As for economic sustainability, the farm is not financially self-sustaining. Although Medardo Tapias and Joseph Vogel, an environmental economist, feel that the farm will someday become profitable, its complete dependence on external financing and the fact that the managers are simply not economically driven and are happy receiving aid leads to a doubt of the project’s potential for economic self-sufficiency or profitability. The economic potential of tapir meat is unknown, since it has never before been commercialized. Capybara, however, have been profitably harvested, but only on a large and probably environmentally unsustainable scale. If the populations of capybara were high enough to make harvesting profitable, their impact on plant populations would probably negate their status as an environmentally sustainable form of agriculture, which the Centro Fátima would probably never do. Externalities would be internalized with the potential profit of animal culture. Externalities are currently being internalized somewhat by the fees charged for educational ecotours, although they are too low to make up for the opportunity cost of the conservation. Since this is not directly part of the sustainable agriculture project, it does not affect the neutral score for internalizing environmental externalities. Immediate needs of the community are being met, though not directly by the Centro. Fátima was given a relatively low score for economic sustainability of 6 (see table 1c). All in all, the project is relatively sustainable, receiving an overall sustainability score of 8.6.

Table 1: Sustainability of Centro Fátima

<table>
<thead>
<tr>
<th>a. capacity building</th>
<th>motivation and enthusiasm</th>
<th>Training program?</th>
<th>Ongoing education?</th>
<th>Are people using their skills?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

47
b. Environmental sustainability of Centro Fátima

<table>
<thead>
<tr>
<th></th>
<th>Sustainable resource use*</th>
<th>Avoiding secondary environmental problems?</th>
<th>Local environmental awareness</th>
<th>Environmental education?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

c. Economic sustainability

<table>
<thead>
<tr>
<th>Product/service</th>
<th>Resistant to fluctuation?</th>
<th>Self-sustaining?</th>
<th>More $ or benefits than before?*</th>
<th>Internalize externalities?</th>
<th>Immediate needs met?*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>tapir/capybara</td>
<td>n</td>
<td>-</td>
<td>+</td>
<td>n</td>
<td>+</td>
<td>6</td>
</tr>
</tbody>
</table>

* these criteria are considered necessary for sustainability

Analysis of factors influencing sustainability

Community Participation

The project was not designed to involve extensive full-time local participation at the project site, since the work is so specialized. There are currently four people who work full time for the project, a husband and wife manager team and two workers who feed and study the animals and lead educational tours. For these people, the Centro is more than a full-time job; it is their way of life. However, if participation levels were to include all the farmers who have started their own sustainable fauna farms as a result of the efforts of the Centro, and their workers, the level of full-time participation would increase to several dozen. Furthermore, if it also included those people who regularly participate, teach and help organize the workshops and various activities at the Centro, the number would increase further. However, since less than half of the community participates full-time in the project,
it received a negative score for community participation. Participation is limited because of the lack of funding: the Centro relies largely on volunteer work, and would like to have a much higher level of participation. Medardo explained that he would like to eventually have 10 employees, with one person to specialize in each of the species they are studying. Currently one of their major limitations is that they simply do not have enough people observing and studying the animals to obtain the specialized information they require for domestication and eventual commercialization.

Community acceptance of the project was not immediate, as Medardo Tapias explains "At first they thought our idea was crazy, but it has slowly gained acceptance of everyone around here. It has taught them that there are economic alternatives for indigenous people of Pastaza." With the attention it has received from outside, Fátima has become much more accepted and local participation has increased. Decisions are made mainly by the managers, Medardo Tapias and Ruth Arias, a husband and wife team, who consult and value the opinions of the Organization of Indigenous Peoples of Pastaza and their two full-time workers. The project is completely based on local, traditional knowledge, combined with general ecology knowledge and simple sustainable agriculture technologies. Communication between Centro Fátima and the community is relatively strong. The Centro was given a score of 6 for level of local participation and decision-making power (see table 2).

<table>
<thead>
<tr>
<th>percent of community involved</th>
<th>average involvement in design &amp; implementation?</th>
<th>communication</th>
<th>decision-making power</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td># hours</td>
<td>per week</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Local Participation and decision-making power of Centro Fátima

---

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The creation and distribution of local revenue

As for revenue, the Centro is not financially self-supporting; the family who runs it lives mainly self-sufficiently, and the two employees certainly are not in it for the money. All of the money generated by the courses, visitors fees and sale of animals therefore stays within the community. The project provides the primary source of income for the four full-time workers, but not for most of the other farmers participating on their own farms, so that category received a neutral score. The major non-monetary benefits for the community are the environmental education provided by the Centro, the maintenance of environmental quality and biodiversity, and the potential economic alternative for locals. Although the distribution of economic benefits for the community are low, the distribution of non-monetary benefits is high, since anyone can attend the workshops or visit the farm and everyone benefits from the protection of biodiversity. The Centro received a score of 5 for creation and distribution of local revenue (see table 3).

Table 3. Creation and Distribution of Local Revenue at Centro Fátima

<table>
<thead>
<tr>
<th>% stays in community</th>
<th>average amount $/person/week</th>
<th>primary source?</th>
<th>Non-monetary benefits?</th>
<th>distribution of economic benefits</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>-</td>
<td>n</td>
<td>+</td>
<td>-</td>
<td>5</td>
</tr>
</tbody>
</table>

Social and Cultural Holism

As for the social and cultural holism of the project, the Centro obtained a very high score of 9. As a project run by the Organization of Indigenous People of Pastaza with no management from the outside, the project is socially appropriate. It
The Use of Economic Instruments in Biodiversity Conservation Projects

successfully preserves social systems by its efforts to revalue indigenous knowledge, and protect the forests and the way of life of indigenous communities. The social equality is average, since the Centro has no negative effects, but it does not provide the opportunity for many people to participate. There are no known negative social changes or value changes created by the project. This is largely due to the fact that it has so few full-time participants and the project's effect on the community is mainly through its educational outreach programs. The technology is appropriate, with the use of simple, low-cost, traditional practices and the spread of sustainable techniques to surrounding communities. The Centro obtained a score of 9 for social and cultural holism (see Table 4).

Table 4. Social and Cultural Holism at Centro Fátima

<table>
<thead>
<tr>
<th>preserves social systems</th>
<th>cultural preservation</th>
<th>appropriate technology</th>
<th>social equality</th>
<th>preserves value systems</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>n</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

Source and Amount of Funding

Concerning the funding of the project, the annual amount of funding has not been revealed, although the main sources are known. The Centro is funded by a multitude of sources, including the Polytechnic Institute, the United Nations Environmental Programme, the GAIA Foundation from London, Petroecuador, the Honorable Consejo Provincial de Pastaza, and various Ecuadorian and International NGOs. The length of time the sources have contributed varies, but those who started contributing have almost always continued contributing annually. Several have been contributing significantly for 11 years since the project began. The owners are very grateful for the donors and the project could not survive without them.
Table 5. Source and Amount of Funding at Centro Fátima

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>Amount of funding</th>
<th>length of funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>multiple source: international aid and conservation, national and local NGO’s</td>
<td>high initially, then average</td>
<td>heavy for a short time then low for a long time</td>
</tr>
</tbody>
</table>

Vogel feels that Centro Fátima "should be seen as an antecedent to future small farms predicated on the science of sustainable agriculture."\(^{85}\) The information gained at Centro Fátima has the potential to enhance sustainable agriculture throughout the Amazon basin if the information is shared widely. The Centro's success was recognized nationally in 1994 when Sr. Tapias received the Blue Planet Award, the Ecuadorian Prize for ecological merit given to just one person each year.\(^{86}\) Fátima has successfully helped people revalue and rescue indigenous knowledge about native fauna and the domestication of wild animals, and protected a significant portion of tropical rain forest.

The Centro is certainly contributing to what its leaders see as the four main development problems faced by Amazonian indigenous communities: lack of education, cultural loss, health problems, and environmental degradation. They are providing education to the entire region, restoring and revaluing indigenous knowledge and cultural uses of fauna, trying to provide improved nutrition with the protein of capybara and tapir, and they are finding environmentally sustainable economic alternatives to deforestation and unsustainable agriculture. Tapias feels as though the Centro has proved its hypothesis that it is possible for indigenous


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communities to increase native animal populations for their own use without damaging the jungle ecosystem.\textsuperscript{87}

A further positive and important lesson that can be learned from the Centro is the successful use of secondary forests as a land-use resource. Much of the Ecuadorian Amazon consists of secondary forests and degraded land that were abandoned pasture or used for shifting agriculture. Too often these landscapes are hopelessly abandoned when they need not be. The Centro allowed the forest cover to restore itself naturally, proving that even in highly altered ecosystems, forest resources can continue to be used on a sustainable basis. Degraded forests in the Amazon basin exhibit an amazing, and usually underestimated ability to recover from human disturbances when given the opportunity (unless they were intensively used for too long and have been seriously impaired). As Anthony Anderson explains "in a region of constantly beckoning frontiers, a key challenge is to engage rural inhabitants in restoring the land in areas where the frontier has already passed."\textsuperscript{88} The use of these secondary forests can significantly reduce land-use pressures on remaining primary rain forests.

Centro Fátima’s extension services aimed at small-scale farmers is key to promoting sustainable land use in the region. The extension efforts have had a great impact on raising environmental awareness, and have gotten some farmers involved in sustainable agriculture. It seems, however, that there are low limits to the success of the agriculture extension efforts, considering that the Centro itself has not achieved production of tapir or capybara on a scale that is high enough to be sold.


or consumed regularly. This type of sustainable agriculture probably does not have the potential of making more money than people could receive participating in economic activities like raising cattle or monoculture agriculture, and at the present level does not seem like an economically viable alternative for communities without significant external funding for such projects. Nonetheless, Centro Fátima is a valuable resource and a very positive contribution to the Amazon indigenous community, and is rescuing indigenous knowledge about how to manage Amazonian biodiversity.

**Case Study #2: SUBIR**

**Project description**

A second sustainable agriculture project is the SUBIR (Sustainable Uses for Biological Resources) project, which worked with communities surrounding the Cotacachi-Cayapas Ecological Reserve (RECC) in Northern Ecuador. Between forty and sixty percent of the reserve's plant species are found nowhere else in the world, and it is therefore one of the world's most important areas for biodiversity. The project was a CARE project (the Cooperative for American Relief Everywhere) funded by USAID, working in coordination with the Wildlife Conservation Society, The Nature Conservancy, the Ecuadorian Forestry, Natural Areas and Wildlife Institute, and local NGOs. The goal was to conserve biodiversity and improve the standard of living of the communities in the protected areas and their buffer zones through the sustainable use of their natural resources, specifically involving various forms of sustainable agriculture. The project focused on a comprehensive approach
involving agricultural and technical training, organizational strengthening, environmental education, and emphasized community decision-making.89

The RECC is classified as one of the world’s ten hot spots in terms of biological conservation priorities.90 Before the project began, the community of Cuellaje, a small, mountainous agricultural community outside the reserve, suffered from population pressure, poverty, and serious deforestation. The goal of the SUBIR project was to prove to these communities that "long-term biological conservation can be combined effectively with self-sustaining community development."91 The project "is creating economic incentives for conserving biodiversity, facilitating this process through local, national, and international partnerships...a multi-faceted, multidisciplinary, and multi-sectoral approach."92 The project involved local people, indigenous organizations, governmental and non-governmental agencies, as well as international and private sector groups working together to improve the economic and social conditions of the communities, and protect biodiversity. The SUBIR project was divided the project into five components: 1) Institutional and Organizational Development, 2) Policy and Legal Issues, 3) Biodiversity Investigation, 4) Sustainable Land Use, and 5) Commercialization and Marketing.

SUBIR started by providing workshops on sustainable agricultural practices, crop diversification, and the commercialization of agricultural products. The organization helped the community intensify and diversify its agriculture and agro-forestry, and introduced fruit cultivation to deter deforestation and erosion. Local people started cultivating tree-tomato fruit and raspberries to sell home-made jams.

91 CARE International, SUBIR brochure, p1.
92 CARE International, SUBIR brochure, p1.
They also formed a company to help build and manage a small paper-making and sisal pulp facility.93

Julia Taylor, a researcher who studied SUBIR in Cuellaje two years after its implementation, reported that locals understand the importance of the project and strongly support it, appreciating the benefits they have already derived from it. She explains that the percentage of residents who use slash and burn agriculture dropped from 50% to about 10%, and that locals started to understand the environmental impacts of erosion, water pollution and the loss of biodiversity. Clearcutting was replaced by selective harvesting and deforestation had been reduced.94 She attributes the success to the project’s emphasis on training and education, to SUBIR’s strong relationship with local people and their level of interest and participation, and to the presence of a strong community organization. Local residents were consulted initially to discuss their wants and needs and those who showed the most interest became the project managers. Dialogue between the local staff and the project’s regional and national managers was described as “open and horizontal.”95 Lopez and Utreras explain that around 23% of the families were reforesting, particularly with fruit trees, which are more profitable than forest species.96 Taylor found the project to be an exception to the typically unresponsive and manipulative international development projects, and of SUBIR, she said “This is sustainability.”97

Implemented in 1991, SUBIR planned to stay in Cuellaje for ten years. In 1996, however, after just six years, the same project that had begun to transform a community to sustainability took a turn for the worse. William Almquist researched the community a year after the project ended, and found the community to be in

93Sisal fiber, or cayuba, is used to make rope and coffee sacks. from CARE International, SUBIR brochure, p.2.
95Taylor, Julia. SUBIR in Cuellaje. p 17.
97Taylor, Julia. SUBIR in Cuellaje. p 23.
worse shape than it was before SUBIR ever arrived with good intentions. SUBIR donated all the resources to construct the paper and sisal factory, but it was never realized. The original community organization was replaced by a much less effective one, and many of the community leaders began arguing with the project directors. FISE-Ecuador, which was going to provide half of the matching funds, decided to withdraw its funding because of the disagreements, claiming that the plant would not be efficient and self-sustaining in the long term. The failure of the factory led to fights in the community until several important community members told SUBIR to leave.98

When SUBIR left, it took back most of the resources it had provided the community with - cars, motorcycles, video equipment, a computer and furniture, and all of the publications and information about the project. The factory was abandoned and the environmental education was "forgotten," so the community went back to growing monoculture crops, sisal fiber and tree tomatoes, which are cheap and vulnerable commodities. The use of pesticides, herbicides, and fertilizers increased. Slash and burn started again, and hunting is even more prevalent than before. It was estimated that 80% of farmers were doing slash and burn in 1996, while during the project, only 10% of the farmers engaged in this activity.99

Analysis of sustainability variables

As for the sustainability of the project, the capacity building was high. There was a strong training program for the participants, ongoing weekly educational workshops in which the participants learned a great deal and improved both their knowledge and appreciation for their environment and their practical skills in sustainable agriculture. They put their newly-learned skills and understanding to

use on a daily basis and Julia Taylor reported that the people seemed generally content and satisfied. The SUBIR project received a score of 10 for capacity building (see table 6a).

Resource use was generally sustainable, although it is possible that some natural biodiversity was replaced by the planting of fruit trees. The only known secondary environmental problem was some water pollution from cleaning the sisal fibers in the river, which community members did before the project as well, but not to such a degree. The Environmental awareness was high because of the environmental education, and it scored 8.8 for environmental sustainability (see table 6b).

As for economic sustainability, the product's resistance to fluctuations in prices is unknown. The project was not completely financially self-sustaining. People were not making more money than before, however, which was one of the necessary criteria for sustainability. This therefore led SUBIR to receive a 0 score for economic sustainability, and to be declared unsustainable overall (see table 6c).

Table 6: Sustainability of SUBIR

<table>
<thead>
<tr>
<th>a. capacity building of SUBIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>motivation &amp; enthusiasm</td>
</tr>
<tr>
<td>+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b. Environmental sustainability of SUBIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>sustainable resource use*</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
As was determined earlier, one of the necessary criteria for sustainability is that the benefits to the community exceed what they would get by pursuing an alternative. In this case, the overall benefits may have been high, but the monetary benefits were low, and combined with the social instability, this led to the project's demise. Even a project with wonderful objectives trying to take all the right steps was a flop. An analysis of the factors influencing sustainability will show why.

### Analysis of factors influencing sustainability

**Local participation and decision-making power**

The SUBIR project had very high rates of local participation, with nearly the entire community participating in the project in some way, most as a full-time activity. Locals were involved and strongly considered in the design and implementation of the project, and communication between participants and managers was on a daily basis. The quality of communication, however, was probably not completely open and understanding, due to the misunderstandings and...
strong disagreements. The decision-making power of the locals started out to be high, but proved not high enough for them, as SUBIR did not want to give up complete control of the project and withdrew at the end because of it. Level of decision-making power was rated neutrally, and the project received a score of 10 for the level of local participation and decision-making power (see Table 7).

**Table 7. Local Participation and decision-making power at SUBIR**

<table>
<thead>
<tr>
<th>percent of community involved</th>
<th>average # hours per week</th>
<th>involvement in design &amp; implementation?</th>
<th>communication</th>
<th>decision-making power</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

**Creation and Distribution of Local Revenue**

As for the creation and distribution of local revenue, almost all of the money stayed within the community, and it was their primary source of income. The average level of income per person was neither high nor low, though the non-monetary benefits were high, as was the distribution of benefits.

**Table 8. Creation and Distribution of Local Revenue for SUBIR**

<table>
<thead>
<tr>
<th>% stays in comm.</th>
<th>av. amt. $/person/ week</th>
<th>primary source?</th>
<th>non-monetary benefits?</th>
<th>distribution of economic benefits</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>n</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>9</td>
</tr>
</tbody>
</table>

**Social and Cultural Holism**

SUBIR received a low score of 4 for social and cultural holism (see table 9). The project proved to have a negative impact on social systems, and no evident influence cultural preservation or value systems one way or another. The technology was not
appropriate as it was mostly high-tech equipment brought in from outside the community, like the computers and sisal factory. Social equality was high as the project provided the opportunity for almost everyone to participate and promoted equal distribution of benefits. However, despite the project’s efforts to preserve social systems, the tensions that arose seriously disrupted the social order.

Table 9. Social and cultural holism at SUBIR

<table>
<thead>
<tr>
<th>preserves social systems</th>
<th>cultural preservation</th>
<th>appropriate technology</th>
<th>social equality</th>
<th>preserves value systems</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>n</td>
<td>+</td>
<td>n</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Source and Amount of Funding

Concerning the source and amount of funding for SUBIR, it was a bilateral cooperative effort between CARE, USAID, the Wildlife Conservation Society, The Nature Conservancy, the Ecuadorian Forestry, Natural Areas and Wildlife Institute, and local NGOs. The amount of funding was high, but the length of the funding was short, which was a main factor leading to the project’s demise.

