THE BENI BIOSPHERE RESERVE

BOLIVIE

by

Carmen MIRANDA L.
The Working Papers series is a publication of the South-South Cooperation Programme for Environmentally Sound Socio-Economic Development in the Humid Tropics. The series aims to disseminate the results of the research on Biosphere Reserves on such topics as (i) the prevailing conservation and resource-use pattern ands, (ii) the ways of improving traditional practices and orientation for applied research aimed at a more intensive and sustainable use of the biodiversity to provide a better livelihood to the local population in the buffer and transition zones. On more general issues, the Working Papers are also an attempt to identify key problems that will become areas of concentration for international coopération.

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The Biosphere Reserves or similar managed areas that are joining the *South-South Cooperation Programme*, are requested to produce an overview of their covering area containing first hand information on its conditions and urging problems.

These reports will be primarily used as background materials for the comparative projects agreed upon in the programme of activities established at the Chiang Mai meeting, held in May 1994. For more details please report to the newsletter *South-South Perspectives* (Nº 1, October 1994 [28 pp.], UNESCO, Paris [France]).

Given the rich information value of these reports, they are being made available to a wide audience. They may be obtained by contacting UNESCO/MAB Secretariat, Division of Ecological Sciences.

For other documents available in the series, see the back-cover
The Beni Biosphere reserve is located in Northeastern Bolivia (14° 30' S, 66° 38' W). It covers 135,000 ha among which 10 % of the remaining Atlantic forest. Three major biogeographical regions merge on the Reserve : Amazon, Chaco and Cerrado. 70 % of the area is covered by forest vegetation and the remaining by wetlands.

Two thousand people are living in the Station including 1200 Chimane. The use of natural resources by local population includes hunting, fishing, gathering, producing crafts and also subsistence agriculture.

The management objectives of the Beni Biosphere Reserve covers the 3 functions of the Biosphere reserves : Conservation (protection and conservation of biota and natural processes), Logistic (basic and applied research, monitoring of natural processes, development of sustainability indicators, environmental education and training) and Development. (promotion of sustainable use of natural resources, promotion of regional and local development by incorporating all concerned social actors in the Reserve planning).

Different management programmes have been launched in order to integrate the development of local peoplic communities including:

- Anthropological, demographic and diagnostic studies;
- A programme of environmental education aims to build a regional conservationist movement by conferences, workshops and diffusion among population;
- A resource management programme based on the knowledge of local people includes the management of the Amazonian river turtle and the Black caiman;
- A scientific research programme gathering 45 research projects oriented from biological inventories to archeological and ethnological topics.

Monitoring includes offtake effects on natural resources as well as land evaluation of tropical forest by use of satellite pictures.
Interinstitutional cooperation and coordination is developed from local to international level allowing advisory services to other protected areas.

Ongoing strategies are developed in the frame of an expansion plan with following topics: Landuse practices and management of rangelands (savanna, forest island and evergreen tropical forest ecosystems); wildlife management (flora, faune, ecosystems); use of alternative energy. Fellowship funds, improvement of infrastructures, publications and setting of a G.I.S. are also part of the expansion plan.

RÉSUMÉ

La Réserve de la Biosphère de Beni est située dans le nord-est de la Bolivie (14° 30’ S, 66° 38’ W). Elle occupe 135,000 ha dont 10% du reste de la forêt atlantique originale. Trois régions biogéographiques principales ont leur jonction sur la Réserve: Amazonie, Chaco et Cerrado. 70% de la surface est couverte de végétation forestière et le reste par des zones humides.

Deux mille personnes vivent sur le territoire de la Station dont 1200 Chimanes. L'utilisation des ressources naturelles par la population locale comprend la chasse, la pêche, la cueillette, la production artisanale et l'agriculture de subsistance.

Les objectifs de gestion de la Réserve de la Biosphère de Beni couvrent les 3 fonctions des Réerves de la Biosphère : Conservation (protection et conservation de la biodiversité et des processus naturels), Logistique (recherche fondamentale et appliquée, suivi systématique des processus naturels, développement d'indicateurs de durabilité, éducation environnementale et formation) et Développement. (promotion de l'utilisation durable des ressources naturelles, promotion du développement régional et local en incorporant tous les acteurs sociaux concernés dans la planification de la Réserve).

Divers programmes de gestion ont été lancés pour intégrer le développement des communautés locales, avec en particulier:

- Études anthropologiques, démographiques et diagnostiques ;
- Un programme d'éducation environnementale vise à construire un mouvement régional conservationniste grâce à des conférences, des ateliers et par la diffusion dans la population locale ;
- Un programme de gestion des ressources reposant sur le savoir des populations locales concerne la gestion des tortues de rivière amazoniennes et celle du caïman noir ;
- Un programme de recherche scientifique réunissant 45 projets de recherche allant des inventaires biologiques à des thèmes archéologiques et ethnologiques.
Le suivi systématique concerne les effets des prélèvements sur les ressources naturelles aussi bien que l'évaluation des forêts tropicales par clichés satellitaires.

La coopération interinstitutionnelle et la coordination sont développées du niveau local au niveau international, permettant de délivrer des services de consultants aux autres aires protégées.

Des stratégies pour la continuation sont développées dans le cadre d'un plan d'expansion comprenant les thèmes suivants : Pratiques d'utilisation de la terre et gestion des terres de parcours (écosystèmes de savane, îlots forestiers et forêt tropicale sempervirente); gestion des espèces sauvages (flore, faune, écosystèmes); utilisation d'énergies de remplacement. Des bourses universitaires, l'amélioration des infrastructures, des publications et l'acquisition d'un Système d'information Géographique font également partie du plan d'expansion de la Réserve de Beni.

Carmen Miranda L. is the Director of the Beni Biosphere Reserve.
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Working Paper N° 9, 1995, UNESCO (South-South Cooperation Programme), Paris (France)
I- GENERAL DESCRIPTION

1) The national setting

With an area of 1,098,581 km², the Republic of Bolivia is located at the center of South America. Its population of 7 million people is characterized by an ample cultural diversity, which through a complex historical process has dynamically kept numerous indigenous groups both in the Andean and Amazonic regions. Also, intercultural processes have taken place throughout the country.

