

**GLOBAL ENVIRONMENT FACILITY  
PROPOSAL FOR PDF BLOC B & C GRANTS**

**Country:** Brazil

**Focal Area:** Biodiversity

**Project Title:** Juruena Feasibility Study for Industrial Production of Non-Timber Forest Products

**Amount of Funding Requested:** US\$ 276,917  
**Co-funding:** US\$ 77,585 (European Commission)

**Requesting Agency:** Pro-Natura International (PNI)

**Bloc B**   x  

**Bloc C**       

**Bloc A Grant Awarded:** No. The project was developed by PNI

**I. Summary Project Objectives and Description**

This project forms part of an integrated sustainable development programme being carried out by Pro-Natura International (PNI) to foster biodiversity conservation by promoting the sustainable development of forest-edge communities. The basic premise of this project is that farmers will destroy significantly less biologically diverse forest habitat if provided with suitable economic alternatives including sustainable management and harvest of forest products.

Juruena is one of the most biologically diverse regions of the Amazon. The municipality of Juruena, covering an area of 12,000 square kilometres, is also the most advanced frontier region of human settlement in the southern Amazon with an existing private settlement project having been allocated half the area. Today more than a thousand families live in the rural regions of the municipality with an equal number living in the two principal towns. The farmers originate from outside the region and have found it difficult to survive using their original farming practices.

These practices involve clearing of forested land and planting short-term crops leading to rapid erosion and soil exhaustion. This forces the settlers to abandon their farms and seek new land deeper in the forest. Poor revenues do not allow them to make any investment for improved land use, and they continue to clear new forest areas, engage in logging or migrate to other areas of the Amazon where they pursue further slash-and-burn cultivation. Almost one quarter of the farms have been abandoned in this manner, increasing the pressure on the remaining forests. Currently less than ten percent of the Juruena region's original forest has been altered but, if left unchecked, this process threatens to follow the same path of destruction that has deforested nearly 100,000 square kilometres in the neighbouring state of Rondonia.

Pro-Natura was founded in Brazil in 1986 by Dr. Marcelo Andrade and Dr. Thomas Lovejoy with the goal to "Save the Tropical Forests for the People with the People." Since then, Pro-Natura's activities have evolved from creating simple protected areas to carrying out complete eco-development programmes. This organization is now one of Brazil's leading NGOs in the area of forest conservation and directly influences the conservation of more than three million hectares of forest in Brazil. With the aim of creating a network for international collaboration, Pro-Natura took an international dimension following the Rio 92 Conference. Pro-Natura has on its boards many of the world's most renowned specialists in tropical forest ecology and its actions in the field are a combination of their expertise and the traditional knowledge of tropical farmers, particularly in term of agroforestry. Pro-Natura's strategy is based on the clear conviction that the conservation of biodiversity is best achieved in most tropical forest contexts through sustainable development in buffer zones.

In 1990, with the help of the British company ICI, Pro-Natura initiated the Juruena Development Programme which influences over 1.2 million hectares in the north west of Mato Grosso State. The Juruena programme follows an integrated strategy aimed at stabilizing the local communities on their land by working with them to develop sustainable economic alternatives to forest destruction. The project began by rethinking the way agriculture was done given both its unprofitability and unsustainability. The first initiative developed by Pro-Natura in Juruena is an agricultural programme to establish agroforestry systems on degraded land and to undertake enrichment planting of secondary forests.

As part of this programme, Pro-Natura has established an experimental research programme which includes a model farm. This will lead to the identification and demonstration of a sustainable cultivation system for Juruena, using the techniques of agroforestry combined with a twenty-year rotation system. This process was begun in 1992 and has produced impressive preliminary results. Nevertheless, the current agricultural research programme is not sufficient to bring significant development to the region since most agricultural products have no important value added. Therefore, both to help local people more significantly in the short term, thereby attracting their interest to the agricultural research in progress, and to favour significant non-destructive economic development in the longer-term, small-scale industrial projects which sustainably use forest resources need to be implemented.

The project's objective is to promote the establishment of small scale industrial projects based on sustainable harvest of forest resources.

Long-term project objectives are:

**I.1 To assist farmers in the sustainable production and trading of specialized products with high value-added within the international concepts of quality and reliability of supply.**

**I.2 To produce animal feed from agricultural, extractive and wood industry residues in order to reduce the pressure of forest clearance for cattle ranching.**

**I.3 To implement this commercial exploitation by way of distinct but complementary projects each involving a private company or cooperative with the support of existing**

appropriate technical and scientific organizations.

**L.4 To provide training for local people on value-added agroforestry production and provide a series of experiences and lessons to help the sustainable development of other tropical forest areas.**

## II. Description of Proposed PDF Activities

This project aims to conduct the initial research necessary to develop a full-scale project to promote the local processing of forest resources which are sustainably produced and gathered. A feasibility study will be carried out for four small scale industrial projects producing specialized products with high value added for export. Work on the technological aspects of this study has already been initiated with the collaboration of the University of Campinas/CODETEG.