Table 10. Source and amount of funding for SUBIR

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>Amount of funding</th>
<th>length of funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>multiple sources</td>
<td>high</td>
<td>short</td>
</tr>
<tr>
<td>(multilateral, NGOs, etc.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SUBIR's failure was mainly triggered by personal conflicts that exploded. The underlying issues were communication problems between community leaders and SUBIR, the project's limited time in Cuellaje, and primarily the lack of revenue.
created by the project. Although the community knew that SUBIR was doing good things for them, each family did not feel a significant increase in income, because the new crops were no more profitable than the previous ones. Despite the environmental success of the transition, the people did not have more money than before, so when the pressure of the donor was gone, they did not feel it was worth it to continue the new practices. Although they knew that the new agriculture was more sustainable, immediate income was the priority, as it usually is in the case of poverty. The project did not have a strong enough foundation to maintain itself after the support was withdrawn. It is impossible to know, however, if even ten years would have been enough to make the agriculture more economically sustainable. This case is a frustrating example of a seemingly wasted effort, good intentions gone wrong partly because of the economic reality of sustainable agriculture. It argues the importance of economic benefits to local people, and demonstrates how economic realities can overshadow other factors of sustainability.

The average sustainability of Centro Fátima and SUBIR are 8.8 and 6.25 respectively, but SUBIR is considered unsustainable overall, since it received a zero in the category of economic sustainability. Both projects had high scores of 10 for capacity building, and they both had relatively high scores for environmental sustainability as well, 10 for Fátima and 8.75 for SUBIR. The economic sustainability was average for Fátima, with a score of 7, and a score of 0 for SUBIR, because it failed the requirement of creating more money or benefits for the participants than they had before. Of all the factors of sustainability, social and cultural holism had the highest degree of correlation for these sustainable agriculture projects, which implies that social and cultural holism is an important factor to ensure a sustainable agriculture project's sustainability. The level of local participation and decision-making power was not positively correlated to sustainability, since Centro Fátima
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had low participation and high sustainability and SUBIR had a high degree of participation but low sustainability. This relationship is actually inverse, which implies that SUBIR may have failed partly because of its high level of participation. Since the community's transition to the new activity was so dramatic and complete, and the new activity was not profitable, when everyone participated so fully, the project had no profitable or sustainable economic base. The inverse relationship between sustainability and participation in case of Centro Fátima suggests that there are certain conditions where community participation may not help the project become more sustainable, particularly when the nature of the work is specialized and the revenue gained is modest. The creation and distribution of local revenue had a significant correlation to sustainability, as both project received a 7.4 for local revenue, which was about one point away from their overall sustainability scores.

Other Sustainable Agriculture Lessons and Initiatives in Ecuador

A potential pitfall with sustainable agriculture can arise when communal land is being harvested. If proper regulations and incentives are not designed, and each person has an economic incentive to over-harvest the land, it can lead to Garret Hardin's "tragedy of the commons," and become unsustainable. It is important that the project remain environmentally sustainable by not decreasing the diversity of the forest. Homogenization of production leads to a very narrow genetic base. As Vandana Shiva explains, "biodiversity cannot be conserved unless production itself is based on a policy of preserving diversity." Ecosystem changes must therefore be carefully monitored, and there should not be a slow progression, or regression to homogeneity. If this does become overly domesticated, then the demand for the wild or sustainable product often decreases.

101 Shiva, Vandana, Monocultures of the Mind. p.87.
Many projects based on extracting naturally-growing species from the forest eventually turn into sustainable agriculture as the harvesters realize that further profits can be made if they increase the species abundance by physically planting more of the species. This transition from wild harvest extractivism to sustainable agriculture becomes environmentally logical if the demand for the species is so high that continued wild extraction would seriously deplete the naturally occurring species and have further ecosystem repercussions. However, if the demand and the hunger for profits exceeds the limits of sustainable agriculture, there is an economic incentive to create a monoculture and eliminate biodiversity. Thus, a concern is raised with the possibility of too much success and demand for these "natural, sustainably-produced" products, because the greater the demand, the less likely the product will continue to be managed sustainably. Many worry that international demand of rainforest products may actually lead to the destruction of Amazonian biodiversity, rather than encourage its preservation.\(^2\)

Major indigenous forms of forest management in the history of the Amazon depended partly on practices of sustainable agriculture, and supported high population densities over long periods of time. These practices usually required a profound knowledge of highly complex ecosystems, knowledge which is in great danger of disappearance today.\(^3\) Studying these past types of sustainable agriculture and rescuing the ecological knowledge that accompanied it can therefore provide important lessons for Amazonian sustainable agriculture today. As Alcorn explains, indigenous-run sustainable agriculture is anything but "primitive attempts to make


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a living with crude tools." It is a complex management system that requires a sophisticated understanding of ecological processes and native technologies. It is a process best controlled by indigenous people themselves.

Another important type of sustainable agriculture project is extension programs, which provide different results and modes of production that are often more easy for communities to transition to. One interesting sustainable agriculture extension program is the Coca and Tena Agroforestry Project. The project uses on-farm demonstrations to make existing farming systems more sustainable. Implemented in 1984 by the Ecuadorian Ministry of Agriculture and the National Forestry Directorate, with financial and technical support of the U.S. Agency for International Development (USAID) the project promotes the use of 27 native tree species and dozens of other plant species in mixed associations. The demonstrations extend to about 30,000 local families, encouraging them to experiment and adopt more sustainable practices. The demonstrations occur on the property of farmers who express interest in receiving technical assistance to increase the diversity of their existing production systems.

The participants plant fruit trees, palms, small trees and shrubs, yucca, platano, cotton, and corn, in association with commercial timber trees. The participating farmers add to their plots improved grasses, legumes, plantains, or living fence material and farmers of coffee plantations add certain tree species to their plots. The most common improvements are commercial timber species planted in coffee plots and grass, legumes, and fruit trees planted on pastures. The demonstrations are established by a project agronomist and the farmer. All demonstrations are gradually

enlarged as the farmers realize the merit of the species combination. The field members of the project are recruited from local agronomy schools. All recruits have been raised on local farms or "communas", (communal lands belonging to the Napo Quichuas) and all are familiar with the local plants and their management problems. This type of large-scale extension project allows many more participants to become involved in sustainable agriculture by relatively easy ways to improve their existing plots. Although the project itself does not generate income, it allows thousands of farmers to augment their income in a sustainable fashion.106

Another type of sustainable agriculture project does not involve the production of food products for local consumption, but rather the production of sustainable rainforest goods to be sold on the international market. The "Tagua Initiative" in the Northern Esmeraldas region of Ecuador is one such project. It involves 52 member communities (15,000 inhabitants) harvesting a local palm tree called tagua (Phytelephas aequatorialis), also known as vegetable ivory. The tagua nuts are cut into slices to sell to US clothing manufacturers as buttons and are also carved for the production of locally-crafted handicrafts. The tagua palm grows most successfully when it is surrounded by a high level of biodiversity, like in associations with cacao, the breadfruit tree, and the coconut. The project was promoted by Conservation International and CIDESA, a local NGO, as a way to increase the standard of living of the people of the Rio-Santiago-Cayapas Commune. Conservation International is also working in the United States to promote and expand the market for tagua products. There are a dozen collection centers and two large warehouses, where the rest of the community who is not harvesting in the grove, works. The project has thus far met with a great deal of success, but as Rodrigo Hidalgo of CIDESA points out, the profitability of the Tagua Initiative is subject to the

changing demands of the international market, and profitability therefore cannot guarantee sustainability.\textsuperscript{107}

Communities involved in sustainable agriculture projects with products that are marketed internationally are not in complete control of the project sustainability. The industrialized countries on the demand side must guarantee the economic sustainability of the projects by instilling an ecological consciousness among the consumers to establish a sustained demand.\textsuperscript{108} To increase the role of sustainably-harvested rainforest products on the international market, local source communities need consistency and continuity of production. Furthermore, a marketing system that guarantees that a significant portion of the benefits goes back to the indigenous community is necessary, because some sustainable agriculture projects have actually led to the diversion of benefits away from the local indigenous communities they were intended to benefit. For example, the development of the liquid wax of jojoba, \textit{simmondsia chinensis}, promoted for providing revenue to Apache Indigenous communities, has provided very few benefits to the Apaches who have used jojoba as a medicine and cosmetic for hundreds of years. Now its production benefits upper-class Californians, Arizonans, and Japanese, who have invested in plantations to use them as tax write-offs.\textsuperscript{109}

\textbf{Conclusion}

The examples of Centro Fátima and SUBIR were not necessarily typical examples of sustainable agriculture projects, simply because there really is no average sustainable agriculture project. The size of the projects, species planted, techniques used, and demand for the project are very variable for sustainable agriculture, and


\textsuperscript{108} Hidalgo, Rodrigo. "The Tagua Initiative." P 272.

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the sustainability of each type may be completely different. It is therefore safer to make conclusions from these case-studies about other small-scale, conservation-oriented sustainable agriculture projects that also focus on local food or animal production. True sustainable agriculture that protects rather than destroys biodiversity, is almost always better for the local people and the environment than agriculture that would take place otherwise. Sustainable agriculture can be an important aspect of an integrated conservation and development project, but it should not be the only part. When the project does not create enough revenue for the local people, it should be combined with more profitable economic activities that are also sustainable. Overall, sustainable agriculture can be an important solution for many communities, should mainly be used as one part of an integrated conservation and development project.
Chapter 3: Community-Based Ecotourism

Defining Ecotourism

Possibly the most obvious and promising solution to combining biodiversity conservation with local development is ecotourism, nature-based tourism that allocates part of its revenue to conservation. Ecotourism is a non-consumptive use of natural resources and one of the solutions that can most easily integrate significant biodiversity protection. Douglas Southgate feels that "of all the economic alternatives contemplated for threatened habitats in the developing world, none appears to hold as much commercial promise as the business of accommodating people who wish to experience those habitats firsthand."

Ecotourism captures the values that people hold about natural resources and educates about those resources to enhance support for them. As Brian Fuerze explains, "it provides a vehicle for translating the values that others hold for a natural area into benefits for those who live in or near it."

Ecotourism is another overused ambiguous word like sustainable development. Many tourism facilities, because they focus on outdoor, educational, cultural or adventure travel have adopted the label of ecotourism. It is difficult to know whether a facility is a legitimate ecotourism project or not. Ray Ashton defines ecotourism as "any tourism development which is planned and carried out in an environmentally, socially and economically sustainable fashion." The Adventure Travel Society narrows the definition to "environmentally responsible travel to experience the natural areas and culture of a region while promoting conservation

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and economically contributing to local communities." 113 Rolf Wesche emphasizes the importance of not focusing on extrinsic values such as luxurious high-class facilities, but rather on intrinsic values, like the experience provided by first hand contact with a natural area or an indigenous community.114 Success of ecotourism should therefore be measured by how much the tourists learn and appreciate their surroundings rather than by the physical comforts or achievements such as summiting a mountain. Ideally, ecotourism should simultaneously benefit the environment, the local people and the tourists.

Ecotourism does have its costs, of course. It can be destructive of natural resources and cultural traditions particularly when it is more profit-driven than conservation-driven. The success of ecotourism, both in the short-term and long-term, depends on a healthy natural environment. If the natural habitats are not maintained or are overdeveloped for tourist facilities, this can cause various environmental effects. There are environmental effects as well; tourists often create erosion and solid waste problems which threaten the quality of the natural areas they came to visit. Tensie Whelan says that ecotourism can exceed two types of carrying capacities: ecological and aesthetic. The ecological carrying capacity is reached when the tourism starts to degrade the ecosystem and affect the wildlife, and the aesthetic carrying capacity is reached when tourists encounter so many other tourists, or see their effects (litter, lack of wildlife, erosion), that their enjoyment of the site decreases.115 The rapid increase of the numbers of tourists in particularly fragile areas of Ecuador has seriously exceeded the carrying capacity. Furthermore, Southgate points out that the roads and other improvements that are often needed for projects

to be successful also enhance the profitability of more depletive lines of work, making the area more accessible and attractive to logging companies, for example.\textsuperscript{116}

One solution to this is targeting fewer people who can pay more, thus emphasizing quality rather than quantity. Although it can solve part of the environmental dilemma, it is certainly elitist, and would lead to only the wealthy having the opportunity to experience other environments. The wealthy would thus have a higher access to environmental education through ecotourism, while average citizens might become less environmentally aware because they could no longer afford such opportunities.\textsuperscript{117}

The other main problem created by ecotourism projects (and probably the most unintended one) is that of cultural homogenization. Ecotourism projects involving the communities of traditional or indigenous groups who have not been exposed to Western life-styles are particularly susceptible to cultural transformations. Exposure to wealthy tourists can make local people aspire to a similar material possessions. When tourists want to participate or see various cultural rituals as forms of entertainment, this can devalue and change the meaning of these traditions. In order to avoid this cultural transformation, it is helpful to undertake an extensive investigation and plan of the effects that the facility and its visitors will have on the local culture and natural environment is done. Ashton stresses the need to understand the socioeconomic fiber of the community that may be affected by tourism development which in turn affects the way in which the project can develop.\textsuperscript{118}

When people who are accustomed to working for themselves, their families and communities are then made to serve tourists, it can lead to what Dahlan calls

\textsuperscript{116} Southgate, Douglas. Alternatives for Habitat Protection. P.1.
"the commodification of culture". When a community becomes controlled by business, the decisions get made based on efficiency rather than on social equity. The revenue created by ecotourism is often poorly distributed. This revenue distribution often disturbs income distribution as well; when some local people become very rich, or children might even make more than parents in some cases. It is easier for some tourists to refuse the sales tactics of an older person than a cute young child who the tourists may pity. Prices of goods may rise for tourists to the point where locals can not afford them. To prevent cultural transformations, tourists can be educated on culturally acceptable behavior, locals can demand different food or entrance prices for tourists and locals, and the size of tourist groups or the frequency of visits can be limited. Furthermore, community members can be prevented from doing only menial work, and tourist accommodations can be designed so that tourists stay in lodging similar, and not more extravagant than local homes.

Participation in ecotourism projects can also lead the good intentions of local participation to have unintended results. K. Brandon compares the truly "participatory approach" to the "beneficiary approach", which happens when local people receive some of the economic benefits of ecotourism but are not central to the decision-making and development process. They work as guards, guides, cooks and sales people, and share the economic benefits, but their lack of decision-making power ultimately leads to the project's failure. This would probably be more of a problem in large commercial facilities, since it is easier for everyone to participate more meaningfully if the project is smaller.

120 Fuerze, Brian, et al. Culture, Conservation and Biodiversity p. 162
The Economics of Ecotourism

Unlike sustainable agriculture, the profitability of ecotourism is almost always great. Tourism is the second largest industry in the world, and is predicted by the World Tourism Organization to become the world's largest industry by the year 2000.\(^{121}\) Tourism brings over $200 million annually in foreign exchange to Ecuador, most of which is from ecotourism.\(^{122}\) Since ecotourism can be so profitable, projects are occurring in non-genuine forms (that do not fit the definition of ecotourism) wherever there is demand, rather than being used as a tool for conservation or sustainable rural development. Furthermore, since the infrastructure is much less expensive than that of luxury tourism, rural communities can begin projects with relatively low capital assets. However, income generated by these projects often largely bypasses the communities participating in the ecotourism. In other cases, where the project started as a true rural conservation and development initiative, demand has proven insufficient.

In determining the economic potential of a site, it is important to consider the opportunity costs of ecotourism development, asking what other potential uses of this land would be given up if it was used for ecotourism. The opportunity costs of ecotourism are often environmentally unsustainable activities that are profitable in the short term, such as logging, oil exploration, or cattle ranching. The benefits of ecotourism are either of a private nature or a social nature. Social and ecological values include watershed protection, erosion control, nutrient cycling, soil formation, aesthetic and spiritual values, human consumptive values, and most relevant to this project, biodiversity protection.\(^{123}\) It is important to look at the

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ecosystem, its values and what it can handle, and design the project based upon those ecological considerations, the local interest in the project, and probable demand.

Ecotourism projects are often owned by profit-seeking non-locals or local elites, which can lead to the unequal distribution of economic benefits which does not facilitate local level sustainable development. Furze et al. point out that those who bear the costs of reduced access to resources, for example, often do not collect the benefits.\textsuperscript{124} Many of the resources that ecotourism takes advantage of (including forests, beaches, trails, scenic vistas, etc.) were public goods before the tourism project existed, and restricted use of these may cause resentment among locals. The free-rider problem characterizes those public goods - it is difficult to exclude people from the use or to make them pay for the benefits they get. Ecotourism can change property and resource rights and more adequately capture the positive externalities of natural areas. However, since tourist fees are usually lower that what tourists would be willing to pay, the full value of the natural area is not often captured by the tourism. To capture that excess value the fees for foreigners can be increased. For example, the fee for foreigners to visit the Galapagos National Park has risen from $40 to $80, generating about $3 million annually for Ecuador, 11\% of which goes to improving park management. The fee for Ecuadorians is only $6.\textsuperscript{125}

Instead of examining any of the dozens of the more common profit-driven private, ecotourism enterprises that abound in the Ecuadorian Amazon, this study closely examines two community-based, conservation-oriented projects that are trying to achieve the above goals of true ecotourism. Both projects focus on the sharing of indigenous culture, and both are run mainly by the communities themselves. The first is a community-initiative, controlled from the inside, while

\textsuperscript{124}Furze, Brian et al. \textit{Culture, Conservation and Biodiversity.} p.155.
\textsuperscript{125}Furze, Brian et al. \textit{Culture, Conservation and Biodiversity.} 160.
the other was initiated by an international conservation group. Their sustainability varies, and an examination of both projects reveals why.

Case Study #3: Capirona

Situated in the deep valley of the Rio Paño in the middle of the rainforests of the Ecuadorian Amazon is Capirona, a small Quichua community of twenty-five families. The community has initiated and managed one of the most socially, culturally and environmentally appropriate and responsible ecotourism projects in the Amazon Basin. The Capirona ecotourism project was designed and directed by the community alone, "with the goal of achieving economic self-sufficiency, protecting our environment, and promoting the indigenous goals of self-determination." The visitors who leave Capirona describe it as "an amazing experience with one of the most beautiful, kind, welcoming, and intelligent communities in the world." They are not portraying a romantic or idealistic vision of Capirona.