Bolivia is catalogued among the twelve countries possessing the highest biological diversity. The biogeographic convergence of its territory, from the Andes, the Amazon, the "Chaco" and the "Pantanal," as well as a broad altitudinal variation determine the existence of a large number of species of flora and fauna distributed along several ecological regions.

Map 1: Map of Bolivia

Since the colonial period, the country's natural resources have suffered an increasing pressure and have not been used adequately. Under that situation and with the main task of preserving representative areas of natural ecosystems, in 1939, the government initiated a process of adoption of legal instruments for the creation of protected areas. This effort however, was slow to take place. The absence of a legal framework and policies for the...
management of protected areas, the absence of qualified human resources and the lack of financial resources limited in a decisive way the strengthening and development of conservation units.

Within this context, during the decade of the 80’s, some Bolivian institutions initiated a systematic effort to evaluate the situation of protected areas and biodiversity. This effort allowed to create the basis for the development of a National System of Protected Areas, which today is a thriving organization.

One of the pioneering protected areas is the Beni Biological Station (EBB), created in 1982 under initiative of the National Academy of Sciences of Bolivia, with the main purpose of protecting the area’s natural resources as a representative sample of neotropical forest, savanna and swamp, and develop scientific activities that would allow to increase knowledge on tropical ecosystems.

Map 2: the Ebb's area in the Beni Department

With the purpose of promoting the conservation of the biological diversity of the area, in 1986, the recognition as a Biosphere Reserve from MAB-UNESCO was sought. Within this status, the EBB has now the function of protecting the area and promoting basic and applied
research, addressed to the generation of knowledge that would orient a wiser use of renewable natural resources, promote environmental education and participate in the development of the region.

2) **General information**

<table>
<thead>
<tr>
<th><strong>Legal Base:</strong></th>
<th>Supreme Decree N° 19191 of 5/10/1982 (creation)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location:</strong></td>
<td>Department of Beni, Ballivián and Yacuma Provinces</td>
</tr>
<tr>
<td><strong>Area:</strong></td>
<td>135,000 has</td>
</tr>
<tr>
<td><strong>Coordinates:</strong></td>
<td>14° 30' Lat. South and 66° 38' Long. W.</td>
</tr>
<tr>
<td><strong>Administration:</strong></td>
<td>National Academy of Sciences of Bolivia</td>
</tr>
<tr>
<td><strong>Objectives of creation:</strong></td>
<td>Protection of flora, fauna and gea and execution of scientific research.</td>
</tr>
<tr>
<td><strong>International recognition:</strong></td>
<td>Declared Biosphere Reserve by MAB's International Council in 1986.</td>
</tr>
<tr>
<td><strong>National recognition:</strong></td>
<td>Priority area of the National System of Protected Areas (SNAP)</td>
</tr>
<tr>
<td><strong>Region:</strong></td>
<td>Amazonian lowlands of eastern Bolivia</td>
</tr>
<tr>
<td><strong>Subregion:</strong></td>
<td>The Beni planes, llanos de Moxos.</td>
</tr>
<tr>
<td><strong>Vegetation:</strong></td>
<td>Extensive humid tropical forest formations of diverse composition and structure, multiple interphases forest-swamp and forest-savanna. Predominance of the humid tropical stational forest and humid savannas with low shrubs. 14 out of 22 great formations of the Department's characteristic vegetation are represented in the area.</td>
</tr>
<tr>
<td><strong>Flora:</strong></td>
<td>Estimated presence of more than 2,000 species of vascular plants.</td>
</tr>
<tr>
<td><strong>Fauna:</strong></td>
<td>More than 100 species of mammals, 470 species of birds, 45 species of amphibians, and at least 200 species of fishes. Presence of numerous endangered species is recorded.</td>
</tr>
<tr>
<td><strong>Climate:</strong></td>
<td>Mean annual temperature 26° C and annual rainfall 1800 mm.</td>
</tr>
<tr>
<td><strong>Population:</strong></td>
<td>Ethnic group: &quot;Chimane&quot;, mestizo agrarian communities and cattle ranches.</td>
</tr>
<tr>
<td><strong>Management:</strong></td>
<td>16 subprograms distributed in 8 ongoing Programs.</td>
</tr>
</tbody>
</table>
II- PREVAILING CONSERVATION AND RESOURCE USE PATTERNS

1) Ecological and biogeographical characteristics

The Beni Biosphere Reserve is located in the Department of Beni, in the Ballivian and Yacuma Provinces (northeastern Bolivia). It has an area of 135,000 hectares and its operation center is geographically located at 14° 30' latitude S and 66° 38' longitude W. Annual average temperature is 26°C and mean annual precipitation 1,800 mm.

Three large biogeographical regions of South America merge on the Reserve: the Amazon, the Chaco and the Cerrado. Fittkau et al. (1975) include all the Beni area in an ecological subregion that belongs to Amazonia or the peripheral preandine Amazonia. This preandine alluvial land has soils moderately rich in nutrients, in comparation with the Central Amazonia ones.

Beck (1983), discussing the floristical affinities of Beni, considers a great influence from “Gran Pantanal”, “Hylea” and “Cerrado”. The Beni forest presents remarkable affinity in structure and composition with the forest of Peru’s southeast Amazonia (Boom 1987; Foster 1986). In general, the Reserve’s dense forest formations have amazonian affinity. On the other hand, the savanna formations are basically influenced by the “Chaco-Cerrado” elements.

The influences of the Amazon can be seen in the forest ecosystems with plant species such as Calophyllum brasiliense (tree of the Meliaceae family, locally called “palo maria”), Cedrela odorata (“cedar”, tree of the Meliaceae family also, very appreciated for its wood), Socratea exorrhiza (a palm species, locally called “pachuiba”), and the respective fauna species such as Ateles paniscus (black spider monkey), Lutra longicaudis (Southern river otter) and Bradypus variegatus (sloth). The influence of the Chaco can be observed in savanna species such as Tabebuia sp. (tree of the Bignonaceae family, locally called “tajibo”), Mazama goazoubira (grey bracket deer, locally called “huaso”) and Dasypus novemcinctus (an armadillo species, locally called “tat”). The Cerrado is characterized by the presence of species such as Machaerium hirtum (“tuseque”, tree included in the Leguminosae family), Curatella americana (species of the Dilleniaceae locally called “chaaco”), Rhea americana (the american nandu) and Chrysocyon brachyurus (maned wolf, “borochi”).