The proposed feasibility study will contain the four following sub-components:

- 1) Brazil nut oil
- 2) Natural soap
- 3) Animal feed
- 4) Chewing gum

For further details on the potential for industrial product development within each proposed sub-projects, please refer to Appendix A.

The following project development activities are proposed under the Block B project:

**Marketing research-Exploratory Phase.** The feasibility study will include for all the four sub-projects research on the following marketing areas:

1. Market segmentation
2. Qualitative analysis: exploratory phase to evaluate project positioning alternatives
3. Quantitative analysis: the degree of concept acceptance is measured in order to determine demand in terms of quantity and price.

This research first will involve an exploratory phase to evaluate the degree of acceptance of the products, their positioning alternatives, existing directly or indirectly competitive products, their main physical characteristics as well as the type of packaging, the price level, the possible distribution channels, and the best communication strategy.

**Industrial Feasibility research.** In conjunction with the marketing study, further research will be carried out regarding the technical feasibility and ecological sustainability of producing each of the proposed products; specific research will be carried out to determine sustainable harvesting limits for each forest product.

**Final Phase of Marketing Research/Implementation of Pilot Manufacturing.** During this phase samples of the products will be produced on a pilot scale in order to conduct actual sales tests. The final characteristics of the product will be determined as well as the volumes of sales and the price. The choice of distribution channels and the communication strategy will be further refined.

**Financial modelling.** The analysis of each sub-project within the feasibility study will include a full financial modelling with balance sheets, profit and loss accounts, and cash forecasts over short, medium, and long term periods.

**Project Design.** Based upon the findings of the feasibility study, a strategic investment programme will be developed for GEF or other financing to implement the sustainable production of industrial forest products. Cooperation will be actively pursued with other potential investors and institutional partners within the private and public sector. The full-scale project will be developed through a participatory process involving all relevant stakeholder to ensure an equitable process and distribution of benefits.

### III. PDF Outputs

For each of the four non-timber forest products listed above, the GEF, in collaboration with the European Commission, will finance the production of the following outputs:

- 1) Marketing Study
- 2) Industrial Feasibility Study
- 3) Pilot Manufacturing and Final Market Research
- 4) Financial Modelling
- 5) Full-scale Project Design

### IV. Eligibility

This project fits into the strategy for promoting sustainable uses of biodiversity as laid out in the GEF Interim Programming Guidance. Furthermore, the activities proposed in this project relate directly to Article 12 of the Convention on Biological Diversity which calls upon the Contracting parties to "Promote and encourage research which contributes to the conservation and sustainable use of biological diversity, particularly in developing countries." This project also falls under the more general scope of Article 6 which calls for the development of programmes for the sustainable use of biodiversity resources and of the various other articles which call for sustainable biodiversity use. Article 8, for example, calls for the promotion of sustainable development in communities adjacent to protected areas so as to further their protection. By stemming the burning of tropical forests, this project also contributes to the objectives of the GEF in terms of mitigating global emissions of carbon dioxide. By encouraging agroforestry development and the development of industrial tree crops, moreover, the project contributes to an on-going process of carbon sequestration.

This project fits into the set of policies recommended by the Amazonian Commission for Development in the Environment in the joint UNDP-IDB report *Amazonia Without Myths* which was prepared as a contribution to the Earth Summit in 1992. This report explicitly calls for new measures to be developed so as to make sustainable usage of "the standing Amazon." In particular, the report mentions the potential for industrial products and argues that "Future strategy should be geared to the study of the different species, the search for markets, and the guarantee of a fair profit to the local inhabitants. This project responds directly to these recommendations.

This project will make its findings available to the ongoing GEF-financed activities in the Amazon region, including the Pilot Phase projects sponsored by the World Bank and UNDP and will seek to coordinate activities in those areas where opportunities for collaboration exist. This project has been discussed with the World Bank Task Manager for the ongoing Pilot Phase biodiversity protection project; no overlap or duplication of efforts have been foreseen. The project will complement the UNDP-GEF initiative on "Regional Support to the Conservation and Sustainable Management of Natural Resources in the Amazon" which is strengthening capacities for biodiversity management and is supporting the development of national plans for the sustainable use of biodiversity.