The ecotourism program consists of two major programs: rainforest appreciation and ecology, and the cultural program. Tourists participate in interpretive hikes through the rainforest, river trips in dug-out canoes and traditional rafts, demonstrations on traditional medicine, folklore, and music, making handicrafts, ceramics and tools, working with the villagers on community agricultural plots, and participating in community work projects. Upon leaving, each group is invited to participate in a traditional Quichua "despedida", or farewell ceremony, which includes Quichua music and dance. Aside from strict ecotourism, Capirona has become the site of dozens of educational seminars, workshops and

conferences on indigenous ecotourism and several tropical biology studies. Some of these seminars have had the objective of monitoring and continuously evaluating the social, cultural and environmental effects of the project on the community.

**Project description**

In the late 1980s, the people of Capirona decided that they were tired of the hard and unrewarding life that growing and exporting corn gave them. Their poverty and isolated location nearly 100 miles from the nearest town made them come together to design an easier way of life. They held a series of community meetings where they analyzed their needs and desires and decided that ecotourism might be the best way to meet those needs. They built one cabin, did not advertise, and were swamped with demand. Realizing that the tourism might have unforeseen impacts on the culture and environment of Capirona, several members of the community started a non-profit organization aimed at preventing cultural and environmental change from ecotourism and sharing Capirona's project with other interested communities to diffuse the heavy demand. The Indigenous Network of the Alta Napo for Intercultural Living and Ecotourism, or RINCANCIE, was then formed as a network of indigenous Quichua communities interested in following Capirona's model by using ecotourism as a way to achieve their indigenous goals. RINCANCIE also aims to educate people about the issues and conflicts and they face, and of the solutions sought by the Quichua people.\(^{128}\) RINCANCIE gave the communities much-needed organization, structure, and direction in ecotourism. RINCANCIE places tourists in appropriate communities, limits the number of tourists in each community, establishes and enforces guidelines for the tourists to follow, and conducts an obligatory educational entry seminar for each group of tourists to prepare them for their experience.

\(^{128}\) RINCANCIE Brochure. FOIN: Tena, Ecuador. 1996.
The code of conduct and norms for the tourists that RINCANCIE and Capirona developed was aimed at minimizing cultural, social and environmental impacts. Its effect has been positive and significant. Tourists are asked to follow the following list of guidelines, rules and norms:

- Enter the forest accompanied by a guide only, (both for safety and environmental reasons).
- Bathe in the river with biodegradable soap only.
- Be respectful of the different concept of space and time that we have.
- Do not give gifts to community members, only donations to the entire community are accepted.
- Do not give individual tips.
- The garbage policy is "if you carry it in, you carry it out."
- Do not collect any living material or part of our environment.
- Do not mistreat or kill any vegetation, insects or animals.
- Avoid intimate contact with community members which could disturb ethical traditions.
- Avoid public displays of affection.
- Wear simple practical clothes that will protect you from vegetation and sun that you do not mind damaging.
- Never go the bathroom in or near a body of water.  

These norms were developed after Capirona experienced several instances of degrading, inappropriate, or annoying behavior from the tourists. Since the creation of these norms and the educational training session for tourists began, the villagers found the tourists to be much more respectful and conscientious.

The most striking aspect of the Capirona to most visitors is the amazing sense of a tight, cooperative community. The president, Miguel Mamallacta explains that,

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"it is very peaceful and easy here because we all work and do everything together. There is a great cooperative union that brings us together for work and play and to talk about how things are going in the community. We run our community together, and no one is in charge, not even me, because we all are in charge together." They truly seem like one big family, cooperating and sharing everything. They pass drinks and food around so that one mango might pass among the mouths of 10 children. Almost every woman between the ages of 14 and 40 has a baby on her shoulder, and one baby was being breastfed and cared for by three women. Although the families do have different houses, rarely do any families work in their own fields or build or repair their own house. Almost all the work to be done - whether individual, family, or communal work, is shared by all with "mingas", or community work projects. Most mornings when no tourists are present, everyone meets at someone's agricultural plot to plant seeds together, or at a trail head to clear trails together, or at someone's house to repair a leaky roof. While they work, they joke around and drink until they can work no more, which leads to the most evident flaw of the community.

Alcoholism was the only serious problem observed at Capirona. My interview with the president had to be rescheduled three times because each afternoon when we returned from the mingas, he was too drunk. The amount of drinking, according to the community members, has not increased since the beginning of the ecotourism project. Though they do have more money to buy alcohol, the alcohol they drink is called "chicha" and they make it themselves from fermented yucca that they grow. Drinking makes their work seem like play, but it becomes a problem when people drink too much, and do not do their share of work. When someone realizes he or she did not do their share of work, they make up for it later.

The way that the community income and finances are dealt with proves the equality and communal nature of Capirona villagers. Instead of being paid
individual salaries, they unanimously decided to invest the majority of the money made from the ecotourism directly into the community itself, toward improving the ecotourism facilities, buying seeds or medicine if someone is sick. Individuals are not responsible for buying their own medicine, since the community grows and gathers many of their own medicines which can be taken freely, and sickness of one member is seen as the concern and responsibility of the entire community. The remaining money is distributed to the community members for personal needs, though it is a very small amount of money (average is about $5 a week). Furthermore, the president of the community is not the permanent president, but the position changes hands every year, and every community member has the opportunity to be the president if the individual so desires and the community agrees. The president is unpaid during the presidential year, though the rewards in respect make up for the lack of income.

To avoid the monotony of a single profession, the community members do different jobs every day, and the variety keeps them excited about working. One day, a woman might cook for the tourists, and the next day she might do a cultural demonstration, lead a bird-watching trip in the dug-out canoes, or work on the crops.

After the success of Capirona, RINCANCIE solicited thirty other indigenous communities in the area to participate in similar projects. Unfortunately, none of them were as successful as Capirona. In some cases, the ecotourism caused social problems when the community members wanted to get individual income rather than communal income, which led to some people becoming much wealthier than others. RINCANCIE decided that many of the communities were not well suited for ecotourism for various reasons, and have since cut back to 10 communities, emphasizing quality rather than quantity.
The Use of Economic Instruments in Biodiversity Conservation Projects

Analysis of sustainability variables

The capacity building of Capirona was very high, receiving a perfect score of 10 (see table 11a). Everyone interviewed was enthusiastic about the ecotourism, and the motivation of the community as a whole and of the leaders was evident through their desire to continually find ways to improve the project. The training program is excellent and the education of both the participants and the tourists is ongoing. Villagers are using their newly acquired skills on a daily basis.

The environmental sustainability of the Capirona ecotourism project is equally high, also receiving a score of 10 (see table 11b). The resource use is very sustainable, and there were efforts being made to prevent any potential secondary impacts such as boards to walk on in the trails to minimize erosion and aquaculture tanks to allow fish populations to recover. There is no direct and sustained natural resource extraction, other than the occasional use of wild plants for medicines and other purposes. The local environmental awareness is very high, as it is an integral part of the Quichuan culture, that has been strengthened by the environmental education they have received from Jatun Sacha, RINCANCIE, and the seminars they hold. As Miguel Mamallacta explains, "we think about how our actions impact our environment more now... before, we had to do things that hurt our forest so that we could survive. Now we have plenty to eat, and our priorities have shifted, so that we can afford to protect our ecosystem. Before, we used to use dynamite for fishing, but now we don't even need to fish from the river at all, since we raise our own fish."

The economic sustainability of the project was very high as well. Its only non-positive score comes from the fact that tourism is a luxury that is not particularly resistant to fluctuations in world market prices. However, the fact that Capirona has so many other economic alternatives to depend upon makes the community less

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vulnerable to such price changes, so Capirona received a neutral score for this category. The project is completely self-sustaining, as Capirona is no longer receiving any direct funding. Community-members are making much more money than they were harvesting corn, and the immediate needs of the community are being met. Externalities are internalized since the opportunity cost of conservation is made up for by the tourist fees. The overall score for economic sustainability was 9 (see table 11c). Capirona's overall score for sustainability was a very high 9.6.

Table 11: Sustainability of Capirona Ecotourism

a. capacity building

<table>
<thead>
<tr>
<th>Motivation &amp; enthusiasm</th>
<th>Training program?</th>
<th>Ongoing education?</th>
<th>Are people using their skills?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

b. Environmental sustainability

<table>
<thead>
<tr>
<th>sustainable resource use*</th>
<th>avoiding secondary environmental problems?</th>
<th>Local environmental awareness</th>
<th>environmental education?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

c. Economic sustainability of Capirona Ecotourism

<table>
<thead>
<tr>
<th>Product/service</th>
<th>resistant to fluctuation?</th>
<th>Self-sustaining?</th>
<th>More $ or benefits than before*</th>
<th>Internalize externalities?</th>
<th>Immed needs met?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ecotourism</td>
<td>n</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>9</td>
</tr>
</tbody>
</table>
Analysis of factors influencing the sustainability of Capirona

Local Participation

Capirona had a very high level of local participation and control, scoring a 9 (see table 11). The participation rate is 100% of the community (excluding only babies), with even children participating in the cultural activities for the tourists. The average number of hours people work on the ecotourism depends on the week, (some weeks, they may work every day while other weeks they may receive no tourists). The average, however, was quite low, since the total number of days with tourists at Capirona was 120 in the entire year (1997-98). After counting up the days and telling the people, they said seriously: "Wow! Look at us workaholics! We should take a break!" They received about 700 tourists during the year in all. Their level of involvement in the design and implementation was maximum, since they designed and implemented the project on their own. The decision-making power is also completely egalitarian and local, and the communication within the community and to RINCANCIE is very open and frequent.

Table 11. Local Participation at Capirona

<table>
<thead>
<tr>
<th>percent of community involved</th>
<th>average #hours per week</th>
<th>involvement in design &amp; implementation?</th>
<th>communication</th>
<th>decision-making power</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>9</td>
</tr>
</tbody>
</table>

Creation and distribution of local revenue

The income distribution at Capirona is very equal, since instead of getting paid individual salaries, the majority of the money made from the ecotourism is invested directly into the community itself, and goes toward improving the ecotourism

facilities and buying communal things. The remaining money is divided equally among community members who expressed that they were content with their salary and the income distribution of the community, and several said that it was "more than enough". The president and the director do not receive any income during their time "in office," which shows that Capirona has a reversed financial structure when compared to most projects or businesses. Of the fees tourists pay, 90% of it goes straight back to Capirona, while 10% supports the administration and functioning of RINCANCIE, and the advertisement of Capirona, making the project possible. The score for creation and distribution of local revenue was a perfect 10 (see table 12).

Table 12. Creation and Distribution of Local Revenue at Capirona

<table>
<thead>
<tr>
<th>% of $ that stays in community</th>
<th>average amount of $ per person per week</th>
<th>primary source?</th>
<th>Non-monetary benefits?</th>
<th>distribution of economic benefits</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

Amount and source of funding

Capirona and RINCANCIE have received funding from local indigenous organizations and several international development organizations. The indigenous organizations are FOIN, the Federation of Indigenous Organizations and CONFENAIE, the Coordinating Foundation for Indigenous Organizations of the Ecuadorian Amazon. The international groups are the Swiss Foundation for Interamerican Development, the Canadian Development Foundation, and Ayuda en Acción, a Spanish NGO. The level of funding is currently very low, as the communities have already gained self-sufficiency. When RINCANCIE was starting the program, the organization received a total amount of US $30,000 for

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Footnote:

administration, infrastructure, and training, and US $8,600 for technology and service transfer from all of the contributors.\textsuperscript{133}

Table 13. Source and Amount of Funding at Capirona

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>Amount of funding</th>
<th>length of funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>local NGO's,</td>
<td>high initially,</td>
<td>heavy for a short time</td>
</tr>
<tr>
<td>some national</td>
<td>then low</td>
<td>then low for a long time</td>
</tr>
</tbody>
</table>

Social and cultural holism

Capirona is also very culturally and socially holistic, receiving a score of 10 in this category (see table 14). The social systems are preserved by the continuation of communal work and the emphasis on protecting Capirona from any social transformations. The social equity is high because of the egalitarian systems discussed earlier, and all the technology used is appropriate and local, with the exception of several new items which greatly enhance the safety and practicality of the project (i.e. a radio for contact with Tena, a motor on a dug-out canoe, binoculars for wildlife observation, an oven for food preparation, and an electric generator to light the stage for the cultural presentations at night). As Cesar Andy explains, "Our living conditions have improved so much with this project. At first, too many tourists came and we had no time for agriculture and relaxing. Then we realized that we should have fewer tourists and more economic alternatives, to diversify our economic activities. These things let us live more comfortably, but we are careful not to buy things that we do not need."

\textsuperscript{133} Tarquino Tapuy, director of RINCANCIE, personal communication. Tena, Ecuador, January 18, 1998.
Table 14. Social and Cultural Holism at Capirona

<table>
<thead>
<tr>
<th>preserves social systems</th>
<th>social equality</th>
<th>appropriate technology</th>
<th>preserves cultural systems</th>
<th>preserves value systems</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

As Miguel Mamallacta explains, “We want the same culture that our grandparents left us, only adjusted to the present. Now, more than ever, we realize the importance of preserving our culture - and how preserving our culture is imperative to the survival of our forests, and ourselves. Sharing our culture with others and working with RINCANCIE has helped us realize this.” There is a program of careful and frequent monitoring of socio-cultural impacts of ecotourism at Capirona, conducted by yearly conferences attended by members of the community, RINCANCIE, and other indigenous and conservation organizations. These conferences have led to several important concerns being raised.

When the program first began, community members were worried that important cultural traditions, such as the farewell celebration which they share with each group of tourists, might become “meaningless copies” of the real thing. These traditions have not become routine, however, partly because the farewell celebrations were performed almost as often before tourism, when other visitors came to the community, or when a community member left for another village.

Some of the tourists have complained of the lack of “authenticity” of some aspects of Capirona, particularly tourists with misinformed, romanticized expectations of naked Indians living with no influence from the modern world. When they instead see people with commodities such as radio, ovens, and an electric generator, they do not see how much these things benefit the community. Indigenous communities are not frozen in time and they are using what they decide
they need for their development, controlling their own destiny, and that is real cultural authenticity. Self-determination and sufficiency in a changing world is more important than living up to false perceptions of authenticity and the people at Capirona know this. There have been differences between what the community sees as beneficial to their development and what they need to remain an attractive tourist destination. However, the educational program before the tourists enter the community helps them readjust their expectations to better understand the needs and struggles of indigenous communities.

It is also important to consider whether the local market near Tena might be already saturated with socially and environmentally responsible ecotourism. Although the tourism has shown no sign yet of decreasing, it is possible that this may happen in the future, as everyone who wants to and has the means to visit an indigenous community doing ecotourism in the Ecuadorian Amazon has already done it.

Another concern was how the tourism would affect the children and young adults; whether the exposure to tourists would make them want another lifestyle, or whether they would develop an overly service-oriented attitude to the tourists. It is obvious that this is not happening yet. As Samuel Vargas, the 17 year old, most highly educated member of the community told me "What I want to do with my life is be a guide here. I’m on my fifth year of apprenticeship with a guide. I might go to university next year to study sustainable agronomy or botany, but I know that I will come back to spend my life at Capirona as a guide. I could not leave my home. My sister Clemencia fell in love with a man from another community and moved to his community to marry, but she is one of the only ones who has left"134 The average child is educated from age 7 to age 12 or 13 at Capirona. Most of the children are

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literate, Speaking both Spanish and English, though many of the adults are still learning Spanish and neither read nor write.

Many feel that Capirona is a unique example of successful indigenous ecotourism in Amazonia and the reasons for its success are many, including good communication, cooperation, equality, respect, education, and the variety of economic alternatives that is actively pursued.

The open, frequent communication and participation of all community members is integral to the structure of the community. The fairness of everything is astounding, as everyone's voice is equally important and the pay system is so egalitarian. The community holds monthly meetings of all community members to discuss the progress, and any effects, issues or problems related to the ecotourism project or general functioning of the community. "This open communication is key in preventing problems and reminding ourselves of the purpose of the project if need be. These meetings raise conflicts, impacts we hadn't thought of, and we work out a solution to everything together, before it becomes serious." The leaders realize the importance of everyone feeling like he or she has some control over the project and believe that cultural elements should not be compromised to make things more comfortable or interesting for the tourists. "The interests of the community as a whole are always the most important and never go above the interests of the tourists."

Others feel that the key to success is in the project's focus on education of the tourists and villagers. Education of the community members concentrates on how to best fulfill the needs of tourists without sacrificing any part of their culture. It also

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helps community members learn Spanish, and learn more about the ecology and environmental issues of the region. The guides are trained in ecology at the Jatun Sacha Biological Station. The education of the tourists consists of an educational entry seminar at the RINCANCIE office which involves the discussion of cultural norms, problems and pressures facing indigenous people, and how the tourist can make the most out of his or her experience. Furthermore, the entire stay at Capirona is meant to be educational.

Another possible reason the program functions so smoothly is because of the selection process of the tourists. Not any tourist willing to pay can automatically visit Capirona or other RINCANCIE communities. The tourist must actually apply, and participate in the afternoon preparation class before visiting the community. The selection of tourists is based upon their interest in the environment and culture of the community, their physical condition (due to the strenuous journey into the community which involves a long canoe ride and a three hour hike over mountain cloud forests), and their estimated level of cultural understanding which RINCANCIE determines by their education, profession, or an interview.

Cesar Andy, the program director, feels that “the reason we have been more successful than the other communities is because we didn't want to switch 100% to making our lives revolve around ecotourism. We also have many other economic alternatives that we pursue on a daily basis.” For example, in response to the decreasing fish stocks in the river, the community built four aquaculture tanks, in which they raise fish for their own consumption and that of the tourists. They also spend much, if not most, of their time on their "chacras," or agricultural plots. They grow dozens of foods - fruits, corn, grains, lots of vegetables, chickens and eggs.

138 Although more community members are learning Spanish to interact with the tourists, when tourists are not present, only Quechua is spoken.

making food purchasing from the outside almost unnecessary. These activities significantly reduce their dependence on exterior markets. They also have a small store where they sell handicrafts made at Capirona, like ceramics, baskets, woven bags, jewelry, and local clothing as well as other products they make, like natural biodegradable soap, medicinal plants, organic dyes, and nuts. Many of these items could be sold outside of Capirona as well to further supplement their income if it was needed.