The EBB’s actual vegetation is young in a historical sense, it has been transformed by holocenical events and more recently was related with the “Maniqui” river migration. Many formations constitute subsequent steps in the structuring of more mature phases and over more drained lands, as the hydrological dynamics of the Maniqui River exercises decisive influence on the area. It gives way to several vegetation formations in different stages of succession demonstrating the active processes of natural change.

The vegetation’s spatial distribution is highly heterogeneous; the formations occupying the environment in a disperse and fragmented way, built up in a complex mosaic of diverse
vegetation types. The forest formations alternate with patches of open Cyperaceae wetlands, wet savannas and senescent course labyrinths. The Reserve’s vegetation presents basically a fan-shaped image of different ages that are ordered in a progressive gradient from less age in the west and comparatively other formations in the west, in relation with the divagatory advance of the “Maniqui river”.

Photo 1 : EBB’s satellite image showing the different vegetation units.

Research studies have indicated that thirteen of the eighteen Eastern Bolivia’s species in danger of extinction, inhabit the Station’s area. Research has also identified, at least, 100 species of mammals and 470 species of birds within the Beni Biosphere Reserve. Presently, the staff and other research groups are in the process of completing inventories of additional species. This process has become a permanent on-going task carried out by a number of biologists in-residence at the Station, as well as visiting foreign experts.

Around 70% of the Station is covered by forest vegetation (high dense forests, low inundated forest, gallery or riparian forests and swamp forests). The areas surroundings are characterized by forest islands surrounded by savanna, where several species of palms can be found. The wetlands occupy only 30% of the Reserve but they play an extremely important ecological role. This type of ecosystem is the habitat for many species of birds, reptiles and mammals. The savannas or pampas are less extensive and are found mainly in the northeastern part of the Station.

A total of 14 out of 22 vegetation formations characteristic of the Beni can be found in the Station. There are an estimated 2000 species of vascular plants. More than 50% of all fauna species protected by Bolivian legislation can be found in the Reserve.
2) Use of the natural resources and cultural characteristics:

The Station’s population is estimated 1,200 people, consisting mainly of Chimane communities, an important ethnic group indigenous to the region, as well as small peasant communities and cattle-raising farms. Also, there is an estimated population of 800 people living in the Station’s immediate area of influence, which interacts directly with its communities. The combined population figure is of approximately 2000 people.

Photo 2: EBB’s aerial view

The Chimane Indians live principally along the shores of the Maniqui River and its afluents. The internal organization of the Chimane settlements are based on the family nucleus or in groups of families composed of two or three monogamous family nuclei linked by kinship. The family nucleus functions as an independent social, political and economic unit. Their economy is based on agriculture, on which they are quite knowledgeable. They cultivate more than 80 species of plants, including perennials, medical, fiber and others. In addition, they hunt, fish, gather and produce crafts (Chicchon, 1992). About 30,000 ha of the Station are part of the Chimane Indigenous Territory.

The rural mestizo communities in the Reserve’s area originate from different places in the region (Reyesano, Mojeño and Movima). They have settled along the road which runs from San Borja to Trinidad just south of the Station since the 60’s. Indicators exist which point to a mixed indigenous origin of these communities.

The main economic activity of these communities is subsistence agriculture. Rice, manioc and maize are the main crops, and sugar cane, citrus fruit and vegetables are produced on a smaller scale. Any surplus is sold on the market in San Borja or to the cattle ranches.
family economy includes hunting, gathering and fishing. Other activities include craft making, carpentry and offering of labor to neighboring ranches.

The communities have serious problems with agricultural productivity largely because they have lost much of the traditional knowledge about soil management and pest and disease control. The absence of an efficient commercialization system is part of the problem. As a consequence, the agricultural frontier towards the Station is expanding, an issue that is considered a priority for research and management plans.

Photo 3: Chimane community

Photo 4: People from "El Totaizal", a rural mestizo settlement, working in a community garden.
There are no large expansions of savanna in the Station but small cattle ranches with reduced herds can be found. Cattle ranching is an important activity surrounding the Station. Intensive use of natural pasture and the lack of herd or grass management and no genetic improvement are characteristic of cattle ranching in this area.

On the other hand, in areas contiguous to the Reserve, forestry activities exist, characterized by the extraction of species of high economic value as for example *Swietenia macrophylla* (mahogany, "mara" or "caoba")

III. MANAGEMENT OBJECTIVES OF THE BENI BIOSPHERE RESERVE

1) In its conservation functions:

a- Protection and conservation of biota and natural processes:

- Protection and conservation of biota and its diversity in the area.
- Protection and conservation of a sufficiently large area to assure the continuity of natural and evolutive ecological processes such as the hydrological dynamics, successions, regeneration, genetic fluxes, etc.
- Protection and conservation of ecosystems and representative species of the region.
- Protection and conservation of vulnerable species and in danger of extinction.
- Protection of genetic resources.
- Protection, management and recovery of natural resources, in particular, those of common use by the areas inhabitants.
- Link legally the EBB to neighboring areas, increasing the conservation function of the Biosphere Reserve, for example by through ecological corridors.

2) In its logistic functions:

a- Research

- Promotion of basic and applied scientific research in its area and region of influence.
- Monitoring of natural processes inherent to the biota, climate, and gea of its area and region of influence.
- Promotion of specific projects centered on local problems, interdisciplinary projects that incorporate natural and social sciences, and projects related to species...
management, rehabilitation of degraded ecosystems and the sustainable use of natural resources, especially those that constitute the productive base of the region.

- Consolidation of the role of the EBB as a center for research and training in the alternate use of natural and energy resources.
- Development of sustainability indicators (in ecological, economic, social and institutional terms) for the different productive activities that are carried out in the buffer and multiple sustainable use zones.
- Integration of the EBB in international, national and regional research programmes.

**b- Environmental Education, Training and Communication:**

- Development of educational programs addressed to different sectors of the population within the reserve.
- Provide facilities for the development of educational and training programmes.
- Advice, promote and provide opportunities for the development of training programmes in different fields, related to the conservation and management of natural resources.
- Promotion of the EBB for *in situ* training and the execution of international, regional and national seminars.
- Provide an active promotion of the EBB diffusing its effort and highlighting its role as a Biosphere Reserve.
- Diffuse the experience of the EBB in favour of other similar areas.