#### V. National Level Support

The Juruena programme arose directly from a national government-sponsored planning initiative. The Juruena project is the first initiative resulting from the 1990 Environmental Conference of Amazon revitalization of degraded lands held in Brasilia under the joint auspices of the Brazilian and British governments and sponsored by the Overseas Development Administration and ICI. The concept of the project arose in 1989 when the then exclusively Brazilian NGO Pro-Natura spent US\$ 200,000 in methodology development and the search for the area where they could implement a sustainable development project, carrying out field studies on six different frontier land sites in the Brazilian Amazon. Among the six areas initially selected, Juruena situated at the extreme North of Mato Grosso state and renowned for its biodiversity seemed the most promising one for the project defined at the Brasilia conference.

This project was directly designed by a local-level organization representing the various local stakeholder in the Juruena region. To attract the interest of the local community on its initial experimental research work on agroforestry at the Experimental Centre of Juruena, Pro-Natura developed a process of social involvement. This process brought many achievements in the fields of environmental education, children's health care, and technical assistance to smallholders. It also led to greater organization among the villagers which allowed the development of small initiatives such as the creation of a weekly open market for local products. This process also led to bigger steps such as the creation of the Juruena Association for Rural Development (ADERJUR) whose member list includes various key groups of stakeholder ranging from workers involved with the extraction of forest fruits to businessmen of the local timber industry.

The Juruena farmers are concerned with the necessity of raising the community's living standard in the short term without damaging the vegetation cover. As a result of many meetings and talks

in the framework of ADERJUR, they defined its aim as the following: to help the farmers join forces to implement a community system for the sustainable small scale processing of their agricultural products and for the organization of the marketing of these products. This cooperative organization will lead this proposed project and the four different sub-programmes will be implemented as much as possible within the cooperative framework. ADERJUR developed the concepts in this proposal and it is strongly supported by the PNI local team.

#### VI. Items to be Financed

##### By output:

Oil and soap feasibility study:	US\$ 184,321
Animal feed and gums study:	170,181
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	US\$ 354,502

##### By input:

Experts/consultants	259,260
Travel (domestic, international, field)	53,776
Equipment (incl software, GPS)	21,400
Administrative	20,066
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	US\$ 354,502

## ANNEX I

**SUB-PROJECT : BRAZIL NUT OIL**

The oil of the Brazil nut (*Bertholettia excelsa*) contains a high proportion of unsaturated fatty acid glyceride, especially linoleic, and therefore requires stabilisation with an anti-oxidant and protection from atmospheric oxygen. The unsaturated nature of this edible and attractively flavoured oil renders it a valuable item for both cosmetic and food purposes. Sale as oil is expected to be more lucrative for the local collector than sale as raw nuts, whose market at present is grossly over supplied. It also diminishes the storage problem associated with the development of aflatoxin producing fungi on the humid kernels. The oil-cake is high in protein (25 %) and therefore attractive as a raw material for dietary food or animal feed (Mors & Rizzini, 1964, Pesce, 1941).

The Brazil nut tree is quite abundant in the Juruena area. A sale of 17 tons of nuts was reported to have been made by one collector in the adjacent county to the north, Cotriguaçu, last season. The adjacent county to the south is actually called *Castanheira* after the *Brazil nut tree*. There is little doubt that there will be enough raw material available in the region to maintain at least one 50 litre/hour oil press in activity through a large part of the year and, probably, one such press in each municipality of the region.

The operation will require gathering, cracking, storage, oil pressing, filtration, stabilisation against oxidation, bottling, labelling and as well as quality control. Gathering will be open to all members of the community but the further processing will be conducted at a central site where deterioration of the nuts by *Aspergillus Niger* contamination and rancification of the highly unsaturated oil can be avoided by the use of appropriate technology.

There are several possible final uses for this oil :

- as a direct *aroma therapy* type oil for skin application or bath additives in bottles of about 20 ml sold through distributors ;
- as an ingredient for skin and hair care products ;
- as cooking oil for local consumption ;
- as raw material for soap manufacture (sub-project 3).

Blending with a more saturated oil or fat may be necessary to give adequate consistency. Such oils or fats will come from local palm fruits (pataua, buriti, tucum and babaçu), piçua (*Caryocar villosum*) or piçul (*Caryocar brasiliense*) or from ucuuba (*Virola sp.*) all species widely present in the area.

The production of Brazil nut oil will also result in a protein-rich oil-cake. This will go into animal feed (Sub-project 5).

**Notes on other oils with potential :**

Peçua fruits are large (280g average weight), about 65 % consisting of outer case and 35 % (100g) internal consisting of some 30 g pulp and 10 g kernel, with an intermediate woody shell (60g). The yellow pulp when dry contains 67 % "butter" rich in beta-carotene, certainly a tradable product, while the inner kernel contains 70 % of a high melting fat (30-37 °C) suitable for cosmetic cream formulation (C. Pesce, 1941).