All of these factors were important in leading to a successful project, but it seems that the most obvious strengths of the community are the cooperative, welcoming, egalitarian nature of the community, and the care, foresight, and deliberateness with which the project was planned and managed. Every step and change is fully discussed and well thought-out with consideration of many perspectives. As Miguel Mamallacta explains, "we carefully chose a method that we hoped would allow us to develop sustainably, and it really has." 140

The Capironas of ecotourism are few and far between. Xavier Sylva del Pozo explains that the people of Capirona do not want to make their community into an anthropological museum, they just want to gain equality and the ability to protect their land and culture. The factors leading to success are very specific and not found in many other communities. It has proved difficult to replicate the success of the Capirona program even in other similar communities in the area within the same network of RINCANCIE. Cesar Andy, the ecotourism director, explains that "ecotourism is not just a source of income for us, it is a way to achieve our Quichua objectives of cultural and environmental preservation and self-sufficiency." 141

Case Study #4: Antisana

Project description

The Antisana Foundation is an Ecuadorian NGO working to ensure the sustainable management of the Antisana Ecological Reserve through community involvement. The Antisana reserve is a 325,000 acre reserve, and the principle watershed for Quito. The ecosystem is the only home of many threatened and endangered species and one of the most important undisturbed natural transects from the Amazon rain forests to the Andes. The reserve is suffering significant threats of biodiversity loss from deforestation, the burning of grasslands, soil erosion, the extraction of medicinal plants, hunting, the exploitation of mineral resources, and land invasions within the reserve.

An ecotourism project has recently been implemented at the reserve, initiated by The Nature Conservancy. The Antisana ecotourism project aims at improving the standard of living of the local mestizo and Quichua indigenous communities by putting their skills to work on ecotourism activities aimed at biodiversity conservation. A significant percent of the profits are invested in heightened protection of the Antisana Reserve lands and in environmental education efforts aimed both at the tourists and the local guides. The project has trained almost all of the locals as guides, interpreters, ecologists and cooks among other things. The Nature Conservancy provided technical assistance and the tools and resources necessary for the communities to construct cabins for guests to stay in. The cabins and the rest of the facilities were constructed by the community-members themselves with all local materials.

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An integral part of the ecotourism project is the cultural program. A special effort is being made to recover and re-instill vanishing native customs and traditions through ecotourism.\textsuperscript{143} Local customs and traditions are shared with the guests through folklore, participation in making traditional arts and useful crafts, and a welcoming ceremony with dance and song, somewhat similar to the cultural program at Capirona. Aside from the ecotourism project, the foundation is also sponsoring frequent seminars and conferences on various environmental issues mostly related to reserve management and ecotourism.\textsuperscript{144}

Analysis of the sustainability variables for Antisana

The capacity building of the Antisana project is very high, scoring a 10 (see table 15a). There was a training program for the participants, who attend ongoing seminars and workshops. The participants are using the skills gained from the training, such as ecological knowledge, personal relations with guests, building and maintaining trails, and teaching visitors about the natural and cultural history of the region.

The resource use is very sustainable, as well, scoring a 7.5 (see table 15b). The resource use is indirect, as there is no extraction of raw materials or agriculture going on. It is unknown whether there are any secondary environmental problems related to the project. Local environmental awareness is growing with the attendance at environmental seminars and workshops.

Economically, the project appears to be slightly less sustainable, receiving a score of 7 (see table 15c). As explained earlier, tourism is not very resistant to price fluctuations, and the community relies almost solely on ecotourism. For many communities, ecotourism has proven not to be a steady or dependable source of


\textsuperscript{144} Unfortunately, not as much information is available on Antisana because this project was not visited as part of the field study.
income. The project is relatively financially self-sustaining (although it is still receiving some funding), the people have more money than they did before the project, and their immediate needs are being met. Ecotourism inherently internalizes externalities, since the costs of conservation are internalized by the fees that tourists pay. The overall score for Antisana's sustainability is a 9.

Table 15. Analysis of sustainability of Antisana ecotourism

<table>
<thead>
<tr>
<th></th>
<th>Motivation &amp; enthusiasm</th>
<th>Training program?</th>
<th>Ongoing education?</th>
<th>Are people using their skills?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. capacity building</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>sustainable resource use*</th>
<th>avoiding secondary environmental problems?</th>
<th>Local environmental awareness</th>
<th>environmental education?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Environmental sustainability</td>
<td>+</td>
<td>n?</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Product/service</th>
<th>resistant to fluctuation?</th>
<th>Self-sustaining?</th>
<th>More $ or benefits than before*</th>
<th>Internalize externalities?</th>
<th>Immediate needs being met?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>c. Economic sustainability</td>
<td>eco-tourism</td>
<td>-</td>
<td>n</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>7</td>
</tr>
</tbody>
</table>
Analysis of the factors influencing sustainability for Antisana

Local participation and decision-making power

Concerning local participation, almost the entire community is involved in this project, and the time commitment fluctuates depending on the tourist season. The project was designed by locals, in conjunction with the Antisana foundation and The Nature Conservancy. The initial idea and impetus for the project came from The Nature Conservancy, however. There is daily open communication with the Antisana Foundation and less frequent communication with The Nature Conservancy. The level of actual decision-making on the part of local people is unknown, but since some community members manage the reserve, it is assumed that at least some of them have significant decision-making power. The NGOs are in close contact and daily communication with the community, and relations are friendly. Antisana received a score of 9 for local participation and decision-making power (see table 16).

Table 16. Local Participation at Antisana

<table>
<thead>
<tr>
<th>percent of community involved</th>
<th>average # of hours per week</th>
<th>involvement in design &amp; implementation?</th>
<th>communication</th>
<th>decision-making power</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>n</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>9</td>
</tr>
</tbody>
</table>

Creation and distribution of local revenue

All of the revenue created goes directly to the community. The average income is unknown, although it is certainly more than was made before. The community was mainly a subsistence community, and ecotourism will hopefully increase their well-being, although the project is focused more on conservation and education than on profit-making. It is the primary source of income, and non-
monetary benefits are involved as well (education). The benefits thus far have been distributed relatively, with all activities being open to participation of any community member. All of the revenue created by the project will either stay within the hands of locals or be used for park management or the acquisition of more land to conserve. Antisana's score for the creation and distribution of local revenue was 10 (see table 17).

Table 17. Creation and Distribution of Local Revenue at Antisana

<table>
<thead>
<tr>
<th>% stays in community</th>
<th>average amount $/person/week</th>
<th>primary source?</th>
<th>non-monetary benefits?</th>
<th>distribution of economic benefits</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+?</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

Social and cultural holism

The level of cultural preservation at Antisana is thus far high, with the renewed traditions shared with the tourists. There is potential however, for significant socio-cultural impacts with such frequent exposure to Western culture (as there is in the case of Capirona). There is also the possibility of a change in value systems with the introduction of a profitable economic activity to a former subsistence society. There is no formal system of monitoring or preventing social and cultural transition, though the project was designed to avoid this possibility. The social equality is neutral, because although everyone has an equal opportunity to participate, some of the remaining class hierarchies between the mestizos and the indigenous people remain, and it is unclear whether ecotourism will lessen or

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increase those inequalities. The score for social and cultural holism is 8 (see table 18).

**Table 18. Social and Cultural Holism at Antisana**

<table>
<thead>
<tr>
<th>preserves social systems</th>
<th>social equality</th>
<th>appropriate technology</th>
<th>preserves cultural systems</th>
<th>preserves value systems</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>n</td>
<td>+</td>
<td>+</td>
<td>n</td>
<td>8</td>
</tr>
</tbody>
</table>

**Source and amount of funding**

The funding for the project is average, with the NGOs supplying the physical resources and training for the community to implement the project. This method of funding will hopefully breed self-reliance rather than dependence on continuous financial flows. The donors came up with the idea for ecotourism, but they seem to be more on "tap" than on "top".

**Table 19. Source and amount of funding at Antisana**

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>Amount of funding</th>
<th>length of funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>international conservation group,</td>
<td>average</td>
<td>unknown</td>
</tr>
<tr>
<td>local NGO's</td>
<td>but will decrease</td>
<td></td>
</tr>
</tbody>
</table>

It seems that as long as the project stays small and remains more conservation-oriented than profit-driven, and the locals maintain their sense of culture and community, this project has the potential to be successful and sustainable. The relative lack of experience of this project (it is about four years old) is typical of most ecotourism projects funded internationally in the Ecuadorian Amazon, and makes it

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146 Many of these answers were obtained through personal communication with Sylvia Schmidt, a former researcher at Antisana.
more difficult to analyze the variables of sustainability. So far, it is a successful and sustainable example of indigenous ecotourism, as is Capirona.

Conclusion

The examples of Capirona and Antisana are unfortunately not typical examples of indigenous ecotourism in the Ecuadorian Amazon. Most ecotourism projects are much less careful about protecting the indigenous culture than these projects are. There are many operations based out of Tena, Misahualli, and Coca, (the three largest towns in the Ecuadorian Amazon) that involve “indigenous tours” run by non-indigenous mestizos or foreigners that bring tourists on canoe trips which stop at indigenous communities. These frequently involve gawking at the natives, the community members awkwardly looking back at the tourists, and the guide explaining various cultural traditions. When programs do involve tourists spending time with indigenous people, this frequently leads to serious social and cultural problems within the community as explained earlier. Furthermore, many larger scale ecotourism projects in the area have promoted environmental degradation because their improvement in infrastructure, with better roads, for example, can make it easier for the locals to engage in environmentally harmful activities as well, such as logging.147

The average sustainability of Capirona and Antisana are both very high; 9.6 and 9 respectively. Both projects had high scores of 10 for capacity building, and environmental sustainability, and were slightly lower for economic sustainability (Capirona scored a 9 while Antisana scored a 7). Both received scores of 10 for the creation and distribution of local revenue. Both received 9 for the level of local participation. Therefore, both local participation and local revenue were very highly

correlated with sustainability. This implies that local participation and decision-making power as well as the creation and distribution of local revenue are important factors in ensuring the sustainability of a small, community-based ecotourism project. Social and cultural holism was also strongly correlated with sustainability, since Capirona received a 10 and Antisana scored an 8 for holism. The only factor of sustainability that did not seem strongly correlated with sustainability was the source of funding. The main funding source for Antisana was a large, international conservation organization, who also initiated the project, while the Capirona project was funded by local indigenous NGOs, and became self-sufficient quickly. Both projects did, however, have a strong local organization working for them. It therefore seems that a community-based ecotourism project can be sustainable whether funded mainly by a local organization or a large international conservation group, as long as there is a strong local organization that has some power. The other factor to consider is that Capirona has been managing itself successfully for over 10 years, while the Capirona project is only four years old, so its sustainability scores are more preliminary than those for Capirona.

Ecotourism projects should remain relatively small, and focused on community and ecosystem health. Local people should have decision-making power, but it should not necessarily be unlimited, because of the danger of several individuals creating a money-making facility that doesn't distribute benefits evenly. As Marc Dourojeanni explains, "Participation should not be simply a mechanism to allow people to do what they desire, but to do what is needed for the long-term welfare of the majority."148 A good ecotourism project should be a low-impact, educational sustainable, non-consumptive, culturally appropriate and enlightened

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form of tourism. Understandably, and partly due to tourism’s profitability, this is rarely achieved.

True ecotourism that fits the definition of socially, environmentally, and culturally appropriate and educational, is almost always better for the local people and the environment than mass commercial tourism, and many of the less sustainable and less genuine ecotourism operations are also better than mass tourism. Ecotourism can be an important aspect of an integrated conservation and development project, but it should not be the only part. If it is, the danger of the focus turning toward profit generation and away from conservation and sustainable community development is great. As demonstrated by the sustainability of Capirona, ecotourism projects are most successful when they are part of an integrated strategy of sustainable development.
Chapter 4:
Responsible Bioprospecting or Reprehensible Biopiracy?

figure from cover of COICA’s Neustra Amazonia. July 1996.
Defining Bioprospecting

In recent years, cures for cancer, AIDS, and other diseases may have been irreparably lost because too much biological raw material and indigenous knowledge has been irreversibly destroyed. Many believe that bioprospecting will prove the ultimate salvation to biodiversity; as an important way for tropical communities to supplement their income and develop sustainably, and a way to save lives with potential cures to widespread diseases.\(^{149}\) Bioprospecting attempts to discover the amazing untapped potential of tropical forest species for yielding useful drugs by extracting and screening biological samples and using part of the revenue gained for conservation. Under certain ideal but slightly unrealistic circumstances, it could be a successful and sustainable solution that harmonizes economic development with biodiversity conservation and proves to policy-makers the value of biodiversity. Unfortunately, however, bioprospecting has almost always been more like biopiracy: the unjust exploitation of biological diversity and indigenous knowledge for the benefit of large international corporations with meager or no compensation to the source community and no investment in conservation. It is difficult to ensure that much if any of the revenue from bioprospecting goes to supporting conservation.

Bioprospecting is the exploration, extraction, and screening of biological diversity for commercially valuable genetic resources to be used as chemical products, pesticides, food, and, most commonly, medicines. Bioprospecting should involve the disciplines of botany, pharmacology, anthropology, chemistry, economics, ecology, and sometimes agriculture. However, in some projects, one or more of the integral disciplines are largely overlooked and biopiracy can result. There are two types of bioprospecting; the first is the collection, screening, and testing of random samples. The second is ethnobotanical prospecting, which involves pharmaceutical companies using leads from indigenous people who use the plants

\(^{149}\) Vogel, Joseph Henry. *The Successful Use of Economic Instruments*. p.34.
as medicines, and essentially buying (or taking) their knowledge. Once a successful specie is identified, it is either chemically synthesized or harvested in the native area.

Ethnobotanical bioprospecting is much more successful overall than random sampling and can save pharmaceuticals significant amounts of money. The success rate of random tests is one marketable product found in 10,000 tested species, whereas with ethnobotanical prospecting, the success rate has been as high as one of every two products tested. Considering these statistics, it seems that drug companies would focus exclusively on ethnobotanical prospecting; however, they rarely do. With ethnobotanical bioprospecting, the concern with compensating indigenous communities for their knowledge arises, a problem that unfortunately has not been adequately addressed by pharmaceutical companies or international law. Vandana Shiva feels that with both ethnobotanical prospecting and random sampling, drug firms rob the Third World’s medicinal plants and have benefited from the free collection of biodiversity.

There is also competition amongst tropical countries to supply samples, and Joseph Vogel explains that a price war is emerging among supplying countries as each offers its biological diversity at lower and lower prices. Royalties to the country or community in some cases have been reported as low as 0.2%. In the case of biodiversity, competition is unfair and inefficient, because it drives the price of biological samples down and deprives countries from being reimbursed for the opportunity costs of conservation. It also generates low short-term revenues because many of the chemicals of interest to biotechnology firms cannot be efficiently gathered due to scattered distribution. Unlike the case of sustainable agriculture, where the knowledge should be shared free of charge, and the government should

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152 Vogel, Joseph Henry. The Successful Use of Economic Instruments. p.3.
even subsidize the spreading of such knowledge, in the case of bioprospecting, sharing the knowledge at low prices would be harmful to the ultimate objectives of biodiversity protection and community development.

Douglas Southgate feels that forest dwellers are unlikely to derive substantial income from any medicinal products that might be obtained from their ecosystems.\(^{153}\) One example is the well-known case of the rosy periwinkle found in the forests of Madagascar, which was found to treat leukemia and Hodgkin’s Disease. It grows in one of the world’s hot spots, but the local population received almost no revenue from the use of the rosy periwinkle. Other common drugs, such as birth control pills, pain killers, and cancer chemotherapy agents are all equivalents of former plant medicines used by traditional societies.

The Economics of Bioprospecting

The economic profitability of bioprospecting explains why tropical biodiversity is known as the South’s “green gold”.\(^{154}\) In 1990, the global sale of pharmaceutical products amounted to $130 billion a year, $32 billion of which is from products based on traditional medicine from tropical countries. Of the 32 billion, only 551 million of profit went to developing countries, though hardly any of it went directly to the indigenous sources of the knowledge and biodiversity.\(^{155}\) The Commission on Development and Environment for Amazonia reports a higher number, claiming that the three medicinal plants traditionally used by indigenous groups throughout the world represent $43 billion a year, a small portion of the world’s pharmaceutical trade. They report that none of the money comes back to the indigenous people who

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\(^{153}\) Southgate, Douglas. *Alternatives for Habitat Protection*, p.36.


supplied the knowledge.\textsuperscript{156} This demonstrates both the volume of world trade in pharmaceuticals and the extent of biopiracy.

The value of “undiscovered” plant-based pharmaceuticals in the tropical forest is much larger than the value of known plant medicines, and is conservatively estimated to be $147 billion.\textsuperscript{157} In the mid 80’s, pharmaceutical industry analysts warned that every medicinal plant species lost in the tropical forests could lose drug firms possible sales of more than $200 million.\textsuperscript{158} In the United States, a quarter of all prescriptions dispensed are substances extracted from plants, and over 40% are organism derived.\textsuperscript{159} Bioprospecting thus undoubtedly leads to economic growth for the world, however, its environmental and social desirability in relation to the source communities is contestable.

Several studies have been done to determine the economic value of tropical forests for pharmaceutical uses. D. Pearce and S. Puroshothaman found that the annual biodiversity protection value of tropical forests for genetic raw material with pharmaceutical potential is between $0.10 and $21 per hectare, which represents the cost of the loss of those potential genetic resources to deforestation.\textsuperscript{160} Reid et al. estimated the net present value of an untested species to be between $53 and $46,000.\textsuperscript{161} Simpson, Sedho, and Reid found that the highest marginal value of habitat for bioprospecting is in western Ecuador, at $21 per hectare. Unfortunately, this price is only about a tenth of what the region’s farmers are willing to pay for

\textsuperscript{158}“Medicinal Plants Lost?” Scrip-World Pharmaceutical News, October 1986, p 22.
\textsuperscript{159}Wilson, E.O. \textit{The Diversity of Life}. p.287.
cleared land.\textsuperscript{162} According to Jeffrey McNeely, the income generated from bioprospecting is alone not a significant source of funding for conservation.\textsuperscript{163} Southgate feels that the returns are almost certainly too small to justify the investment in property institutions required to establish efficient markets for genetic information.\textsuperscript{164} Michael Balick and Robert Mendelsen explain that if knowledge about tropical herbal medicines becomes more widespread and their collection increases, prices for certain natural medicines would fall. On the other hand, if more consumers become aware of the potential of herbal medicines or if the cost of commercially produced medicines becomes too great, demand would increase, driving prices of natural drugs up. Further habitat destruction would increase the scarcity of biodiversity, also driving up prices. Balick and Mendelsen predict that the value of tropical forests for the harvest of nontimber forest products will increase relative to other land uses over time as these forests become more scarce.

Southgate, however, feels that the value of medicines derived from plants today seems to be diminishing\textsuperscript{165} which might be partly due to the fact that it is often more efficient and effective to simply synthesize the compound in the lab which can be concentrated, and even strengthened, decreasing the need for the actual plant. In particularly diverse forests, for example, useful organisms are often widely dispersed, which means that most work time spent will be looking for something as opposed to extracting it, so synthesizing it would be more efficient.