**c- Regional Projection**

- Regional projection of experiences in environmental organization and planning of adequate use and conservation of resources.
- Development of an institutional cooperation reinforcing, implementing and integrating programmes for the biodiversity conservation in the Beni Department.

**3) In its development functions:**

**a- Use of resources**

- Promotion of sustainable use of natural resources on which the productive activities of the EBB's population and those of the surrounding areas are based, applying
research results to develop methodologies that can help in the conservation of the natural resources over the long term.

- Organize discussion forum and establish demonstration sites to study the socio-economic and environmental problems of the region and the use of biological sustainable resources essential for the region.

b- Development

- Promotion of regional and local development based on the improvement of the livelihood of the inhabitants, harmonizing their activities with the conservation and management objectives of the EBB.
- Promotion of the local population to socially legitimize the Reserve and incorporate local knowledge in the management of the area.
- Incorporate all concerned social actors in the Reserve's planning and decision making processes in the management of the Reserve.
- Evaluate the natural products and services rendered by the Reserve and promote stable financial opportunities for the local population.

IV- ONGOING PROGRAMMES

With the purpose of carrying out the goals as a Biosphere Reserve, the EBB has promoted different management programmes. An overview of the type of activities carried out throughout the years to improve the traditional systems, guiding applied research aimed towards a more intensive, sustainable use of the biodiversity, to improve the standard of living of the local population, inside and around the Reserve, is given below:

1) Programmes addressed to the work with the local population:

a- Local People’s Programme:

- One of the priorities of the EBB is to integrate the development of the communities with the conservation of natural resources. This working strategy is based on the participation of the local population in the protection, research and management of natural resources in the Station. Local people also participate in joint efforts to find alternatives for autonomous development. This concepts form the basis on which the Local People’s Program is based.
- Oriented by anthropological studies, the project “Participative Development for the Chimanes of the Biosphere Reserve, Estación Biológica del Beni” has been developed. This project plans to strengthen the Chimane organization and to create a plan to coordinate
between this and the Station’s administration. In addition, the Station is developing efforts of favorable and efficient commercialization systems for the Chimanes in the Reserve, being one of the principal objectives the prevention of possible ecological impacts that may result from unplanned production. The improvement of education and health conditions will be carried out within a planning process, which will be developed together with the Chimanes.

- One of the Reserve’s important tasks is to help strengthening the Chimane technology and knowledge on the use of natural resources, and to transfer these to other communities. Of special importance is knowledge on land use which can help to develop methods of more efficient tropical soil management.

- On the other hand, the work to support the rural communities in the Beni Biological Station’s immediate area of influence is community based, oriented towards the coordination with the communities organizations, integrating their basic necessities with the Station’s minimum conservation requirements. The Program focuses primarily on human resources training, emphasizing work in four main areas:
  - Strengthening community organizations
  - Support to agricultural and livestock production
  - Improving communities’ health practices
  - Introducing environmental education to school programs in the area.

- Through special training programs and hands-on activities, the Program developed a collaborative work spirit between peasant communities and Program staff resulting in a joint search for development alternatives, oriented towards the improvement of the quality of life in the communities settled in the Station’s immediate area of influence.

Photo 5: Improving communities’ health practices: Training and establishing communities’ pharmaceutics

Carmen MIRANDA L.: The Beni Biosphere Reserve (Bolivia)
Since 1988, together with the Interdisciplinary Center of Community Studies, several projects have been developed with the objective of finding solutions and alternatives to the problems confronted by the peasants of the surrounding communities. Problems in health and production have been confronted with the purpose of improving the quality livelihood of the people and increasing their understanding on the importance of conservation.

Initially, demographic and diagnostic studies on the living conditions of the population gave an approximate understanding of their necessities and realities. In the area of production, a project in agroecology is actually in development. In the area of health, a team of people in each community was trained to give primary attention and first aid. In addition, vaccination campaigns have been carried out with the cooperation of the San Borja Hospital. Water wells have also been dug in some communities.

b- Environmental Education Programme:

The first education experience was carried out in 1988 with teachers from the school in San Borja and the rural community of El Totaizal. They received training in basic ecological and environmental conservation concepts and in teaching and learning techniques. Over the years, the work in environmental education issues incorporated new elements. Working with teachers from the rural communities and with UNESCO’s support, an Environmental Education Manual for the primary school teachers was developed, and actually used in the work of the rural schools.
Courses and workshops for university and school professors and students have been organized as well. Support is given to the activities carried out by the Students Committee for the Defense of Natural Resources (CEDEMAB) of San Borja.

In coordination with some regional institutions, many activities have been organized over the years promoting the formation of a regional conservationist movement, which now is working like an organization called “Forum of the Beni Department”.

Rounds of conferences are also organized, dealing with central environmental issues of the Beni area and supporting the formation of professionals at university and technical levels. This has helped to broaden the capacity to analyze the environmental problems of the region. Principally, this kind of activities is organized with the Technical University of the Beni and the participation of national specialists.

The role of the communication and diffusion program of the EBB is to make the Station work and efforts known and to establish adequate coordination, communication and information mechanisms at a regional, national and international level. For the diffusion process, audiovisual materials about the Reserve (documents, pamphlets, articles, reports, stickers, television spots and radio programs) are being produced permanently.

In “El Porvenir” the Reserve has accommodations for visitors and researchers and offers a great opportunity for recreation in nature. Among the places of interest is the Normandia lagoon where alligators (Caiman yacare), herons (different species of the family Ardeidae), black caiman (Melanosuchus niger) and capibaras (Hydrochaeris hydrochaeris) can be seen. The paths, on foot or horseback, through the savannas and the forest islands give the chance to observe many species of birds and mammals such as the American nandu (Rhea americana), and the swamp deer (Odocoileus dichotomus).

Photo 7 : The rural teachers training in basic ecological and environmental conservation concepts is one of the most important activities in the Environmental Education Programme.
Photo 8: Working with CEDEMAB in San Borja-Beni.

Photo 9: The learning techniques for the school childrens include recreational and participative activities in their free times.

