

# Biological diversity as a resource for the development of Islands

by BÁRBARA GAREA MOREDA, MIGUEL ANGEL VALES GARCÍA, DALIA MARIA SALABARRIA FERNÁNDEZ

## Introduction

Biological diversity is humanity's greatest natural heritage, providing both goods and services to the life of the planet as well as satisfying its main needs and aspirations.

Understanding of the need to conserve biodiversity has increased in number, vision and complexity in the last few years, falling into two main categories (Callicott 1997): intrinsic and utilitarian value.

Biodiversity is significant in any analysis related to sustainable development first, for the present and potential use of biological resources and second, for its role in the maintenance of the biosphere to guarantee conditions for human life and third, for the maintenance of biological biodiversity "per se", mainly at a species level.

This analysis is even more relevant in the case of islands due to their fragile ecology, environmental vulnerability, biologically diverse riches and that their economic activities are chiefly based on natural and cultural values.

## Development and biological resources

Biological resources are concentrated in the world level in some critical points or "hot spots". Mittermeier et al, 1998, estimated that these areas, which represent only one percent of the planet's surface, have that between 30 and 40 percent of biological diversity, 40 percent of all terrestrial plants, and almost 25 percent of vertebrates are endemic to these areas. Figure 1, created by these authors shows that many of the insular systems coincide with the sites of highest priority hot spots or with tropical areas with more natural characteristics in their ecosystems.

Figures 2 and 3 compare the presence of some taxonomical groups, reflecting the world importance of biodiversity in the islands, even when they are compared with zones of mega-biodiversity.

But, despite the singularity of biodiversity in the islands, only approximately 15 percent of established biosphere reserves are located

in islands: 6 percent in small islands and only 4 percent of the RAMSAR sites.

The oceans occupy over 70 percent of the planet's surface. However, natural marine areas are only 1 percent, which represents a serious situation (Hillary 2001). The same author studied the list of World Heritage

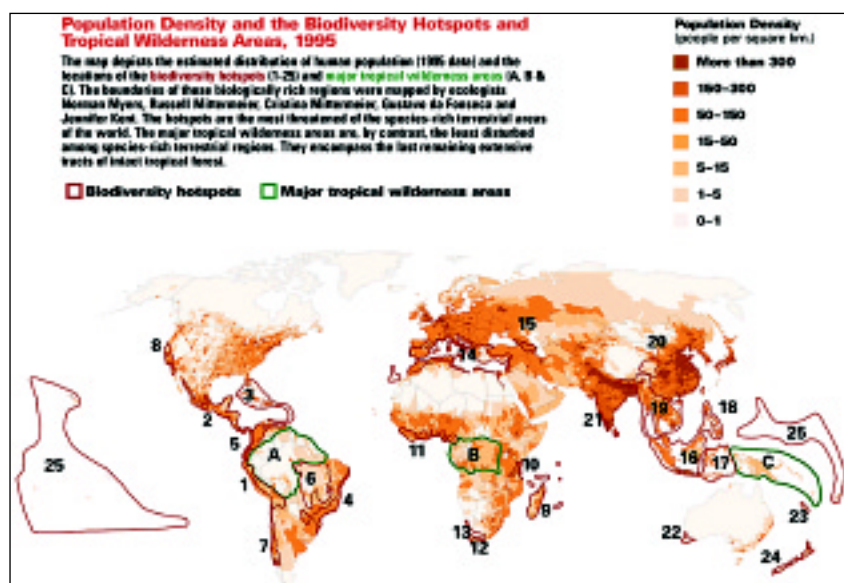


Figure 1 Schematic representation of Mittermeier et al.



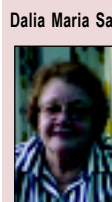
**Bárbara Garea Moreda.** Graduated in 1979 as Physic at Lenin Institute in Moscow, Russia. Currently is the Director of the Centre for Management of Prioritised Projects and Programs, Ministry for Science, Technology and Environment. Head of the National Research and Development

Program "Global Changes and the Evolution of the Cuban Environment" and is the Cuban representative at the Inter American Institute for Global Changes Studies, where hold the position of 2<sup>nd</sup> Vice-president of this institution.



**Miguel Angel Vales García.** Graduated in 1973 as Licenciante in Biological Sciences speciality Botanist at the Faculty of Biological Sciences of the Havana University, Cuba. In 1982 obtained the degree of Dr. In Biological Sciences at the Humboldt University of Berlin. Since 1992 to 2000 he has directed

the National Biodiversity Center and coordinated the Cuban Biodiversity Country Study and formed part of the task force group for the elaboration of the Cuban National Biodiversity Strategy and Action Plan. Member of the Experts Group of the Cuban Program for Global Change. Since 2002 worked as specialist of the Centre for Prioritized Program and Projects



**Dalia Maria Salabarría Fernández.** Graduated in 1966 as Licenciante in Biological Sciences, speciality in Marine Biology, at Havana University, Cuba. In 1989, obtained the Doctor Degree in Biological Sciences, at the Hungarian Academy of Sciences. Since 1977, started to work at National Commission for Environmental Protection, attending the issues

related with the conservation and management of natural resources in the coastal and marine zone. She has been close related with the Convention on Biological Diversity since the process of elaboration and negotiation, from 1989, and participated in the process of the National Biodiversity Study, from 1997 to 1999 and the elaboration process of Biodiversity National Strategy and the Action Plans, in 2000. Since 1994 is the Head of Department on Natural Resources Management at the Environmental Information Management and Education.