Although the economic profitability of bioprospecting proves biodiversity as "the South's green gold", the South has not profited much from its exploitation. The

\textsuperscript{164}Southgate, Douglas. Alternatives for Habitat Protection, p. 2.
\textsuperscript{165}Southgate, Douglas. Alternatives for Habitat Protection, p. 37.
mines are being stripped by companies from the North, largely because of the lack of international regulations on bioprospecting.

International Regulations on Bioprospecting

Bioprospecting involves many more legal issues than does ecotourism or sustainable agriculture, and its sustainability depends directly upon the structure and function of the international and local laws concerning bioprospecting, intellectual property rights, and national sovereignty. It is thus imperative to review the current laws that protect, or don't protect, countries from biopirates.

Bioprospecting is not a new idea; plant collectors have been collecting and bringing back to the North since colonial times. In earlier times, however, no money was exchanged, and the source countries had no legal rights. Unfortunately, the rights of source communities today are not what they should be. As Darrel Posey hypothesizes, "if something is not done now, mining of the riches of indigenous knowledge will become the latest- and ultimate - neocolonial form of exploitation of native peoples."\(^{166}\) The lack of uniform international standards to treat bioprospecting discoveries, patents, royalties, and enforcement is allowing and even encouraging biopiracy.

There have been a number of international conferences and treaties affirming the intellectual property rights of indigenous peoples in relation to bioprospecting, however, their ability to protect communities from irresponsible behavior of pharmaceutical companies is unclear. The 1992 Charter of the Indigenous-Tribal Peoples of Tropical Forests declared the willingness of indigenous peoples to share their knowledge with humanity "provided we determine where and how it is used".

The World Conference of Indigenous Peoples on Territory, Environment and

Development called for the criminalization of "the usurping of traditional medicines and knowledge from indigenous peoples." Article 24 of the Declaration on the Rights of Indigenous Peoples drafted at the conferences of the United Nations International Year for the World's Indigenous Peoples, entitled indigenous peoples to "the full ownership, control and protection of their cultural and intellectual property." The South Pacific Regional Consultation on Indigenous Peoples' Knowledge and Intellectual Property Rights (1995) reaffirmed that "imperialism is perpetuated through intellectual property rights systems," and even declared a "moratorium on bioprospecting in the Pacific."\(^{167}\) The First Symposium on Ethnobotany and Economic Botany was held in Quito in 1992, and dealt with the bioprospecting issues and native uses of medicinal plants. Each of these conferences and agreements is a step in the right direction, and they have successfully raised awareness and strengthened the anti-piracy movement. Whether they have significantly reduced biopiracy, however, is unfortunately doubtful.

The most powerful international legislation on bioprospecting is the United Nations Convention on Biological Diversity (CBD). Until recently, access to biological diversity for bioprospecting was free and legally protected under the doctrine known as the "common heritage of mankind." In 1993, over 160 countries rejected the "common heritage of mankind" and ratified the Convention on Biological Diversity. The USA, however, was not one of these countries.\(^{168}\) The United States is one of the few countries in the world that has not officially recognized the intellectual property rights of indigenous peoples and urges many countries to ally and agree to protect the patent of their industrial products.\(^{169}\)


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The Convention, which entered into force in 1993, seeks to convert bioprospecting into an environmentally sustainable and equitable use of biodiversity; however, it offers no comprehensive multilateral mechanisms to make it happen. The Convention advocates bilateral bioprospecting agreements that give little control to the source country or community. The bilateral contracts create competition between source countries to see who will supply their biodiversity at a lower cost. It supports and protects the intellectual property of industrial corporations of the North without providing a way to justly recognize and reward the contributions of the source communities. As explained by the Rural Advancement Foundation International, "the terms and conditions under which indigenous peoples might benefit financially are usually controlled by Northern corporations that are free to claim intellectual property on indigenous knowledge and biodiversity. Indigenous communities find these systems culturally and ethically alien, as well as politically and economically inaccessible." Furthermore, the Convention provides no means for source countries or communities to effectively monitor or enforce commercial bioprospecting agreements. The effect of the Convention has not been to suppress biopiracy, but some believe that it has actually promoted it. RAFT claims that since the entrance into force of the Convention, a wave of biopiracy has enveloped the South, propelled in large part by the CBD's promotion of bilateralism.

Article 8J of the CBD recognizes the ownership of local communities of their traditional environmental knowledge, but Southgate points out that the same treaty also states that national governments have sovereign rights over things such as germplasm and their derivatives. The question of who owns biodiversity,

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national governments or local communities, has been a major source of conflict in bioprospecting. There is usually too great an emphasis on national government control and very little emphasis on control by those who are the most direct stewards of the biodiversity. It is obvious that the legal distinction between whose rights to the forests' resources prevail (national governments or local communities) would benefit by being clarified with some kind of international agreement. National governments usually want to be able to prevent local communities selling the resources or knowledge at too low a cost, and local communities want to be able to control rights to their biodiversity. The argument could also be made that the land belongs to local communities and they should be free to do with it what they please.

The following case studies provide contrasting examples of bioprospecting. The first is one of the only morally oriented pharmaceutical companies, making a noble effort to protect indigenous rights and biodiversity by an innovative system of compensation to source communities. The other is on the opposite end of the spectrum; a profit-driven pharmaceutical company that epitomizes biopiracy by patenting and commercializing a drug that is sacred to the hundreds of Amazonian indigenous groups who use it.
Case Study #5: Shaman Pharmaceuticals and Sangre de Drago

Project description

Shaman pharmaceuticals is often cited as an atypical representative of US pharmaceutical industries bioprospecting in the tropics. Dedicated to "ethical pharmaceutical production," Shaman integrates bioprospecting with biodiversity conservation, and shares benefits with traditional communities to form a direct interaction between ethnobotany and Western medicine. Shaman combines the sciences of ethnobotany, isolation chemistry, pharmacology, anthropology and the environmental sciences to create a more efficient, equitable and environmentally responsible drug discovery process. The company represents the first commercial US effort to work exclusively with tropical higher plants for the development of pharmaceuticals, and the first and only with a more equitable approach to bioprospecting. Shaman is a multimillion dollar business effort that could ideally make a fortune, save lives, and improve the lives of tropical source communities while protecting their environment.

To address equity issues, Shaman created a nonprofit conservation organization called the Healing Forest Conservancy. The Conservancy provides a structure for indigenous people to participate in the bioprospecting process, share the resource management responsibilities, and receive immediate and long-term benefits. The directors of Shaman's field research meet with indigenous leaders, scientists and physicians in host countries, non-governmental organizations, and local governments to find interested communities and Shamans (indigenous doctors and spiritual leaders) with whom they negotiate agreements. The researcher works

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176 King, Stephen R. "Pharmaceutical Discovery."
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with the Shaman, explaining various diseases so that the indigenous Shaman can point out which plants he uses to treat each malady.

The benefits provided to source communities fall into three categories: short-term, medium-term, and long-term. Short-term benefits include supplies, services, and direct funds; medium-term benefits involve the creation of sustainable agriculture supply industries within the communities, and long-term benefits are received when the products reach the market. These long-term benefits are in the form of projects that are proposed by the community themselves, and usually consist of health care services, water purifying systems, or legal expertise for land conservation battles. Thomas Carlson, director of ethnobiomedical field research for Shaman, says that “when Shaman starts generating profits, a percentage will be distributed among the indigenous people.” For every product marketed, Shaman has committed to return a portion of the profits to all the communities they have worked with, not only with the supplier of the marketed product. About 20% of the total field budget finances these projects. Unfortunately, none of these projects have thus far been initiated, since no medication has yet been marketed in the ten years of Shaman Pharmaceutical's business. The commercialization of several products is pending however, and the average time it takes a pharmaceutical company to find, develop and commercialize a new drug is typically twelve to fifteen years.

It is generally held that only about one in 10,000 chemicals derived from mass random screening of plants results in a potentially profitable drug. Shaman’s method has led to a 50% success rate; half of the 800 plants Shaman has tested have come out to be potentially profitable. The method Shaman uses to screen plants is

that if they find three distinct indigenous communities using a plant, they screen it. This "filter" of indigenous knowledge makes Shaman's method about 5,000 times more effective than random testing.\textsuperscript{182}

Eight compounds are being prioritized for clinical studies. Thus far, Shaman has patented three medicines which are now in clinical development, one that treats herpes, another that treats a children's respiratory disease, and a third is for the treatment of AIDS diarrhea.\textsuperscript{183} They are all in Phase II or III clinical trials. The first two compounds are derived from the Sangre de Drago (dragon blood) tree which has been used by native healers throughout Amazonia for millennia.

Shaman also works on sustainable harvesting methods for the plant products it is interested in marketing. This provides a way for the participating indigenous communities to gain a longer-lasting more dependable source of income. Shaman and its indigenous community partners are now trying to sustainably harvest Sangre de Drago at the Jatun Sacha Biological Station in Misahualli, Ecuador. Jatun Sacha is one of the several pilot projects that Shaman's Healing Forest Conservancy has undertaken to investigate equitable compensation and sustainable production.

Jatun Sacha (which means big forest in Quichua) is a non-profit center for biological and environmental investigation and education, run by locals and foreign volunteers (see Chapter 6 for a more complete description of Jatun Sacha). Unfortunately, representatives at Jatun Sacha have been disappointed working with Shaman Pharmaceuticals, and reported that the large amount of volunteer work they have invested in the sustainable harvesting project has not as of yet paid off.\textsuperscript{184} During personal interviews with the people at Jatun Sacha, it seemed that most of them had given up hope of benefiting from their deal with Shaman.


\textsuperscript{183} "Shaman Pharmaceuticals has been moving on big". (http://biz.yahoo.com/bw/97/10/30/shmn.html)

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Pharmaceuticals. They continue the project partly because the majority of the work and investments have already been made, and because of local interest in learning how to harvest Sangre de Drago sustainably for sale in Ecuadorian markets.

The Sangre de Drago tree grows in lowland Ecuador and produces a sap which has been used by many indigenous groups to treat various maladies. There are seven species of the Sangre de Drago tree, each with its own medicinal properties. It is used by Ecuadorian indigenous groups and mestizos as an astringent, antiseptic, bug repellent, anti-inflammatory, anti-itch creme, and as a cure for dysentery, rheumatism, hemorrhoids, herpes, and ulcers caused by stress, alcoholism, and hepatitis. The tree is also used for handicrafts, food, and wood. The sap is drained by various techniques mentioned later and then sold in markets, on the street, and in pharmacies in Ecuador. The present value of a single planting and harvesting cycle of the tree is about $250 per hectare, which exceeds the opportunity cost of land in the region.

Analysis of the Sustainability of Shaman's Sangre de Drago Project

Shaman Pharmaceuticals is significantly more sustainable than most bioprospecting companies. The project's sustainability is examined in the same manner the other projects have been regarded: with relation to the Ecuadorian community involved (Jatun Sacha), not the sustainability of Shaman Pharmaceuticals as a corporation.

The capacity building for the Sangre de Drago project with Jatun Sacha was relatively high, though not necessarily because of its involvement with the Shaman project. The community members seem to be enthusiastic and motivated to

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volunteer their time to any of Jatun Sacha's activities, including the Sangre de Drago Project. Those who participate in the Sangre de Drago harvesting did go through a training program. There is ongoing education at Jatun Sacha, but since the program runs independently of their affiliation with Shaman and does not cover the Sangre de Drago project, that category was rated neutrally. The people are using their skills, but again, the locals participate in all of the Jatun Sacha programs and do not gain many new skills from the Sangre de Drago project. However, if the project was considered in absence of the other projects at Jatun Sacha, people would be gaining skills from working with the Sangre de Drago, so that category was rated positively.

The overall score for Shaman's work at Jatun Sacha was 8.5 for capacity building (see table 20a). The capacity building score would probably be higher if Sangre de Drago was eventually successfully commercialized by Shaman, in which case community participation, education, and training would increase.

The environmental sustainability of the Sangre de Drago project is very high, since the tree is relatively easy to harvest in a sustainable manner. The harvesting is sustainable since, instead of using the method of cutting down the tree to extract sap, Jatun Sacha uses the traditional Quichua method of taking small samples that do not kill the tree. This method involves making a thin incision into the tree, inserting a leaf into the incision, and leaving a bottle underneath the leaf allowing the sap to drip down the leaf into the bottle. Furthermore, the tree's natural regeneration is rapid, and it can be harvested throughout the year. Local environmental awareness is high because of the environmental education program of Jatun Sacha, however, since it is unrelated to Shaman's project, the score for those categories is neutral. Shaman's overall score for environmental sustainability was 7.5 (see table 20b).

In examining the economic sustainability of this project, it is important to medicine is relatively resistant to fluctuations in world market prices. The company is self-sustaining, though the nonexistent profits of the company are not significantly
The Use of Economic Instruments in Biodiversity Conservation Projects

helping the community to sustain itself. They do, however, get some more money and benefits than they were before the project began. Immediate needs of the community are being met, though again, it is not due to the Sangre de Drago project. The score for economic sustainability was 7 (see table 20c). The overall score for sustainability (the average of capacity building, environmental and economic sustainability) was 7.6, which is quite high. It is important to realize, however, this sustainability score is for the Sangre de Drago project at Jatun Sacha alone, which depends completely on the sustainability of Shaman Pharmaceuticals itself, which was not analyzed. If Shaman remains without profits for too long, it might be impossible to continue the Sangre de Drago research, and the unsustainability of the company itself would cause the project to become unsustainable. The overall sustainability of the Sangre de Drago Project was a 7.6.

Table 20: Sustainability of Shaman's Sangre de Drago Project

a. Capacity building

<table>
<thead>
<tr>
<th>Training program?</th>
<th>Ongoing education?</th>
<th>Motivation &amp; enthusiasm</th>
<th>Are people using their skills?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>n</td>
<td>+</td>
<td>+</td>
<td>8.5</td>
</tr>
</tbody>
</table>

b. Environmental sustainability

<table>
<thead>
<tr>
<th>Sustainable resource use*</th>
<th>Avoiding secondary environmental probs?</th>
<th>Local environmental awareness</th>
<th>Environmental education?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>n</td>
<td>n</td>
<td>7.5</td>
</tr>
</tbody>
</table>

c. Economic sustainability

<table>
<thead>
<tr>
<th>Product/service</th>
<th>Resistant to fluctuation?</th>
<th>Self-sustaining?</th>
<th>More $ or benefits than before*</th>
<th>Internalize externalities?</th>
<th>Immed needs met?*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medications</td>
<td>+</td>
<td>n</td>
<td>+</td>
<td>n</td>
<td>n</td>
<td>7</td>
</tr>
</tbody>
</table>

Analysis of the factors influencing sustainability for Shaman
Local participation and decision-making power

Local participation with Shaman is potentially high if Sangre de Drago is commercialized. At the present time, however, there are about a dozen local people who work with Jatun Sacha, but not specifically on the Sangre de Drago project. Another several dozen foreign volunteers work at Jatun Sacha and sometimes help with the Sangre de Drago project. The perspective of local communities in general was strongly considered in the design of the project, since indigenous organizations were consulted regarding the best method of compensation. Communication between researchers, managers, and communities is very high. The project received a 5 for participation (see table 21).

Table 21. Local Participation and decision-making power

<table>
<thead>
<tr>
<th>% community involved</th>
<th>average # hours/week</th>
<th>involvement in design &amp; implementation?</th>
<th>communication</th>
<th>decision-making power</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>n</td>
<td>+</td>
<td>n</td>
<td>n</td>
<td>5</td>
</tr>
</tbody>
</table>

Creation and distribution of local revenue

Shaman has the potential to create a significant amount of non-monetary benefits for the community if Sangre de Drago is commercialized. Most of the money made by the commercialization would not remain within the community, however, since much would be kept as profits, and a large portion would be distributed to other communities that Shaman has worked with. The Sangre de Drago project is not the primary source of revenue for anyone in the community. The benefits are distributed very equally, since they are a public good, and non-monetary benefits could be very high. The community ends up with more benefits than they had before the project, even if the medicine is not commercialized, since
some benefits have already been gained (such as goods and services related to the agriculture project and education on sustainable harvesting). Shaman received a 4 for creation and distribution of revenue (see table 22).

**Table 22. Creation and Distribution of Local Revenue for Shaman**

<table>
<thead>
<tr>
<th>% stays in comm.</th>
<th>av. amt. $/person/week</th>
<th>primary source?</th>
<th>Non-monetary benefits?</th>
<th>distribution of economic benefits</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>4</td>
</tr>
</tbody>
</table>

**Social and cultural holism**

Shaman's influence on social, cultural and value systems is probably neglectable, since the community involvement is so minimal and the project is so similar to other projects at Jatun Sacha. The social equity is high, since everyone has an equal opportunity to participate. The technology used at the local level is appropriate, since native Quichua techniques are used. The project is relatively holistic socially and culturally, scoring a 6 (see table 23).

**Table 23. Social and Cultural Holism of Shaman’s Sangre de Drago Project**

<table>
<thead>
<tr>
<th>preserves social systems</th>
<th>social equality</th>
<th>appropriate technology</th>
<th>preserves cultural systems</th>
<th>preserves value systems</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>+</td>
<td>+</td>
<td>n</td>
<td>+</td>
<td>6</td>
</tr>
</tbody>
</table>

**Amount and source of funding**

The source of funding is private, from Shaman Pharmaceuticals, and the benefits come from Shaman’s NGO, the Healing Forest Conservancy. The current amount of funding is long-term and low, but if the drug were commercialized, it would be much higher (see table 24).
Table 24. Funding of Shaman's Sangre de Drago Project

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>Amount of funding</th>
<th>Length of funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>private pharmaceutical and NGO</td>
<td>low, but potentially high</td>
<td>long</td>
</tr>
<tr>
<td>(Healing Forest Conservancy)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A serious mistake that Shaman made was in choosing to employ a company called DTM to help them exploit Sangre de Drago before the project at Jatun Sacha. DTM is well-known for not respecting indigenous organizations. The company has been denounced by the Indigenous organizations of Ecuador for facilitating the destruction of archaeological sites by hiring US archaeologists to collect all the archaeological evidence over a few days from sites that are "in the way" of development schemes such as oil wells. The sites are then bulldozed. Furthermore, instead of sustainably tapping the tree, DTM believes in the faster method of cutting down the tree for its sap. Informants claim that DTM's director was caught trying to smuggle 30 gallons of Sangre de Drago latex out of the country. After protests from several indigenous organization and conservation groups, Shaman decided after a short time to no longer work through DTM. 187 Unfortunately, its reputation had already been scarred, as demonstrated by an article entitled "Bioprospecting, Biopiracy and Indigenous Peoples," which put Shaman Pharmaceuticals in their "Bioprospector's Hall of Shame."188 This mistake does not effect the sustainability of the Jatun Sacha project directly, since it happened before the project at Jatun Sacha began.