Ucuuba seeds have been long exploited for their fat. A plantation of 165 trees per ha is expected to produce about 2.4 tons of this fat which consists mainly of

trimyristin and melts above 40°C. There are two common species, *Virola surinamensis*, ucuuba branca and *V. sebifera*, ucuuba vermelha, with similar yields of seeds and fat. The fat when purified from non glyceride resins constitutes a useful base for cosmetic creams. The Indians and other river-side dwellers of Amazon use the fat for illumination, either by burning the seeds directly or by making candles (Mors & Rizzini, 1965; C. Pesce, 1941).

*Astrocaryum tucuman* pulp oil is Vaseline-like and its nut fat is solid below 30°C.

The pataua palm (*Jessenia bataua*) was observed to be abundant along water-courses in the forest. Its pulp oil is similar to olive oil. Its use should therefore be as a table salad oil and it could easily be developed if the extra pulp oil equipment mentioned above were installed. It is not considered however a priority oil for development during the first year. The high nutrient value of the fruit pulp freed from fibre, used as baby-food (Balick, 1982, cited by Grenand et al, 1987) suggests the preparation of a dietary food or the use for animal feed of these fruits (sub-project 5).

As a long term objective, plantations of pupunha or peach palm could be contemplated. Pupunha fruit oil is an oleic (50%), palmitic (30-40 %) oil acceptable as a good quality cooking oil. It is estimated that 2.2 ton/ha can be produced by plantation (400 palms/ha). The oil-cake is similar in composition to maize and can be used for the production of flour or animal feed, the latter being available according to estimates at 20 t/ha. This palm produces an internationally recognised palm heart. The palm was selected over centuries by Indians. More recent research (INPA, Manaus) and agro-development (CATIE and Univ. Costa Rica) are reported by Clement (1991).

Babaçu, as in much of Amazon, occupies cleared areas and forms natural *cloisters*. Its kernel oil/fat is one of the best sources of lauric glycerides (34% lauric, 19% myristic, 11% palmitic, 17% oleic) for soap manufacture.

### **SUB-PROJECT : NATURAL TOILET SOAP**

The objective here is to produce *Amazon* or *Rain forest* toilet soap, sold at a price premium, (cf. the original *Phebo* glycerol soap of Belem, entirely derived from natural botanical sources and manufactured in the region of origin of these sources). This toilet soap production will also absorb the less valuable fractions of glyceride oils resulting from fractionation (sub-project 2) as far as the properties of these fractions permit. It also provides a finished product outlet for locally produced natural perfumes & aromas (sub-project 4).

Soap manufacture is expected to consume about 80 % oleic oils and 20 % lauric oils - the former in fruit pulp - the latter in kernels.



## SUB-PROJECT : ANIMAL FEED

A major industry which is still expanding in Amazon is cattle raising. Small farmers also raise pigs and poultry and in some places these productions have been important in the past. As is already well known, pasture planted on forest clearance areas has only a short life before it becomes of poor quality and unable to support animals at an economic population density. The development of animal feed for cattle, pigs and poultry, derived from protein and vitamin-rich natural Amazonian sources is a fundamental step towards the reduction of forest clearance (in round figures 10 kg biomass maintains 1 head of cattle in fattening at 1 kg weight gain per day. Thus the 2.5 tons/day waste of the existing palm heart plant in Juruena could be transformed into 250 k meat/day).

These sources are numerous and are mainly by-products of the vegetable oil and timber industries. There is therefore no specific agricultural investment involved and the raw materials are essentially free-of-charge. The products are in all cases adaptable to confined husbandry and avoid forest destruction.

In Juruena, the initial operation will be with palm-heart residues and Brazil nut oil-cake (this last from sub-project 2). Indústria de Conservas Alimentícias Juruena Ltda produces palm-heart from Jussara (*Euterpe precatoria*) with a residue of 2 to 3 tons/day of the outer sheath which will probably not need high pressure steam treatment, but only a milder process of steam heating well within the capacity of the industry's existing steam boiler. A production of around 1-2 tons/day of rations suitable for non-ruminants is envisaged, for local consumption.

The installation of a pilot high pressure steam plant (2 m<sup>3</sup> capacity) at the principal timber company in Juruena (Rohden SA) would permit technical and economic evaluation of wood residues for cattle-feed with the company's technical staff. The main questions to be resolved are :

- what is the size of the local and regional cattle feed market ?
- which of the woods sawn by the company are acceptable to cattle before and after steam treatment and which are non toxic ?
- Is sawdust available, as distinct from larger pieces of wood waste ? Can larger pieces be reduced economically to saw dust ? Can sawdust be delignified by steam treatment ?

## SUB-PROJECT : CHEWING GUM

In Brazil the most important chewing gum latex come from *Manilkara bidentata*, which is tapped at rather wide intervals. In Juruena some seven abundant latex producing species are present, *Borracheira* (*Castilla ulai*, Moraceae) is widely represented. These local species are suitable for chewing gum in terms of rubber/gutta content.