Centro de Gerencia de Programas y Proyectos Priorizados  
Calle 20, No.4112 e/18ª y 47, Miramar, Playa, Ciudad de la Habana, CP.11300, Cuba email: bgarea@geprop.cu

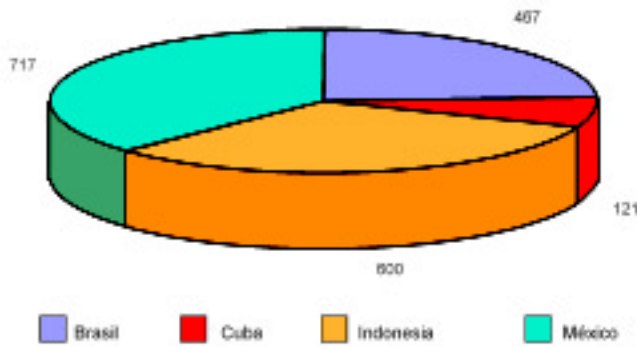


Figure 2 Number of reptilian species in two selected islands and two continental countries

and found that only 10 out of 161 natural and mixed sites have been registered for the values of marine biodiversity. This shows the urgent need to include a greater number of marine and coastal sites and small islands with exceptional value.

The Global Forest Resources Assessment 2000, published by FAO (2001) using a new definition of forests with areas of at least 0.5 hectares and a forest surface of over 10 percent, gives us information about the surface of most of the islands of the world. Insular Africa has 0.006 %, Insular Asia 4 %, Insular Caribbean 0.15 % and islands of Oceania, 0.9 % of the total forest surface of the world.

Although this information is considered manipulated, it permits a view of how forest resources are distributed in the islands. There are a considerable number of plants and animals in terrestrial, coastal and interior water ecosystems that are part of complex networks of biological relations, creating the necessary conditions for their balance

Present assessments on the loss of biodiversity show:

- 75 percent of genetic biodiversity of crops was lost in the 20th century.
- 20 percent of freshwater fish species are extinct, threatened, or endangered.
- 75 percent of marine fish reserves is depressed, overexploited, or at its biological limit.
- 24 percent of mammals and 12 percent of birds are in danger of extinction.
- 50 percent of swamps have been drained.
- 33 percent of coral reefs have been destroyed or degraded.
- 17 million hectares of forests have been cut down in tropical regions.

and preservation. Alterations of these conditions due to natural or anthropological factors cause the genetic reduction of species and ecosystems.

- 5 to 10 percent of forest species could be extinct in 30 years.

Currently, biological resources support nearly 40 percent of the world economy and meet 80 percent of human needs, including ecological, social, genetic, scientific, cultural, and spiritual ones. Its economic importance lies in its role for the development of agriculture, livestock, forestry, and fishing, as well as for

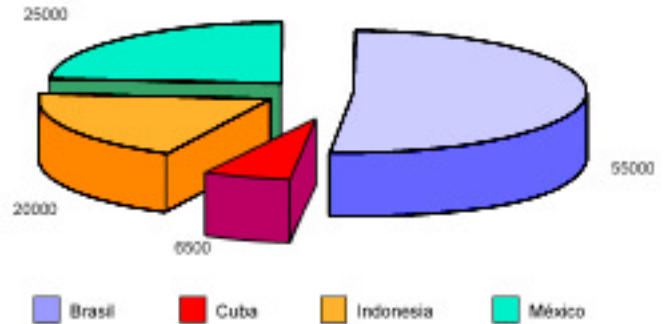


Figure 3 Number of Angyosperms in two selected Islands and two continental Countries with Megadiversity.

many industries and key life services.

However, what is most important is that today, biodiversity continues being the main food source and thus an essential component of food security for our planet. The increasing development of new products and services -which source are genetic resources, microorganisms, flora and fauna species, ecosystems, and landscapes- provide insular economies with an ever increasing potential.

Many species are used by native and rural communities due to their traditional heritage.



New technology has accelerated the process, transforming native genetic resources into commercial products, mainly developed by companies from countries at a different scale of industrialization. They include the production of certified seeds for agriculture and forestry, production of dyes, medicines, bio-fertilizers and bio-pesticides, as well as high quality fibers and fuels.

The development and commercialization of these products would allow Islands to obtain income through a solid system of patents and copyright of genetic resources and development of technologies, based on biological species and their chemical components.

The unquestionable biotechnological advances and commercialization of genetically modified organisms have paved the way for an international debate on “bio-security.” Regarding this, it is necessary to establish policies combining development in these fields with preservation and sustainable use of biodiversity, based on economic, ethical, and sustainable aspects, among others.