2) Programmes addressed to the generation of knowledge and the management of natural resources:

a- Resource Management Programme:

- The Environmental Management Programme is addressed to enhancing the conservation of the Reserves natural resources following planned zoning. The corp of rangers give special control to the areas in which use of natural resources is restricted and those which are destined for regeneration of wild flora and fauna.

- The programme of Resource Management is based on knowledge of traditional technologies concerning the use of resources and ecosystems, the management of threatened
species and what constitutes alternative resources for the population as well as the development of agroecological systems.

- One of the most interesting projects at the moment is the management of the amazonian river turtle (*Podocnemis unifilis*) in the Maniqui River. This project was initiated as a study on the abundance of the turtles and an inquiry on the characteristics of use and importance of this resource for the population and runs at its 4th year now as a management and conservation project.

- Another species management is that of the black caiman (*Melanosuchus niger*), a species threatened with extinction in the Bolivian tropics. The Normandia lagoon is the site of permanent monitoring of a group of caimans that was reintroduced there in 1990 from a nursery.

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Photo 10: Measuring a recently hatched river turtle (*Podocnemis unifilis*)

Photo 11: Black caiman (*Melanosuchus niger*)
Their process of adaptation to the new environmental conditions is being monitored in comparison with El Cedral lagoon which where a natural population of black caiman exists. These activities are being complemented by studies on the habitat and behavior of the natural and introduced populations in different lagoons on the Reserve.

b- Scientific Research Programme:

- The Scientific Research Programme is a priority in the Station. This programme is directed towards the increasing of knowledge of tropical ecosystems and the formation of the technical and scientific bases for the use of natural resources. One of the most important contributions of this programme is the support given to the training of professionals in the fields of conservation and the encouragement given to academic entities of the Beni to develop scientific research programs.
- Until now, 45 scientific research projects in natural and social sciences have been completed, and 30 are in progress. The results of some of these works have been published in important scientific magazines. There are nearly 70 titles between reports and diagnosis in botany, zoology, ecology, anthroplogy, planning, environmental education, archeology and manuals.
- Within the research programme, a first phase was oriented towards the exploration of the area and the gathering of biological inventories. The Station relies on nearly completed lists of the most important flora and fauna groups and, studies on the distribution and abundance of some invertebrate and vertebrate species. Research in the fields of ecology, edaphology agriculture, anthropology and archeology have been supported. Socio-economic diagnostics have been completed and the information obtained during this stage has allowed the zoning of the Reserve and the planning of the management activities in the area.
- The work of foreign and national researchers and the systematization of their results has permitted the EBB to form a base of important knowledge and to become one of the most important areas in Bolivia to count with ecological information. The EBB’s presence in the Beni has contributed to an increased discussion and debate about conservation and associated topics in the region. The regional institutions consider the EBB an important reference point when it comes to environment and management of natural resources. All this work has been possible thanks to efforts of the many people and institutions that were involved and have collaborated in its institutional growth.
- In the ongoing second phase, a long term participative research strategy is being developed to rescue the traditional landuse systems and to promote the development of knowledge and experience for the sustainable use of natural resources. The information...
produced from different studies is being ordered systematically. The central objective is to contribute to the improved quality of life of the local and regional population within a sustainable development framework. The functioning of this program implies permanent coordinating activities with national and foreign academic institutions.

- In the same way it is important to mention that the Reserve promotes agronomical research projects on pre-colombian land use systems (raised fields, canal networks, and terrace causeways) used in the plains of Moxos. Remains of these prehispanic agricultural networks exist in the area of the Reserve. Researchers from the National Institute of Archeology (INAR), the University of Pennsylvania and the Station’s staff are in charge of a project that is trying to determine the pre-colombian occupational sequence in the Beni and the pre-hispanic inhabitants’ agricultural activities and techniques. The Stations principal objective in this context is to recover this ancient flood and savanna management technology and to promote it in the region. The results so far obtained, show us that this technologies could constitute an interesting alternative for the tropical soils management in the area.

- Different studies carried out about the indigenous knowledge show that the Chimanes have a lot of ancient technologies for use in a better way the natural resources. In this context, the ethnoecological project (PEBENI) will provide inputs as far as the recovery of traditional technologies is concerned, to allow for improved productive activities and thus for the improved conservation efforts as well. The activities are focused on the systematization of the local knowledge about useful plants. In cooperation with the People and Plants Program (UNESCO, Kew Botanical Garden and WWF initiative), the EBB has been developing projects oriented to manage some of these useful resources to improve the quality of life of the local people. One example constitutes the management of “Jipi-japa” (*Carludovica palmata*) a Cyclantaceae whose fiber is used to make handicrafts. The Reserve is concentrating efforts for continued this kind of research in useful and promisory plant species.

- In relation with the PEBENI project, there are other efforts for conservation of the genetics resources, such as the rescue of ancient varieties of local useful plants.

- A project on the study of the genetics of the “Swietenia macrophylla” (mahogany) population, the priceless species for lumber companies, will allow important inputs for the definition of future conservation and management policies for this highly endangered species.

- A pasture management project is being carried out to provide information to support a better use of the extensive Beni’s extensive savannas which are used for cattle ranching activities. Data on floristic composition, native grasses species, their quality, the response of the pastures to the fire management, and the relations whith the different varieties of cattle are included in this project.

*Carmen MIRANDA L.: The Beni Biosphere Reserve (Bolivia)*
Monitoring is also part of the Research Program as a basic component in the understanding of the dynamics of tropical ecosystems and for the management of the Reserve. Registering and evaluating the essential changes in the ecosystems and natural populations of important species is crucial for the decision about adequate conservation activities. This work depends on limnmetric and climatological stations that register information and a system of permanent information update on fauna and flora of the Reserve.

As part of the monitoring subprogramme, information is gathered on the populations' use of natural resources. For example, there is data on the quantity of hectares of primary and secondary forest that are used for agricultural production and on the commonly used flora and fauna species. This information serves as a reference for the environmental management program of the Station.

With the cooperation of Smithsonian Institution, a series of permanent vegetation plots have been established in different formations. The task of establishing plots involve surveying and monumenting corners, as well as marking, measuring, and mapping all trees with a dbh of 10 centimeters or bigger. The Reserve is using this plots to obtain information about tree species composition, spatial distribution, size, mortality, and regeneration over time can be studied.