Despite this mistake, Shaman Pharmaceuticals represents a meaningful step in the responsible direction for bioprospecting pharmaceutical companies. Shaman is

ethically, socially, environmentally and culturally superior to most US pharmaceutical firms. The fact that it has not yet commercialized any drug, however and has not produced significant benefits for the participating communities, cannot be ignored. Since its success rate is reputedly thousands of times higher than most pharmaceuticals, it is surprising and bothersome that they still have not made a profit, though Shaman has still not been around for the average 12-14 years that it takes to commercialize a new drug. The true sustainability of the Shaman Sangre de Drago project, or any of Shaman's projects, cannot be known until a profit is made and the community compensation projects are initiated.

It is important to examine the very few successful bioprospecting projects among the hundreds of other companies who blatantly commit biopiracy. Shaman represents a pharmaceutical effort that does not abuse existing international regulations, and economic conditions to make a profit. If those international regulations and standards could better protect tropical communities, biopiracy would not have to exist and Amazonia would have one less way to be robbed of their biodiversity and traditional knowledge.

Case Study #6: The International Plant Medical Corporation and the Patenting and Commercialization of Ayahuasca
The Shaman walked around me slowly in the complete darkness, the only light coming sporadically from the inhalation of air through the Shaman’s joint containing a sacred tobacco, and from the occasional brilliant illumination from heat lightning. I was living with a Quichua community in the Ecuadorian Amazon when the Shaman invited me to participate in a healing ceremony to cure me of my asthma. When I arrived at the scene, my curiosity and excitement increased while my skepticism was forgotten. He had sanctified the ceremonial area with smoke and fragrances and passed me a small cup of a deep brown liquid called ayahuasca that was necessary to contact the healing spirits. Its strong taste of tar and urine made me vomit almost immediately, shortly after which my senses seemed to all be magnified a thousand times. The thick smell of the jungle at night, the sound of rain on the hut’s thatched roof, the Shaman’s soft melodious chanting, the blackness of the night, the warm humidity on my skin, and the taste of a potent ginger root that the Shaman gave me to relieve the wretched taste in my mouth were all so intense. Although my senses and awareness of my surroundings were never dulled, I started to drift into a dream world where I was seeing both the past and the future. Familiar faces from home distorted with animal bodies flew past me. The Shaman spit, and rubbed juices from several other plants and vines on my head, blew on my face, called and chanted to spirits, and shook fragrant dried leaves all around me while I was in my dream world, though aware and quite enjoying the Shaman’s actions. Later, he prepared a quart of liquid medicine he boiled from the Sangre de Drago tree for me to drink on a daily basis for a week to treat my asthma. Ever since that night, I have not once needed to take any asthma medications, which I had depended upon every day for the past 12 years. Though I do not understand it, I am convinced of the powers of ayahuasca and Shamanic medicine.
Background on Ayahuasca

Ayahuasca is seen as the most powerful and sacred holistic medicine throughout Amazonia, where it has been used for millennia. It is believed that the first cultures that were established in the Amazon Basin (3000 years BC or earlier) were already familiar with the hallucinogenic effects of the medicine. Ayahuasca healing is considered a holistic purge of body, mind, and spirit, and is a prominent and accepted shamanic practice for almost all of the over four hundred indigenous communities throughout the Amazon Basin. Ayahuasca is used by Shamans and their patients to contact the spirits necessary for healing and it cures a wide range of physical, mental, and spiritual illnesses.

The name "Ayahuasca" is from the Quichua words "aya", which means "spirit", and "huasca," meaning "vine", so that with the vine, people can enter the world of spirits. The hallucinogen is made by combining and boiling the woody vine ayahuasca (Banisteriopsis caapi) and the leaves of Chacruna, another tropical vine, creating a thick dark tea of powerful hallucinogenic alkaloids. Taken by both the Shaman and the participant, the drink allegedly allows the Shaman to summon healing spirits to aid the participant in his or her pursuit of personal well-being, and allows both to look into the future. The experience creates incredible visions, frightening, beautiful, strange, and even life changing for some. The indigenous groups have different customs and beliefs about ayahuasca, but its use as a sacred spiritual healer is universal. The Shuar in Ecuador, for example, drink it from the beak of a dead bird, and it allows them to come close to their main god, Arutam, who severely punishes anyone who spills even a drop of the sacred plant.

Project history and description

One recent case of indigenous plant resources being used for commercial purposes by pharmaceutical companies is the case of Ayahuasca in the Ecuadorian Amazon. To understand this case, it is important to examine its history. In 1986, Loren Miller, director of International Plant Medicine Corporation (IPMC), visited the Ecuadorian Amazon and stayed with a Secoya community who was ignorant of his pharmaceutical background. Like myself, Miller was invited to participate in an ayahuasca ceremony, but instead of consuming the hallucinogen, he packaged it and returned to the IPMC labs in the United States. He later went to the Office of Brands and Patents and successfully applied to be recognized as the inventor of a new type of ayahuasca plant that he “discovered” in a small Ecuadorian jungle. The patent (#5751) gives him exclusive rights to produce and trade the products of the sacred plant. He assigned the plant healing powers as an antiseptic, antibacterial, healer of Parkinson’s disease, and also patented it as an ornamental plant. He gave his new “invention” the name “Da Vine.”

Initially there was fearful talk of indigenous people no longer being able to use ayahuasca for traditional purposes. However, since the patent is actually for the creation of a chemical equivalent of the plant in the laboratory, the wild plant is still available to the indigenous communities. The effects of the patent are serious, the most widespread effect being a moral shock, fear of widespread inappropriate use of ayahuasca, and the lack of acknowledgment and distribution of the benefits to the indigenous communities. Alejandro Argumedo, the international coordinator of the Indigenous People’s Biodiversity Network, says that the patenting “has a very profound impact on the internal processes of communities.” Others fear that if the process continues, “soon ayahuasca shall be part of the culture of drugs in the United States and DEA officials will pursue Shamans and burn up any plant that

looks like ayahuasca... Next thing we'll know is that small doses for individual use as a means of avoiding reality are being sold in some low suburb in Miami or New York. Then Ayahuasca will stop being a bridge for communion with the divine and shall change into a possibility of stepping down the stairway to hell."

In 1996, ten years after the patent, Ecuadorian Indigenous Organizations became aware of what had taken place, and began a national and worldwide campaign spearheaded by the indigenous NGO, the Coordinating Body of Indigenous Organizations of the Amazon Basin, “COICA”, and one of its sub-groups, la Confederación de Nacionalidades Indígenas de la Amazonía Ecuatoriana “CONFENIAE.” Both organizations work for the protection of indigenous rights and biodiversity. In an article announcing the ayahuasca patent, Valerio Grefa asks "what would happen if an Amazon Indian tried to patent a wafer and the wine that is used in catholic ritual, or the kosher purification for the food that Jewish believers have? Why are the elements of our sacred rituals not respected as those of the Catholics and Jews are?" Some feel that this analogy is a bit too strong, but there is an important parallel, particularly if the religious origin of ayahuasca is considered. The successful patenting of ayahuasca obviously did not satisfy Miller, since he and a group of cameramen returned to Ecuador in 1995 and tried with military support to enter the community of the Tagari people, a group of sixty indigenous people who had never had any contact with, and continued to resist contact with Western culture. The men were prevented from entering by a large campaign

195 "Heaven or Hell: On Ayahuasca and Wafers." p. 5.
196 The Tukanu people believe that after the Sun fertilized the Earth, the original people were created from the semen of the sun. The first woman appeared and had a child called Yagé (the local name for ayahuasca), which meant a person having many visions. Because of the child’s remarkable visions and healing power, the Yagé child was dismembered and everyone present ate a part of his body. Consuming ayahuasca is thus similar to eating the wafers which represent the body of Christ. from "Heaven or Hell: On Ayahuasca and Wafers." p. 5.
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spearheaded by COICA, CONFENAIE, other indigenous organizations, conservation groups, and CNN, to whom Loren wanted to sell the footage. COICA has since declared Loren an enemy of indigenous peoples in the nine countries of the Amazon Basin and his entrance to the Amazon and that of any of his affiliates is prohibited. COICA, in a letter recently sent to Bill Clinton, has asked the US government to review the granting of this patent, hoping to annul it. Miller has meanwhile built another laboratory to process ayahuasca and other medicinal plants that he "invented" and is currently using ayahuasca to develop psychiatric drugs.

Analysis of the Sustainability of the IPMC's Ayahuasca Project

Although the moral problems of the ayahuasca project are obvious, it is nonetheless important to consider its sustainability for this project. Its sustainability is again examined with relation to the Ecuadorian communities involved, not the sustainability of the International Plant Medicine Corporation itself. The capacity building of the source community is nonexistent, (receiving a score of 0) since there is no education, training program, use of skills or improvement of well-being from the IPMC's project (see table 25a).

The environmental sustainability for the source communities is not affected by the project, since after the initial sample, all creation of ayahuasca has been done in the labs in the United States. It is not directly damaging the environment or decreasing biodiversity, but it is not actively making an environmentally sustainable use of it either. The environmental sustainability would probably decrease if IPMC were to begin taking the vine directly from the rainforest. However, if they initiated a project of sustainable cultivation, this could benefit the locals and improve the project's sustainability. It is nearly impossible to sustainably harvest a vine such as ayahuasca, since it necessitates a healthy, lush rainforest with large trees to grow on. The environmental sustainability score was 6 (see table 25b).
As for economic sustainability of the project, the products are medicinal, probably quite resistant to price fluctuations as most medicines are. The company is financially self sustainable, but the source communities are not receiving more money or benefits from the project than they were before Miller set foot in Amazonia. Since that is a necessary criterion for sustainability, it is already obvious that the project is unsustainable overall. Furthermore, it does not directly internalize externalities, and the immediate needs of the communities are not met by the commercialization of ayahuasca. The ayahuasca therefore receives a total score of 0 for economic sustainability (see table 25c). The overall sustainability score was a very low 1.6.

Table 25: Sustainability of the Ayahuasca Project

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b. Environmental sustainability</th>
<th>sustainable resource use*</th>
<th>avoiding secondary environmental probs?</th>
<th>Local environmental awareness</th>
<th>environmental education?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>+</td>
<td>n</td>
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<tbody>
<tr>
<td>medications</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>

Analysis of factors influencing sustainability

Local participation and decision-making power

The local participation and decision-making power was zero, since none of the community was involved in the project intentionally, and there is no positive or direct relationship between IPMC and the indigenous groups (see table 26).
Creation and distribution of local revenue

The creation and distribution of local revenue was equally non-existent, resulting in a score of zero (see table 27).

Social and cultural holism

There is no social or cultural holism in the Ayahuasca project. It damages social, cultural, and value systems by degrading an important spiritual tradition (see table 28).

Source and amount of funding

The funding for the ayahuasca project is all from the private pharmaceutical firm, International Plant Medical Corporation. None of the long-term funding reaches the source communities (see table 29).
Table 29. Source, Amount, and Length of Funding

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>Amount of funding</th>
<th>Length of funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>private</td>
<td>high, but none</td>
<td>long</td>
</tr>
<tr>
<td>pharmaceutical</td>
<td>reaches communities</td>
<td></td>
</tr>
</tbody>
</table>

With a sustainability score of 1.6 out of 10 and zeros for each factor of sustainability, it is obvious that the Ayahuasca project does not benefit the source communities in the least. It is important, however, to realize that International Plant Medicine Corporation itself is economically, at least, quite sustainable. It is shocking, and hard to believe that, in reference to the patenting of ayahuasca, a US representative is alleged to have said something like “the Indians have the same access to the patent process as anybody else: if they think their plants are so important, why don’t they patent them?”

The patenting and commercialization of ayahuasca is the commodification of something sacred. The patenting of living organisms or indigenous knowledge is unnecessary and should not be tolerated. Indigenous knowledge is an intergenerational possession that belongs to indigenous people collectively, and, like living things, should not be considered an “invention”, or the property of anyone but the indigenous people themselves. The IPMC’s ayahuasca project provides a disturbing, but unfortunately common example of biopiracy in the Ecuadorian Amazon.

Other Bioprospecting Arrangements and Solutions in Ecuador

Another company accused of biopiracy in Ecuador is Maxus Petroleum of Dallas, Texas. The company extracts Ecuador’s tropical plants in addition to

petroleum. Maxus has built a 120 km. road through the rainforest for oil exploration, and contracted with the Missouri Botanical Garden to collect and catalogue plants that it encounters on the land. The road traverses both the Yasuní National Park, one of the most biologically diverse places in South America, and the Waorani Ethnic Reserve. They have gathered thousands of species of plants, dozens of which are new to the scientific world, but have reinvested nothing in conservation and recompensated the natives in no way.\textsuperscript{198}

Many people feel that most of the accusations of biopiracy have been exaggerated. An article entitled "In re-patenting Ecuadorian Plants" expresses that there have been several recent cases where people have accused geneticists, biologists, and... anthropologists, all from the US of stealing somebody's precious genetic heritage to the utter and permanent damage of the 'victims'. That's an easy way to whip up anti-US sentiment, since all you have to do is combine arcane biology without giving readers a chance to understand the issues with a threat to the rights of downtrodden 'natives' facing brutal imperialism.\textsuperscript{199}

It is perhaps more likely that this is the reader who does not fully understand the issues. It is difficult to ignore the negative moral issues of bioprospecting, but it is also important to consider both moral sides of the argument; the other being the urgent need to discover cures to widespread diseases. Aside from this positive life-saving role that bioprospecting pharmaceuticals play, they also could potentially play a significant role in biodiversity conservation. The fact that the companies have a stake in the existence of biodiversity gives them an incentive to push for its protection, though unfortunately no company has done this significantly, if at all.

\textsuperscript{198} "Bioprospecting, Biopiracy and Indigenous Peoples" March 29, 1998.
There is an inherent moral problem in the selling of genes, since they belong to no one but the organism. But if exploiting and selling them will ultimately lead to their preservation, it is advantageous to define the rights related to genetic diversity. Joseph Vogel believes that privatization seems the most obvious tool to controlling access on indigenous biodiversity in Ecuador and Latin America. He proposes extending intellectual property rights of source communities to include genetic materials, with 15% royalties and realizes that an enormous database would need to be developed, with botanical and zoological inventories and a detailed global mapping of the distribution of biodiversity resources. This would be a costly task, and major legal and institutional structures would be needed for this to happen. It could, however, lead to a successful cartel of tropical governments' biodiversity. Others feel that intellectual property rights are inappropriate for indigenous peoples, the most common sources of traditional ethnobotanical knowledge. Michael Blakeney, for example, argues that "indigenous peoples do not view their heritage in terms of property at all... but in terms of community and individual responsibility." The rationale of intellectual property rights can be inappropriate to the cultural, spiritual and aesthetic values of indigenous peoples, notwithstanding the enormous costs of enforcing intellectual property rights.

Vogel's possible solution to biopiracy in Amazonia is starting to become reality, with a project entitled "The Transformation of Traditional Knowledge into Trade Secrets." The project attempts to establish a cartel on indigenous knowledge throughout Ecuador and then expand the program to neighboring countries. The project idea was started in 1995 as a collaborative effort by the InterAmerican Development Bank Program on Environmental Capacity Building, CARE-Ecuador, and the Ecuadorian NGO, EcoCiencia. In 1997, it entered a pilot phase in the regions

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of the Costa, Sierra, and Oriente (Amazon). The project involves cataloging traditional ethnobotany knowledge in confidential databases. Each community would have its own file in the database and would be unable to access files of any other community. Regional NGOs and universities will maintain the database and compare the knowledge of various groups to find out what information is common traditional knowledge. The information would then be filtered through an on-line database that already exists to determine what is already in the public domain. The knowledge could then be negotiated as a trade secret in a Material Transfer Agreement (MTA) with industrial users or intermediaries. The benefits from the MTAs would be split between the government and the communities that provided the knowledge. The share of the communities would then be used to finance public projects in each community, and the government’s share would go into conservation. The sustainability of the project will depend upon the amount of involvement of the participants, whether or not products were to be harvested, and the quality of benefits that the communities would receive. Local participation would be limited due to the short time involvement of the communities, Economic benefits could be significant, however, and could not be distributed more evenly, since the rewards go to the community as a whole. The effect on the social and cultural systems would probably be minimal or neutral. It could, however, successfully create a cartel over indigenous knowledge in Ecuador, increase the royalties, and get rid of the problem of competition. This one project could combat biopirates throughout Amazonia.

Another solution that works around the lack of international standards to regulate bioprospecting to ensure that a portion of the benefits is returned both to local communities and their environments is the use of contracts between the pharmaceutical company and the source community. Sarah Laird argues that

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Vogel, Joseph Henry. *The Successful Use of Economic Instruments*. p.38
contracts can produce new leads for drug discovery, provide incentives for conservation, increase the use of traditional knowledge in drug discovery, ensure the equitable distribution of benefits to all affected parties, and promote complete national inventories of biodiversity. The role of international institutions and law, however, is increasing, and the idea of a treaty on international property rights and significant royalties to tropical communities and countries is not impossible.

A further solution to biopiracy that became obvious during field study in Ecuador was to avoid it all together and instead get communities involved in the creation and maintenance of medicinal plant gardens. The creation of these gardens not only responds to health problems of the community but can also become a significant source of income when the medicines are sold in local natural herbal medicine pharmacies, stores, and nationally-run pharmaceuticals. Growing medicines that are already existent and well-known avoids the issues of patents, copyrights, sovereignty, and even compensation. These businesses are locally controlled, often communally run, and benefit the entire community. One such garden in Capirona, a Quichua community on the Rio Paño, is maintained by the entire community and whenever anyone gets ill, they are all free to take as much as they need. The community sends the extra medicines they grow to a natural health store in Tena, the nearest city. In exchange for the medicinal plant extracts, the pharmacy sends back medicines to Capirona that the community cannot grow themselves.

If the needs and priorities of Ecuadorian indigenous groups are examined, it becomes obvious that they do not need to become dependent on an international corporation that might take more than they give back. Furthermore, the drugs that bioprospectors discover rarely benefit the indigenous communities, as they are

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mainly targeted for people in the North who can pay for the drugs. The priority of indigenous communities is not the discovery of new drugs, but gaining access to simple drugs to deal with the health problems they face daily: children's diarrhea, malnutrition, and malaria. The remedies for these illnesses already exist, but it is a question of distribution, prevention, and education. It is estimated that 50% of Latin Americans have very little or no access to medications. Most indigenous people never see a pharmacy, depending on the forest as their pharmacy. Projects that distribute seeds of various medicinal plants to communities to help them start their own medicinal plant gardens can often supplement the forest enough to improve the health of the community members.

Conclusions and Recommendations

The average sustainability of Shaman and Ayahuasca were both relatively low, with Shaman's overall sustainability a 7.6 and Ayahuasca's a 2. Shaman scored higher than Ayahuasca for every factor of sustainability, but compared to projects in other categories, Shaman's scores were still low. The Ayahuasca scored 0 for every factor of sustainability, which suggests that every factor is related to its low sustainability. Shaman scored a 5 for local participation, a 4 for local revenue, and a 6 for social and cultural holism. Holism is the factor that was more strongly correlated to sustainability (or lack thereof) in both bioprospecting projects. The other factors were strongly positively correlated with sustainability as well, though the sustainability scores for each project are higher than any one of the scores for the factors of sustainability. The source of funding was private US pharmaceutical companies in both cases, but the amount of funding for each project seemed inversely correlated with sustainability. Although the relationship is probably not causal, it certainly shows that high amounts of funding are not necessary for project sustainability.
Bioprospecting is obviously not the ultimate salvation for biodiversity and indigenous knowledge. Under the current conditions, bioprospecting simply reinforces the role of less industrialized Southern nations as suppliers of cheap raw materials to support the growth of Northern corporate wealth. Not only is the North the beneficiary of the wealth, but it will probably remain the center of the high-tech laboratory screening and testing while the raw material collection will stay in the South.

It is obvious that a comprehensive multilateral framework for cooperation between developing countries themselves and Northern Pharmaceutical companies should be developed, and the promotion of bilateral agreements should be stopped. As Gener de la Cruz of the NGO CONSERVE says, "Without the protection of the multilateral community, there is no such thing as bioprospecting - only biopiracy." It seems that the only way tropical countries could derive significant benefits from bioprospecting is by cooperating among themselves, like through the creation of a cartel. Furthermore, the patenting of living products and indigenous knowledge is unnecessary and should be stopped. Indigenous organizations such as COICA can raise awareness of the issues and empower indigenous people to prevent acts of biopiracy.

Instead of initiating intense bioprospecting efforts to ensure that a cure for AIDS does not disappear with the last shaman who knew about it or the last plant that contained it, the problems that lead directly to the endangerment of biological and cultural diversity should be confronted. Until those problems are confronted and a comprehensive multilateral framework that protects source countries is implemented, bioprospecting will probably create more problems than it solves. As Katy Moran of the Healing Forest Conservancy explains, "biocultural diversity is valuable because it retains options and possible solutions to crises not yet envisioned,

and answers to questions not yet asked. It appears, however, that the crises and questions are already all too evident. Unfortunately, the solutions seem overwhelming. The protection of biodiversity and indigenous knowledge necessitates the protection - not the exploitation - of indigenous peoples, their environments, and their culture. The enormous imbalance between the legal and financial power of multinational corporations and indigenous communities in tropical countries needs to be lessened to prevent the silent stealing of knowledge and genetics.

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Comparisons: How the factors influence sustainability

The diversity of economic, social, cultural and political conditions at the local and national levels make it very difficult to successfully copy the economic incentives and tools used in one project to another. It is therefore imperative to
conduct thorough case-by-case studies of local conditions to determine how economic tools and incentives used can be best applied to facilitate the sustainable conservation of biodiversity. Not always is a project with local participation and decision-making power, well-distributed revenue, and social or cultural holism guaranteed to be sustainable.

Generalizations can be made, however, since the level of local participation, the amount and distribution of local revenue and the social and cultural holism of the project were all significantly correlated with sustainability in each case. The three most sustainable projects, (Capirona, Antisana, and Centro Fátima, respectively), averaged a score of 9.1 for overall sustainability. The three least sustainable projects (Ayahuasca, SUBIR and Shaman, respectively), averaged only 5.1 for overall sustainability, though Ayahuasca and SUBIR were considered unsustainable overall because they did not satisfy the requisite criteria for sustainability. In the following discussion of the variables, the least sustainable projects are compared to the most sustainable projects to determine the correlation between the various factors and the project sustainability.

Not only are the factors examined in relation to the individual projects, but they are also compared by category. This demonstrates whether the ecotourism projects have been shown to involve more local participation, than sustainable agriculture or bioprospecting, for example. It is important to keep in mind that the conclusions implied by the case studies here are not necessarily representative of sustainable agriculture, ecotourism, or bioprospecting in general. Most of the cases were selected because they represent efforts to successfully combine biodiversity conservation with economic development, and should therefore be recognized as some of the best projects in the Ecuadorian Amazon. The Ayahuasca project is the only case study chosen that was not designed to be a locally sustainable and beneficial project, and was included partly because of the lack of successful sustainable
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bioprospecting projects and partly because it is representative of more typical bioprospecting. Shaman was the most sustainable project known and the only one making serious attempts at local sustainability in Ecuador.

The fact that the Ayahuasca project alone did not even attempt local sustainability leads to questions of equality in comparing the scores of the different categories. It is obvious now that this study should have focused either on all projects that were sincere attempts at sustainability, or should have included in each category one project attempting sustainability and another typical project of each type. This would have prevented the bias against bioprospecting that has become problematic in cross-category comparisons. However, since this was not done, when calculating the categorical scores for bioprospecting, the Shaman project is weighted stronger than the Ayahuasca project. It is important that the ayahuasca project is not completely neglected from the scoring because its lack of sustainability is characteristic of most bioprospecting projects. In the calculation of the average bioprospecting scores, the Shaman score is counted twice as heavily as the Ayahuasca score to help make up for the fact that the Ayahuasca project was the only project chosen that does not even attempt local sustainability.

Before examining the factors relating to sustainability, it is first helpful to compare the criteria of sustainability (i.e. capacity building, environmental and economic sustainability) to investigate how those relate to the factors influencing sustainability. As for capacity building, all four projects in the categories of ecotourism and sustainable agriculture received 10s for capacity building, while the bioprospecting projects averaged 5.6, demonstrating obviously that bioprospecting has not contributed significantly to the capacity building of source communities. The environmental sustainability of the bioprospecting projects was also much lower than any other project, while ecotourism and sustainable agriculture had very high environmental sustainability scores of 9.4 and 10. As for economic sustainability,
sustainable agriculture was the lowest with an average economic sustainability of only 3. Bioprospecting was almost as low, scoring only a 4.6 for economic sustainability of the project at the source communities. Ecotourism was by far the most economically sustainable, with an average environmental sustainability of 9.3.

The level of local participation and decision-making power

It was hypothesized that the level of local participation and decision-making power is important to sustainability because locals have the ability to make a project blend successfully with local conditions since they are the most knowledgeable of the local reality and have the most at stake. Participation empowers people to take control of decisions that effect their lives and their land.

In this study, ecotourism had the highest level of local participation, averaging a 9, slightly higher than sustainable agriculture, which averaged an 8. Bioprospecting was the lowest, averaging only 3.3, with Shaman scoring a 5 and Ayahuasca a 0). The three most sustainable projects overall, Capirona, Antisana and Centro Fátima, (average 9.1 sustainability) averaged 8.3 for participation, and the average participation for the less sustainable projects (average 5.1 sustainability) was only 5 (see table 14). In the case of Capirona, one of the most sustainable and participatory projects, 100% of the community participated and the community-members had complete control of the project. The results indicate a relatively strong correlation between sustainability and local participation.

Participation seemed to have varying levels of importance in different project types, since the correlation between level of local participation was high in both ecotourism and bioprospecting, but the relationship was inverse in both cases of sustainable agriculture. Fátima had a low level of participation despite its high sustainability, while SUBIR had the highest possible level of participation and was very unsustainable. This implies that SUBIR may have failed partly because of its
The Use of Economic Instruments in Biodiversity Conservation Projects

high level of participation. Since the community's transition to the new activity was so dramatic and complete, and the new activity was not profitable, when everyone participated so fully, the project had no profitable or sustainable economic base. The inverse relationship between sustainability and participation in case of Centro Fátima suggests that there are certain conditions where community participation may not help the project become more sustainable, particularly when the nature of the work is specialized and the revenue gained is modest.

Therefore, high participation is not always needed for a project to be sustainable, and high participation does not guarantee sustainability. This does not mean that local participation is not an important factor of sustainability, but rather that each project has different needs for participation, and more participation is not always better for every type of project. The type of participation needed is often limited, like the skilled labor needed for some sustainable agriculture projects. The overall correlation between sustainability and participation, however, is quite strong, and it can be concluded that a relatively high level of community participation and control of the project does help ecotourism and bioprospecting projects become sustainable.

The creation and distribution of local revenue

The creation of local revenue was seen as important for sustainability because when people are being paid to participate in a project, they have a strong economic incentive to work toward its sustainability. If the distribution of economic benefits is relatively equal, the project is more likely to maintain the objectives of the
community as a whole rather than being controlled by several profit-seeking people who do not necessarily represent the desires of the community as a whole.

In this study, ecotourism displayed the highest score for the creation and distribution of local revenue, with both projects scoring 10. Sustainable agriculture was the next highest, averaging a 7, and bioprospecting was again the lowest, averaging only a 2.6 for local revenue (Shaman scored only a 4). The creation and distribution of local revenue was also strongly correlated with sustainability, and proved the ultimate deciding factor for projects including SUBIR. The fact that locals had no more money with the project than they had before it led to frustration and social conflicts that led to SUBIR’s ultimate failure. In the more sustainable projects, the local revenue was much higher and better distributed than it was at SUBIR.

The average revenue score for the three most sustainable projects was 8.3, while the average for the three less sustainable projects was 4.3. It appears that the creation of revenue is not always, but usually necessary for sustainability. The overall correlation is high, but there is some variance. In some cases, non-monetary benefits are enough, particularly when the project does not provide the main source of income, but mainly supplements income. This was the case for Shaman, which was the fourth most sustainable project, and provides no monetary benefits. With the case of SUBIR, however, there were many non-monetary benefits, but the project was unsustainable. This might be because SUBIR was supposed to be providing the main source of income, while for Shaman, the project revenue was only meant to be supplementary. In general, it seems that projects have a higher probability of being sustainable when they provide a second, supplementary source of income generation or where labor is underemployed so participants do not have to give up other more profitable forms of income generation.

Related to the creation of revenue, the importance of a strong demand for the service or product became evident, particularly in the case of SUBIR. The opposite
demand story is exemplified by Capirona, where the demand for their ecotourism was so high that they had to share the project with other communities and limit the tourists by a screening process.

As for the distribution of revenue, it is obvious that it should be as equal as possible. Unfortunately, if the project makes too much money, the income distribution and the goals can change, as in the case of some ecotourism projects. The underlying goals of conservation and whole community development can take a back seat to the desire to make a profit.

The amount of revenue that stays in hands of locals is very important, since the three most sustainable project all kept a very high percentage of the profits within the local community, while some of the less sustainable projects did not. Even if the total revenue is meager like at Centro Fátima, the project can be sustainable if there is little but continuous funding and the underlying goal is conservation.

Social and Cultural Holism

The criterion of cultural and social holism measures the project's integration into the community's social and cultural systems. If a project leads to major changes in values and social structure, or loss of cultural traditions, locals may be less enthusiastic and willing to cooperate with the project in the long-term.

The results for social and cultural holism were quite varied, with intra-category scores that deviated considerably. Again, ecotourism was the highest (9), followed by sustainable agriculture (6), and bioprospecting, which scored a 3 (Shaman scored a six while Ayahuasca scored a 0). What is more obvious from the results of the social and cultural holism category is its very high correlation with sustainability. The holism factor revealed the highest correlation with sustainability, since the three most sustainable projects averaged a score of 9, and the three less sustainable projects
The Use of Economic Instruments in Biodiversity Conservation Projects

averaged only 3.3 (see table 14). This shows that holism is obviously a very important determinant of the success and sustainability of projects, possibly the most important of the factors examined here. It also helps explain the unsustainability of many less holistic multilateral projects. The most sustainable projects, like Capirona, for example, were completely integrated into the community systems. However, the correlation indicated by these numbers might be stronger or weaker than it actually is, since holism is complicated and difficult to measure, and there are probably other important indicators of holism that were neglected in this study.

Source and Amount of Funding

The last factor of sustainability was the source and amount of funding. The goal was to determine whether a certain level and length of funding, and a specific type of donor combination of donors (whether multilateral aid groups, international conservation organizations, local NGOs or private sources), and one level of funding would lead to the highest sustainability. The level of funding was shown not to be an important indicator of project sustainability, since some projects that involve more infrastructure or capital investment are inherently more expensive than others. In fact there seemed to be almost an inverse relationship between the level of funding and the sustainability. The most highly funded projects (SUBIR and the Ayahuasca Project were not sustainable at all, while Capirona, and Antisana, were very sustainable and received relatively low levels of funding. This inverse relationship should not necessarily imply that a project will be more sustainable if very little is spent on it. The case studies chosen may not represent the funding relationship properly. What seemed to matter more was whether the project got as much funding as it really needed for as long as it needed. What it may imply is that the projects that are economically self-sustaining and therefore more economically sustainable do not need much external funding. It must be acknowledged, however,
that some large-scale extension projects that support high levels of education or infrastructure may very well be some of the most sustainable projects.

It became obvious that low-level continuous support is favorable to heavy but temporary funding. In the most sustainable projects, funding was relatively high at first but decreased to very low but continuous funding after all the initial investments were made. Once these projects got started, their level of economic sustainability was high enough to support them for an extended period of time.

As for the source of funding, all of the projects examined were funded by multiple sources, and most involved local, national and international sources. It also seemed that projects funded by multiple sources at various levels, (with international funding, support of national NGOs and implementation by local groups) were most successful, as two of the three most sustainable projects were funded this way (Antisana and Centro Fátima). The most important factor seemed to be whether or not the projects had a strong local organization, since the three most sustainable projects did and the three others did not. When the strong local organization at SUBIR fell apart, the project fell apart with it. Local organizations know better than others how to translate the good intentions into reality, within existing local conditions. It also became obvious that the goals and intentions of both international and local groups were very similar overall, though their approaches were not always the same. Almost all of the groups seemed to prioritize conservation and local development, though they have different approaches to conservation and different ways to achieve local participation. Another variable that may have been important that was not examined in this project was not necessarily where the money was coming from, but who initiated the project - the community or outsiders? Each of the most sustainable projects were initiated from within the community, while the other three were outside initiatives, designed mostly by non-locals.
Most of the projects had sustainability scores that were very close to their average score for factors influencing sustainability. It is important to note that two projects, however, Centro Fátima and Shaman, both had sustainability levels that were a bit higher than any of their scores for factors influencing sustainability. While Centro Fátima received a 6 for participation, 5 for creation and distribution of income, and an 8 for holism (average factor score of 6.3), its overall sustainability was 8.6. Shaman got a 5 for participation, a 4 for revenue and a 6 for holism (average factor score of 5), while it also had a higher overall sustainability, at 7.6. This might imply that there is something else unaccounted for that is leading to the projects relatively high sustainability. It could also signify that a project does not necessarily have to have very high local participation, control, revenue, and holism to be sustainable. Whether or not this difference is significant or simply due to error, is unclear, and all of the other cases, show more clearly that participation, control, revenue and holism are very important to sustainability. Whether or not an overall difference of about 2.5 is significant is subjective, but since the rest of the projects were much more closely correlated, this shows that the factors chosen were relatively good predictors of sustainability and could be considered in the design of other integrated conservation and development projects.

Since the scores of the ecotourism projects were consistently highest, followed by sustainable agriculture, and lastly, bioprospecting, this may seem to imply that ecotourism should be pursued over sustainable agriculture, and both should be pursued over bioprospecting. It is important, however, to remember that the chosen case-studies and therefore the results, are not necessarily representative of the average project of each type in the Ecuadorian Amazon. It is safe to assume that bioprospecting is the least sustainable option, since the most sustainable bioprospecting project known was included as a case study, and its sustainability was still low. The ecotourism projects, however, are not representative of most in the
Ecuadorian Amazon. Presented here are the results of two quite successful, small, community-run, conservation-oriented projects. It would be safer to assume that the results may represent that of most small, community-run, conservation-oriented projects. Every sustainable agriculture project is very different, and although an attempt was made to choose two representative projects, it is questionable whether two representative projects even exist. The size of the projects, species planted, technique used, and demand for the project are very variable for sustainable agriculture, and the sustainability of each type may be completely different. Again, it is safer to make conclusions from these results about other small-scale, conservation-oriented sustainable agriculture projects that also focus on food or animal production.

Table 13: Overall Sustainability of Projects

<table>
<thead>
<tr>
<th></th>
<th>Empowerment &amp; capacity building</th>
<th>Environmental</th>
<th>Economic</th>
<th>Overall</th>
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<td>Fátima</td>
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<td>10</td>
<td>6</td>
<td>8.6</td>
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<tr>
<td>SUBIR</td>
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<td>8.8</td>
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<td>6.25, but unsustainable</td>
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<td>Capirona</td>
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<td>9</td>
<td>9.6</td>
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<tr>
<td>Antisana</td>
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<td>7</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Shaman</td>
<td>10</td>
<td>7.5</td>
<td>7</td>
<td>7.6</td>
</tr>
<tr>
<td>Ayahuasca</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>1.6, but unsustainable</td>
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</tbody>
</table>

Table 14: Sustainability compared to factors

<table>
<thead>
<tr>
<th></th>
<th>Participation</th>
<th>Revenue</th>
<th>Holism</th>
<th>Sustainability</th>
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<tr>
<td>Fátima</td>
<td>6</td>
<td>5</td>
<td>8</td>
<td>8.6*</td>
</tr>
<tr>
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<td>10</td>
<td>9</td>
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<td>6.25, but unsustainable</td>
</tr>
<tr>
<td>Capirona</td>
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<td>9</td>
</tr>
<tr>
<td>Shaman</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>7.6</td>
</tr>
</tbody>
</table>
The Importance of Combining Activities

There is no guaranteed recipe for a sustainable biodiversity protection project. No single incentive system or type of project will successfully blend biodiversity conservation and sustainable economic development for Ecuador or Latin America. However, there are certainly factors that seem to lead to success, four of which have been examined in detail. The individual variation of how each factor weighs into the sustainability of each project and category is undeniable. The factors are of varying importance for each project, but each factor displayed a high overall correlation with sustainability. Therefore, when all the factors are examined collectively, (i.e. averaging the scores from each category of participation, revenue and holism), this provides an interesting predictor of project sustainability.