Photo 12: The first stage of the research programme was oriented towards the exploration of the area and the gathering of biological inventories.
Also together with other institutions the plots are being used to validate long term research on the dynamics of the local tropical vegetation. This information was also useful for begin the project “LAND EVALUATION FOR THE STUDY OF TROPICAL FORESTS THROUGH REMOTE CONTROL WITH SATELLITES” which is being developed with the Universities of Reeding and Licester from the UK.

- At the Operational and Research Centre El Porvenir, a small botanical garden has been established for educational purposes and experimentation on agroforestry systems. Into this area, many studies have been carried out by students from the Beni Technical University (UTB); the results are being transferred to the peasant communities as part of more sustainable land use systems.

- On the other hand, numerous research in forest islands and savannas are also being implemented with the collaboration of foreign and national academic institutions. One of the most important projects which is being carried out at present is “ECOLOGY, BIOGEOGRAPHY AND CONSERVATION OF FOREST ISLAND FAUNAS”, in cooperation with the University of Nottingham-UK.

Photo 13: Prehispanic agricultural networks aerial view
Photo 14: Actual experimental raised fields aerial view

Photo 15: Chimane indigenous working as a technician in the PEBENI project, using the "Ochoo" (Ura crepitans) resin.
Photo 16: Rescue of ancient varieties of local useful plants (in the photograph a local variety of pumpkin squash - *Cucurbita moschata*).

Photo 17: The monitoring programme includes the management of information on the population's use of natural resources.
3) Programmes addressed to the administration and cooperation for the Reserves' development: Cooperation and Coordination Programme

- The Reserves have elaborated and implemented their Management Plan since 1990, in this framework, develops activities in interinstitutional cooperation and coordination at international, national and regional levels.
- The subprogramme of scientific cooperation allows partly for the technical and financial support needed to develop the various activities involved in the management of the Station. It facilitates the coordination and interchange of information and contributes to the development of other areas destined to conservation.
- On the other hand, the Reserve is cooperating with different national universities, national and foreign research centers and conservation institutes. The offering of courses and graduate level work on tropical ecology, conservation of flora and fauna and management of protected areas has permanently been promoted and supported.
- For the presence of the Reserve to have meaning and for its work to contribute to the development needs of the Beni's people in a sustainable manner, it has been essential to link it with the region's environmental issues.
- Thanks to the existence of cooperation conventions and work relations with diverse regional institutes (specially the Technical University of the Beni, and several other regional projects), the Station is developing joint activities in the areas of scientific research, human resource formation, environmental education and diffusion. Through an Academic Cooperation Convention with the Technical University of the Beni, the Reserve counts with an
office located at the university campus in Trinidad. Research on the Reserve is being promoted through scholarships for students, pre-professional practical works for agronomy students and technical assistance to the rural communities in the Station.

Photo 19: Every year in cooperation with other scientific institutions, the EBB offers courses on research techniques in tropical ecology, conservation of flora and fauna.

Photo 20: The EBBs' personnel provides advisory services to the ethnic groups on their natural resources management plans.

Besides the above programme, there is also much effort devoted to more formal training. In this component, the Reserve holds several major meetings: like the Beni's Ecological and Environmental Seminars (3 up to now) attended by the scientific community. Other smaller meetings are held periodically.

Carmen MIRANDA L.: The Beni Biosphere Reserve (Bolivia)
Advisory services are provided to other protected areas, regional development organizations and particularly to the ethnic groups on their natural resources management plans.

V- CONTRIBUTIONS OF THE BENI BIOSPHERE RESERVE

The contributions of the EBB have been very large and important:

i) In the development of protected areas in Bolivia, it has generated pilot experiences in aspects such as planning, environmental management, scientific research, interinstitutional cooperation, environmental education and diffusion in a holistic view.

The experience of the Station is serving as a base for the discussion and analysis of the role that protected areas play in development and environmental management and under a strategy for the conservation of biological diversity of the country.

ii) In the Beni Department, it has contributed to the generation of a discussion and debate on the need to incorporate the environmental component in its development. This discussion has intensified since the creation of the Beni Forum for Conservation and Environment, in the creation of which the EBB has been involved. The EBB has become a point of reference in what concerns environment and management of natural resources.

From its experience in planning, the EBB has provided inputs for the proposals of environmental organization in the macro region. In the past years, in coordination with other institutions, many areas are being developed. One present contribution is to the organization of the Indigenous Territory - National Park Isiboro Secure and the Multiethnic Territory, as well as training of the local population in protection and planning.

iii) The intense research activity has allowed an in-depth knowledge on natural resources and their relationship with human populations. In this way, the EBB is one of the most important areas where large amount of ecological information can be found.

iv) The experience of an interinstitutional work, where coordination and cooperation have constituted the driving forces, show the benefits of joint work among national and international organizations.

VI- CHALLENGES

Since 1990, 20 percent of the area of the Reserve has been recognized legally as Chimane Indigenous Territory. The double condition has initiated a reformulation of policies and approaches in the interaction of the EBB with its population.

The main challenge for the EBB is to make compatible the conservation duties with the development of the indigenous territory.

Working Paper N° 9, 1995, UNESCO (South-South Cooperation Programme), Paris (France)
Even though the work of the Local People’s Programme has provided valuable information on the cultural and socio economic aspects of the Chimane nation, and many results have been extracted from the health, educational, environmental projects, ecologically sustainable alternatives are still being developed and tested for the improvement of the productive capacity and economic income of the population.

At present, due to migration fluxes, the Reserve is experiencing an increase of 20% of native population. This fact is causing diverse problems, for example, the occupation of areas with little agricultural capacities and increase of the use of wildlife resources.

The presence of the EBB has generated great expectations in different productive sectors, because its scientific advance can give guidelines for the use of natural resources. The Department of Beni is economically depressed, and because of its richness in natural resources, its development is linked heavily with the perspective of exploitation of such resources.

This situation has forced in an urgent way the design of a new strategy looking for alternatives that would allow the fulfillment of both conservation and development purposes. In this phase, two fundamental aspects are being considered:

* The development of an institutional strategy of applied research, and
* The definition of a socio economic strategy for the area.