One factor leading to sustainability that has not yet been investigated is the combination of activities in a single project. A project that focuses on sustainable agriculture, for example, has an economic disadvantage which can be made up for by integrating ecotourism into the project. A strict ecotourism project may become too profit-driven if it is not designed to be an integrated sustainable development project involving other activities such as conservation, sustainable agriculture, and environmental education. Each type of project (sustainable agriculture, ecotourism, and bioprospecting), has its strengths and weaknesses, and when they are integrated into one sustainable development framework, the probability of success becomes much greater. In the examples of Capirona, or Centro Fátima, two of the most sustainable projects, if any major aspect of the program was removed - the ecotourism, environmental education, or the sustainable agriculture, the project may

| Ayahuasca | 0 | 0 | 0 | 1.6, but unsustainable |

* Scores in boldface type are the three most sustainable projects, while those in normal type were the three least sustainable projects.
not be as sustainable or even able to survive at all. The combination of all leads to success. To demonstrate this point, one final case study will be presented: Jatun Sacha, a biological station which simultaneously focuses on sustainable agriculture, ecotourism and bioprospecting, as well as other environmental activities.

Case Study #7: Jatún Sacha

Project description
The Jatun Sacha Biological Station is a center for conservation, research, environmental education, sustainable agriculture, ecotourism and has experimented with bioprospecting. The reserve is run by the non-profit Ecuadorian Conservation NGO "Fundación Jatún Sacha", which owns several other similar reserves representing various ecosystems of Ecuador. Created in 1985, the reserve consists of 1,500 hectares of tropical rainforest, 75% of which is primary forest. The objectives of Jatun Sacha include "the promotion of scientific investigation on the national level, the conservation of natural renewable resources, environmental education of locals and visitors.... the establishment of a live collection of plants that could provide economic alternatives for the Quichuas of the region, technical assistance to local Quichua communities and small land owners interested in sustainable agriculture, silviculture, reforestation, and preservation of the Quichuan medical culture."206

The reserve is used by community members, researchers, university groups, ecotourists, foreign volunteers and interns. Volunteers and guests can either stay in the huts of the biological station itself, the more comfortable and expensive Cabañas Aliñahui, or at a homestay with a local family. Jatun Sacha is managed by a local,

Alejandro (Alejo) Suarez, who employs mostly local people, as well as volunteer Ecuadorian university ecology students and international volunteers whose US $300 fee per month funds much of the research, reforestation projects, and educational campaigns. Jatun Sacha is a very popular destination for young ecology students all over the world.

The main project at Jatun Sacha is its Amazon Plant Conservation Center, the CCPA, which was established with help from the Missouri Botanical Garden in 1985. The CCPA is primarily a center for botanical and ethnobotanical research and sustainable agriculture experiments. It contains many gardens, mixed species agricultural and agroforestry plots, and plots in full-growth rainforest. The gardens are separated into smaller plots of species of one use, for example, there are sections of medicinal plants, hallucinogenic plants, edible plants, fruit trees, wood species, orchids (of which there are over 370 species at Jatun Sacha), ornamental plants, plants used in native ceremonies, and another large plot dedicated to experiments on the harvesting of Sangre de Drago, as mentioned earlier.

The primary species that are grown in the CCPA are species with known or potential economic profitability. The hope is that the experiments realized at Jatun Sacha will provide important information and techniques that will allow the Ecuadorian Quichuas to sustain themselves with these alternative activities. The seeds and fruits of the species grown are collected to form a germplasm bank, and later distributed to the communities who also receive instruction on the best and most environmentally sustainable way to harvest the species. The medicinal plant section of the CCPA contains over 40 species. There are currently 54 native species that are being actively studied at Jatun Sacha. Many of the species are selected for their economic potential to the local communities, but not with the goal of ever selling to large companies or outside the Ecuadorian Amazon. The benefits of the
CCPA are shared with local communities through Jatun Sacha’s outreach and environmental education program.

The environmental education program at Jatun Sacha involves full-time volunteers and paid locals who visit surrounding communities to teach various lessons on how to minimize the environmental impact of their daily lives and also how to mobilize themselves to protect their forests from exterior pressures posed by logging and oil drilling. The program has employees that travel to the communities to teach them sustainable agriculture techniques such as how to plant sustainable medicinal plant gardens, vegetable gardens, and other agroforestry gardens. Jatun Sacha has visiting ecology teachers that go to local schools to work with the children on a regular basis using a curricula that focuses on the traditional Quichua environmental ethic. The environmental education program also publishes educational material, holds school field trips at the reserve, and presents a weekly ecology program on the local radio station. Community participation has been realized mostly through the environmental education program.

The Cabañas Aliñahui are Jatun Sacha’s ecotourism facility. Located several miles from the Biological Center on a hill overlooking the Napo River, the eight wooden cabins are surrounded by lush tropical gardens and rainforest. In Quichua, Aliñahui appropriately means "beautiful view." Guests can go on bird watching excursions, river floats, Ecology tours at Jatun Sacha, and jungle treks, or visit a nearby wildlife rehabilitation center, the Amazonico. The money generated by the cabins supports the work of the Jatun Sacha Reserve. The Cabañas Aliñahui were built by Jatun Sacha in 1994, with the purpose of acting as a model for eco-tourist development in the region and generating income for the Jatun Sacha biological station.

Jatun Sacha also has an active silviculture and reforestation program designed to help degraded tropical soils recuperate to the point of being able to support a
healthy climax rainforest as quickly as possible. The program is aimed at developing ecological and silvicultural knowledge of native forest species to help regenerate new forests that resemble the former ones as closely as possible. Jatun Sacha oversaw a major reforestation project in the Yasuní National Park. In 1992, the organization started a project to restore the vegetation which was destroyed during the construction of an oil pipeline. The project involved replanting the forest in a 25m wide strip 120 km long and is acting as a pilot project for similar reforestation work elsewhere. Another reforestation project currently being undertaken involves assisting the municipality of Tena, the nearest town to the Jatun Sacha reserve, to turn a waste piece of land into a municipal park and botanical garden. Plants were supplied from Jatun Sacha's Amazon Plant Conservation Center. Foreign volunteers have done most of the reforestation work.

Aside from the CCPA sustainable agriculture program, the environmental education, the ecotourism, and the reforestation, Jatun Sacha also has a community development program which includes a rural health and sanitation program in which they organize the local population to take advantage of government health schemes and plant their own medicinal plant gardens. In response to requests from local women's groups, they are experimenting with various methods for growing small plots of fresh vegetables.

Analysis of Sustainability of Jatun Sacha

The capacity building at Jatun Sacha is very high, receiving a score of 10 (see table 29a). The participants spoken to were all enthusiastic about their projects and expressed that their motivation had increased significantly since they started working at Jatun Sacha. As one participant explains, "we used to be lazier, but now when we..."
see something we know is not right, we do something about it, because we know that we really can change things around here."210 The employees received technical training in various aspects of sustainable agriculture and plant ecology, which is augmented by attendance at workshops and conferences held at Jatun Sacha. Participants are using their new ecology, botanical, and teaching skills on a daily basis.

The environmental sustainability is equally high, also receiving a perfect score (see table 29b). The resource use is sustainable, and environmental health is monitored frequently by ongoing research at the station. Local environmental awareness has increased enormously since Jatun Sacha started, due to the active outreach and environmental education programs aimed at local communities.

The economic sustainability is also very high, scoring a 9 (see table 29c). The products and services are varied, including ecotourism, sustainable agriculture, natural medicines from the plant gardens, educational materials and programs, and reforestation. Since most of the funding for the project comes from the ecotourism program, ecotourism itself is not particularly resistant to market price fluctuations, though since most of the visitors and volunteers are scientists or university classes who have planned the trips ahead of time, this type of tourism is more dependable than most tourism. Both the monetary and non-monetary benefits from the project are much greater than they were before Jatun Sacha was established, the immediate needs of the people are being met, and the costs of conservation and education are being internalized by the ecotourism project.

Table 29: Analysis of Sustainability of Jatun Sacha

| a. capacity building |

The Use of Economic Instruments in Biodiversity Conservation Projects

### Motivation & Training program?
- Ongoing education?
- Are people using their skills?

<table>
<thead>
<tr>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

#### Environmental sustainability

<table>
<thead>
<tr>
<th>Sustainable resource use*</th>
<th>Avoiding secondary environmental probs?</th>
<th>Local environmental awareness</th>
<th>Environmental education?</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

#### Economic sustainability

<table>
<thead>
<tr>
<th>Product/services</th>
<th>Resistant to fluctuation?</th>
<th>Self-sustaining?</th>
<th>More $ or benefits than before*</th>
<th>Internalize externalities?</th>
<th>Immed needs met?*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecotourism</td>
<td>n</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>9</td>
</tr>
<tr>
<td>Sust agric. etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Analysis of Factors Influencing Sustainability of Jatun Sacha

#### Local Participation

The directors of the Jatun Sacha Reserve feel that "the participation of local communities is a vital necessity of the project."\(^{211}\) Almost everyone in the surrounding communities has been involved in the efforts and projects of Jatun Sacha.

Sacha to some extent, whether receiving environmental education, planting a medicinal or sustainable vegetable garden, participating in reforestation, or being employed full time at Jatun Sacha. There are about a dozen indigenous employees at the reserve, two mestizos, and hundreds of volunteers - locals, Ecuadorians, and foreigners. There are another dozen indigenous employees who work at the ecotourism project. The average number of hours per week of full time paid locals is high, but the other participants volunteer on an irregular basis, so the average number of hours per week category was rated neutrally. The locals were completely involved in designing and implementing the project - as it was initiated by locals themselves. The level of communication between the participants, the communities, and the staff at Jatun Sacha is very high. The decision-making structure is not as egalitarian as Capirona, for example, but the local management makes most of the decisions, in cooperation with the Jatun Sacha Foundation management in Quito. The overall score for local participation at Jatun Sacha is 8 (see table 30).

Table 30. Local Participation

<table>
<thead>
<tr>
<th>percent of community involved</th>
<th>average #hours per week</th>
<th>involvement in design &amp; implementation?</th>
<th>communication</th>
<th>decision-making power</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>n</td>
<td>+</td>
<td>+</td>
<td>n</td>
<td>8</td>
</tr>
</tbody>
</table>

Creation and distribution of local revenue

All of the revenue created by the project stays within the community. The average amount per person per week is high, as David Niell, Jatun Sacha president, explains, “the local employees receive well above the normal income for the area.”

It is their primary source of income, and the economic benefits are distributed equally among the employees. The non-monetary benefits, including the conservation, reforested land, and education, are shared equally by all members of the surrounding communities. Jatun Sacha’s score for creation and distribution of local revenue was a 10 (see table 31).

**Table 31. Creation and Distribution of Local Revenue**

<table>
<thead>
<tr>
<th>% that stays in community</th>
<th>average. amount. $/person/week</th>
<th>primary source?</th>
<th>non-monetary benefits?</th>
<th>distribution of economic benefits</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>

*Cultural and social holism*

Culturally and socially, Jatun Sacha is very holistic. Social, cultural and value systems are preserved by the reserve’s cultural and community projects, like their work rescuing the ethnobotanical knowledge of the Quichuas and reviving their environmental ethic. The social equity is very high because of the equal opportunity to participate in the program, and all the technology used is local and appropriate. The cabins were built with all local materials, and the agriculture, though it may use techniques that were not developed locally, uses no non-organic pesticides or herbicides. Jatun Sacha received another perfect score of 10 for social and cultural holism (see table 32).

**Table 32. Social and Cultural Holism**

<table>
<thead>
<tr>
<th>preserves social systems</th>
<th>social equality</th>
<th>appropriate technology</th>
<th>preserves cultural systems</th>
<th>preserves value systems</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>10</td>
</tr>
</tbody>
</table>
Source and amount of funding

Most of the funding to support the Jatun Sacha reserve comes from the ecotourism at the Cabañas Alinahui and the large fees paid by volunteers who work at Jatun Sacha. Funding from the Jatun Sacha Foundation supports larger projects at the reserve, like some of the outreach activities or reforestation projects. The Foundation Jatun Sacha receives funding from international conservation organizations including the Missouri Botanical Gardens, the Schlinger Foundation, the Swiss Children's Rainforest Organization, the Liz Claiborne/Art Orten Foundation and the World Parks Foundation. The $260,000 ecotourism cabins were made possible by a $130,000 donation from Jatun Sacha, another $130,000 from Health and Habitat, plus a loan from The Nature Conservancy which was paid back in four years.¹³

Table 33. Source and Amount of Funding

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>Amount of funding</th>
<th>length of funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>local NGO, some national, some international</td>
<td>low</td>
<td>long</td>
</tr>
</tbody>
</table>

Overall, Jatun Sacha received the highest (tied with Capirona) score for sustainability, a 9.6. It scored highly in all three factors influencing sustainability as well, averaging 9.3. Jatun Sacha's success is not due to rare and idealistic community structure as was found at Capirona, but rather to the diversity of projects it undertakes. The community circumstances at Jatun Sacha are much more common than those at Capirona and the projects could probably be repeated elsewhere successfully. Jatun Sacha is an excellent example of a project that successfully

integrates many conservation and development activities, by using the money made by the more profitable activities to support the educational, outreach, and conservation aspects of the program that make no money alone. As Furze explains, the journey toward sustainable development is "one which represents a variety of concerns and approaches, not just dogmatic assertions of the inherent right or wrong of various views." Jatun Sacha is the epitome of a project with a variety of concerns and approaches.

Conclusions

In this project, circumstances have been identified under which ecotourism, sustainable agriculture and bioprospecting are environmentally, economically, and socially sustainable strategies. Under the right conditions, each type of project can promote biodiversity conservation and improve standards of living. The conditions under which this can happen, however, are not easy to meet. No single type of sustainable development project (ecotourism, sustainable agriculture or bioprospecting) can alone save the threatened ecosystems of the Ecuadorian Amazon while improving the long-term well-being of rural communities. These activities are not panaceas and are too frequently proposed as such. We have seen that it is both difficult and unusual for a project to be environmentally, economically, and socially successful and sustainable. Even if a project includes local participation and control, seems to be holistic, creates significant and equitably distributed local revenue, and is well-funded (which is very rare), other complicating factors can come into play and make a project unsuccessful or unsustainable.

The standards for sustainability are tough, particularly in a world where the realization that conservation and economic development can go hand in hand is
only about a decade old, and in a world whose policies and economic systems usually work against the conservation goals of the projects. Southgate explains that Ecuador has "an ideal set of policies for environmental degradation.... as long as Ecuador's rural economy remains poor in everything but land, water, flora and fauna, those resources will continue to be exploited"\textsuperscript{215} Without compatible national commitments, the effects of local projects are seriously restricted.

The sustainability of conservation and development projects needs to be guaranteed both from inside and outside of the Ecuadorian Amazon. Industrialized nations need to be responsible for stimulating ecological and social consciousness among consumers. They should create long-term demand for the rainforest products and sustainably-harvested, non-biopirated medicines, and should educate ecotourists on how to chose an environmentally and socially responsible and sustainable ecotour. Efforts should also be made to stimulate people of industrialized nations to support the political action causes of rainforest conservation and indigenous rights, and to refrain from supporting the forces that work against these goals. With conservation projects such as these that are inherently global in nature, the international community must take on monumental environmental and social projects to correspond with, and ensure the success of the local community projects.

Although the solutions presented in this project are far from fully satisfying, some of them may currently be the best way to combine biodiversity conservation with economic development, at least until there is widespread economic and political change in both Ecuador and internationally. The criteria that projects have to simultaneously improve the economic and the environmental situation is a tough goal. However, the reality is that if the economic criteria is not satisfied, then the project is not the best way to help local communities, and if the environmental

\textsuperscript{215} Southgate, Douglas. \textit{Alternatives for Habitat Protection}. p. 27.
criteria is not met, then it is not the best type of habitat protection.\textsuperscript{216} The project should simultaneously be a more economically attractive activity that the former activity, and must be more effective than other measures to protect threatened habitats. This does not mean that saving the rainforests and cultures of the Amazon is a lost cause. Most projects are stronger in one criteria than the other; in this paper, sustainable agriculture proved stronger environmentally and weaker economically, ecotourism was slightly stronger economically than environmentally, and bioprospecting was generally weak in both areas, although there are exceptions to all cases. Even the projects that were not judged highly sustainable in all three categories do prevent other economic activities from occurring which are environmentally more harmful and much less sustainable. Each project works to protect biodiversity in various ways, some also provide carbon-sinks, wildlife refuges, protect the culture of local groups, prevent soil erosion, protect a watershed, convince policy-makers to prioritize biodiversity conservation, and many other benefits. The projects represent alternatives in areas where unsustainable agriculture, oil exploration, and logging probably would have otherwise prevailed. Even projects that gain little revenue for the local community that have positive environmental externalities are often worthwhile and result in much less environmental damage and more economic benefits than would have occurred otherwise.

Under the right conditions, sustainable agriculture, and ecotourism can be carried out in a way that brings significant benefits to local economies and protects biodiversity. Bioprospecting is less likely to be locally sustainable under current international circumstances. The success of biodiversity conservation projects depends on ensuring that natural areas are sufficiently well managed to provide a continuous flow of benefits to society. The total effect that Integrated Conservation

\textsuperscript{216} Southgate, Douglas. \textit{Alternatives for Habitat Protection}, p. 3.
and Development Projects can have are limited, however, and they alone cannot resolve environmental and development problems. These projects are one of the many paths that should be explored in search of the ultimate goal of sustainable development. We need to explore each path fully and flexibly, concentrating on site-specific challenges and limitations before general statements and a more direct approach to sustainable development can be made. The future of Ecuador's biodiversity depends on our ability to establish a framework of common interest, with mutual respect, understanding, and cooperation between global, national, and local actors, that will become reality. Sustainability is a new and still ambiguous concept, and the reality of implementing projects that aim to achieve something that the surrounding systems work against needs to be kept in mind. Sustainable development projects are about balancing the dream-able with the do-able. As E.O. Wilson eloquently explains, "the wildlands are like a magic well: the more that is drawn from them in knowledge and benefits, the more there will be to draw."217 I am confident that with refined and innovative ways to sustainably draw from the land, we will realize the effects of the magic well.

217Wilson, E.O. The Diversity of Life, p 282
Acknowledgements

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Finally, I would like to thank my family for dealing well with their fears of me being alone, and lost in the Amazon.
The Use of Economic Instruments in Biodiversity Conservation Projects

Projects can be designed with the environmental and economic objectives in mind, with specific challenges and opportunities in mind. The integration of economic instruments into conservation projects can help address these challenges by providing financial incentives for conservation actions. Economic instruments, such as taxes, subsidies, and payments for ecosystem services, can encourage beneficial conservation actions and discourage harmful ones. It is important to consider the specific context and needs of the project when selecting and implementing economic instruments.
Bibliography


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The Nature Conservancy/ "Overview of the Conservancy's Ecuador Programs" (http://www.tnc.org/) September 26, 1997.


The Use of Economic Instruments in Biodiversity Conservation Projects


List of Interviews