Since 1993, both strategies are being made operative through the execution of two large projects. The first “Consolidation of the role of the EBB as a center for research and education in the alternative management of natural and energetic resources”, which deals with a series of experimental projects concerning alternatives for grazing, agriculture, wildlife management and energy utilization, through research among several institutions.

The second project “Support to the Chimanes of the EBB” started with a participative dialogue in which all communities were invited to state their objectives and goals and will go ahead with activities for strengthening the local capacity.

Furthermore, it is felt that the initiation of these two strategies will contribute to the search for answers to the development needs of the department.

Another consideration is that the Ministry of Sustainable Development, as of 1994, is organizing the development and implementation of the SNAP (National System of Protected Areas), in which the EBB has been identified as a priority area. It is a challenge for the EBB to become integrated in the SNAP, as this may be a way to insure that all the work accomplished until the present will be applied adequately.

Within this context, and with all the experience accumulated over the past 3 years (where the fundamental working objectives of the institution have been the development of a strategy of applied scientific research and the definition of a socioeconomic development
strategy for the area) it can be concluded that there is a need to apply to greater extent the concept behind the Biosphere Reserves in the EBB. It is pretended that this is a strong start and fundamental approach which will guide the development activities in the coming 5 years.

VII- ONGOING STRATEGY

At present, the strategy for the strengthening of the Beni Biosphere Reserve as an operational, educational and research organization, searching for the appropriate use of natural resources is already in its way. Much of the research under this strategy is being conducted in this way, landuse projects, ethnoecological projects, and the pasture management project.

There are expansion plans to increase the protected area to the north, and the creation of buffer areas surrounding the Station. The expansion plans also refers to the need of enhancing research and development activities throughout the Beni Biosphere Reserve. Below, a brief overview of the different proposals that are being discussed is presented.

The main objective of the expansion plan is to maintain and consolidate the EBB’s leading role in scientific research and its applications by carrying out specific projects to complete the information available on the natural resources present in the area and its present and potential uses oriented toward the sustainable development of the region.

More specifically, the expansion plan is oriented towards:

- Undertaking and promoting scientific research about present and potential landuse practices, oriented toward the sustainable management of rangelands, forest islands and forests;
- Contributing to the recovery and validation of indigenous knowledge and management practices;
- Carrying out research projects about the management of wildlife, addressed to:
  - the reconsolidation of degraded ecosystems,
  - the study and promotion of alternatives of economic income for the local population,
- the study and promotion of maintenance of wild species in captive breeding programmes to avoid hunting pressures on the natural ecosystems.
- Undertaking an exhaustive research program about the potential uses of alternative energy forms (wind, sun, biogas) in the region;
- Promoting the use of economically and ecologically sustainable energy forms in the region.

The expansion proposal, where actually there are some already ongoing projects, includes seven main working areas:

1. Landuse practices and management of rangelands
2. Wildlife management
1) **Landuse practices and management of rangelands**

Each of the ecosystems of the Station is used and managed by local people in a different manner and for different purposes, therefore different subprojects are included in this working area for each of the ecosystem types.

### a- Landuse practices in savanna ecosystems:

The landuse practices in savanna ecosystems are mainly related with extensive cattle ranching which constitutes one of the regions most important income sources. The absence of detailed studies of the natural grasslands and its potential use together with the lack of improved sustainable management techniques lead to the underdevelopment evident at present in this productive sector.

Apart from this, in the past there existed large extensions of raised fields in Beni Departments savannas, the remains of which are still visible today. Estimates by archaeologists speak of a population density up to 5 times higher than the actual population, which was maintained by the unique landuse technique of raised fields. Experiments in the raised field technique are led by Beni Biological Station for four years now, focusing on the improvement of technical details in the management of raised fields as an alternative landuse practice which would avoid the accelerated clearing of forest land for food production.

The following sub-projects are envisaged:

- Study of the impact of different intensities of cattle grazing on the floristic diversity of savanna ecosystems.
- Study of the impact of annual burning on the composition and soil conditions of savanna ecosystems.
- Evaluation of the nutritive value of native fodder grasses for different types of cattle production.
• Preparation of a detailed conservation and management plan for the savannas of the Station and guidelines for a regional sustainable development program.
• Experimental study of the raised fields technique as an alternative landuse system for the humid tropics.
• Agronomical evaluation of different native crops produced in raised fields.
• Agronomical evaluation of crop rotation and intercropping systems in raised fields.
• Promotion of raised fields technique in local communities.

b- Landuse practices in forest islands ecosystems:

The forest islands are small patches of higher ground surrounded by savanna, and forest fragments which became isolated by change of river courses or human impact. Its role for conservation has long been underestimated, forest islands being considered only important for the cattle ranching practices (cattle uses the islands to overnight and for shelter during the annual flood) without taking into account their important role as biological refuges and stepping stones between undisturbed forests. Also, the cultural value of the forest islands (settling places of ancient cultures) and their importance for the management of raised fields is little known.

The following sub-projects are being envisaged:
• Comparative evaluation of the biodiversity of forest islands in relation to size, human impact, and distance from continuous forest.
• Botanical study of the influence of cattle grazing on natural regeneration of forest islands.
• Study of the importance of forest islands like cultural heritage sites in Beni Department.
• Experimental study on improved sustainable landuse practices for forest islands.
• Preparation of a detailed conservation and management plan for the forest islands of the Station and guidelines for a regional sustainable development program.

c- Landuse practices in evergreen tropical forest ecosystems:

In the case of the evergreen tropical forest, the remaining forest lands in and around the Station encounter heavy pressure from small landholders and rural communities which use slash-and-burn agriculture for the production of a reduced number of staple foods, restrained to subsistence production and without access to regional markets in an every year more degraded environment. Only a broad ecological and economical evaluation of the situation, together with experimental studies on alternative landuse practices involving the active participation of
the local population, would enable regional authorities and the Reserves administration to
develop the guidelines for a sustainable management programme for this ecosystem.

The following sub-projects are envisaged:

- Long-term study about the impact of slash-and-burn agriculture on fragmentation
  and regeneration of forest lands.
- Remote control mapping of forest fragmentation in the surroundings of the Station.
- Detailed study of the landuse and livestock holding practices used in the area,
  focusing on possible alternatives for subsistence production and market involvement.
- Experimental studies of agroecological production systems including the
  development of integrated production systems and biological pest control.
- Preparation of a detailed conservation and management plan for the forest lands of
  the Station and guidelines for a regional sustainable development program.

2) **Wildlife management**

The wildlife (including flora and fauna) found in the Station is the main base of
extractive production of rural and indigenous communities, constituting one of the principal
subsistence and income sources of the local population. Only the detailed ecological study of
the most important species, together with experimental studies on the promissory species,
would enable the Station's administration to manage wild populations of plants and animals in
close coordination with the local communities. The results obtained by this process of
scientific research, experimental studies, and implementation of management programs will
contribute substantial experiences for the sustainable development of the region.

**a- In flora, the following sub-projects are envisaged:**

- Ethnoecological study of plants used by indigenous and rural communities.
- Mapping and ecological study of economically important tree species of the
  Station.
- Reforestation program for the Southern Zone of the Station with economically
  valuable species.
- Research and promotion of promissory plant species.

**b- In fauna, the following sub-projects are envisaged:**

- Study on the present use and importance of wildlife species for rural and
  indigenous communities of the Station including local knowledge on ecology, reproduction
  and basic management techniques.
- Conservation and management plan for the Amazonian river turtle (*Podocnemis unifilis*).
- Conservation and management plan for the black spider monkey (*Ateles paniscus Chamek*).
- Conservation and management plan for the red howler monkey (*Alouatta seniculus*).
- Conservation and management plan for the peccaries (*Tayassu tajacu and T. albirrostris*), including captive breeding.
- Conservation and management plan for the razor-billed curassow (*Crax mitu*), including captive breeding.
- Conservation and management plan for the common caiman (*Caiman crocodilus*), including captive breeding.
- Reintroduction and management scheme for the black caiman (*Melanosuchus niger*).
- Reintroduction and management scheme for the amazonian giant otter (*Pteronura brasiliensis*).
- Reintroduction and management scheme for the pampas deer (*Ozotocerus bezoarcticus*).

### c- In Ecosystem management, the following sub programmes is envisaged:

- Elaboration of a detailed conservation and management plan for the different ecosystems of the Station and guidelines for a regional sustainable development program.

### 3) Alternative energies

Energy supply of the region as a whole is absent, except local supply of small cities and the departments capital by gasoline generators. In the rural communities, cooking is based on fuelwood and radio and radiocommunication equipments are run by batteries. This energy forms, with exception of fuelwood, are extremely expensive and therefore inaccessible to the majority of the population, apart of creating a broader gamma of environmental problems in the region and restraining it to constitute one of the most underdeveloped regions of Bolivia.

The main objective of the expansion plan is to undertake detailed studies of different alternative energy forms and to promote their use in the local communities which up to now experience a complete lack of energy supply for their most basic needs (cooking, water pumping, electricity). Projects include:
- Feasibility studies for the evaluation of different alternative energy forms (sun, wind, biogas) for the region.
• Installation of small pilot plants in the Stations Operation Center and a nearby rural community.
• Development of guidelines and financing models for the promotion and installation of alternative, small-scale energy plants for the rural and small urban communities of the region.

On the other hand, the expansion plans include projects which are defined to complete the yet named areas:

• **Fellowship fund:**
The establishment of a fellowship fund to support thesis work for graduate and post graduate students

• **Infrastructure improvement:**
Project to build a new scientific compound at El PORVENIR to hold a basic chemical laboratory, a library and computer room, bedrooms for researchers and bedrooms for park guards.

• **Publications:**
Preparation of guides for interpretation of birds and plants in the reserve area.
The preparation of a scientific series containing the results of research carried out at the Station.

• **Geographical information system:**
Project for the implementation of a geographic information system.

In this general context, the following are the areas of concentration of International Cooperation in which the Beni Biosphere Reserve may contribute:

i) **Land use practices and management of rangelands:**
   • *Savanna:* Studies of the Natural Grasslands and its potential use.
     Land use techniques of “Raised Fields”.
   • *Forest islands:* Its role for conservation.
   • *Evergreen Tropical forests:* Experimental studies on alternative land use practices involving the active participation of the local population.

ii) **Wildlife management:**
   • *Plants:* Ethnoecological studies of plant uses by indigenous and rural communities.
     Research and promotion of promissory plant species.
- *Fauna*: Study on the present use and importance of some wildlife species for rural and indigenous communities.

  iii) Alternative energies:
  - Studies of different alternative energy forms for the most basic needs of the local communities.

  iv) Environmental education programmes:
  Exchanges of experiences in the Biosphere Reserves.
VIII- AREAS OF CONCENTRATION FOR INTERNATIONAL COOPERATION INTO THE SOUTH-SOUTH PROGRAMME

Considering the main objectives of the South-South Cooperation Programme on the Humid Tropics, and in accordance with the purpose of strengthening the network of Biosphere Reserves in Latin America, Africa and Asia, the following are the areas which we identified for concentrating the International Cooperation into the South-South Programme.

1. Enrichment of the scientific knowledge about useful plants of the Biosphere Reserves (medicinal plants, food plants, plants for fibers, constructions and plants which provides other non timber products).

2. Enrichment of the knowledge about traditional production and management systems of the indigenous communities.

3. Experimental projects to promote the sustainable management of some promisory species (evaluation of the commercial value and the possibilities of their sustainable use).

4. Environmental education programmes directed to promote the sustainable use of natural resources and ecosystems and the participation of the local population in the administration of the Biosphere Reserves.

5. Exchange experiences between Biosphere Reserves, for example Design community resource management plans.

Carmen MIRANDA L.: The Beni Biosphere Reserve (Bolivia)
IX- BIBLIOGRAPHY


The Programme is publishing its Newsletter *South-South Perspectives*, which can be received free of charge on request.

The first Newsletter was published in October 1994 and the second in October 1995. The Newsletter is edited in English, French and Spanish.

In the Newsletter, its editors would be glad to write short notes about books received and other kind of publications on *environment conservation, biodiversity, sustainable management of renewable resources* and *South-South cooperation*.

We would also reflect information on the present South-South cooperation activities in these fields.

All comments are welcome.
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