At present, there is a growing preference for ecological products on the world market, as consumers are aware that they contribute to increased quality of life in the population and the environment in general. In this, agricultural products and tourism have a very important place, thus providing islands with a special opportunity due to these sectors’ role in their development.

According to chapter 17 of Agenda 21, small developing Insular States are a special case, both for the environment and develop-

ment, as they are vulnerable, ecologically-fragile areas because of their natural and economic environment.

Small islands’ vulnerability is mainly due to their limited territorial extension, limited availability of natural resources, fragility and vulnerability of their ecosystems, their physical-geographic conditions favoring the incidence of meteorological phenomena, natural and industrial disasters, and their generally weak economies.

Climatic changes are also a great risk for islands, as the negative impact is mainly linked to an increase of sea level, possible increase of aridity, and drought processes. This negatively influences availability of water resources, agricultural production, and biodiversity.

The invasion of exotic species is one of the greatest threats for native biological diversity, as their impact is considerable, and generally irreversible. This can be as harmful for native species and ecosystems as the lack and degradation of habitats. This situation is more problematic for small islands.

Oceans, mountains, rivers, and deserts have acted as natural barriers for millenniums, so that unique ecosystems could evolve. In only a few centuries, these barriers have become inefficient, due to the combined action of global forces that have helped exotic species cover long distances toward new habitats, becoming invading species.

Changes in consumption patterns, advances in science and technology, recent trade strategies, and new political and economic scenes have also influenced small insular



States. This is undoubtedly a risk for the sustainability of their natural and cultural resources.

Forest ecosystems have been affected by the cutting of trees and deterioration of swamps due to the expansion of agriculture, intensification of related practices, and socioeconomic development itself. All these aspects have led to the destruction of habitats and the consequent extinction of species.

The development of basic economic activities for islands, such as agriculture, fishing, and tourism in their littoral zones have affected their coastal and marine ecosystems in a peculiar way.

The excessive exploitation of fishing resources, the use of mangrove swamps for aquaculture, changes in the use of soils for agriculture, tourism, deforestation, and pollution have determined the changes in coastal habitats, thus affecting the protective function of marine and coastal ecosystems.

The sustainable development in fishing regions in the small Islands is negatively affected by several factors such as: irresponsible fishing practices, lack of capacity, both human and institutional, for the research and handling of resources, limited participation of those who use the resources in planning and making decisions, inadequate or insufficient knowledge of the fishing reserves of sea biodiversity in general and the ecosystems and its work, and an insufficient capacity for surveillance and control.

The industrial, handicraft and re-creative fishing activities should be carried out in accordance with the real capacity of the species and ecosystems, in a way to guarantee the sustainability of their products.

Tourism based on the Islands’ natural, cultural and environmental values is one of the main ways for the development of the insular States. For example, the Caribbean is visited by more than a hundred million tour-

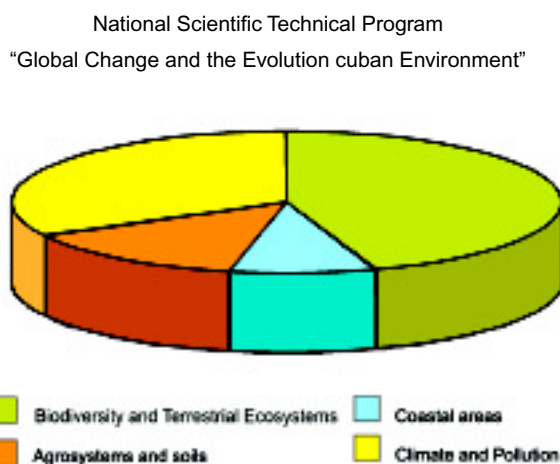


Figure. 4 Participation of the different Projects in the National Program

ists, tourism is fundamental in this region's GDP and it generates a large number of jobs. In the same way, the European Union's island destinations are becoming more recognized, visited and chosen as preference.

The situation presented is highly complex, on one hand, tourism is increasing, and on the other, there are environmental and social risks that can be irreversible. It is only possible to face this challenge with a sustainable tourism, ecologically bearable for the long term, economically and equally viable from an ethical and social perspective for the local communities. The active and consequent participation of all sectors involved in the elaboration and implementation of integrated strategies for tourist development on the islands is necessary for this to be not just a declaration.

The elaboration and implementation of strategies for the preservation and sustainable use of biodiversity comes from the knowledge obtained and that necessary to acquire, the real evaluation of the environmental situation, and the priorities established for development. In this sense, studies and national and regional evaluations, although they are still numerically limited in the case of the islands, could constitute the basis for the preparation of these strategies.

The international community has organized programs and projects that facilitate the study of biological diversity and topics associated with it. This has been included on the agendas of the United Nations, other international and

national organizations, and public, private and non-governmental institutions.

Future efforts that must be carried out to reply to questions such as the following: (CEPAL, 2003):

- What are the factors that represent a threat for the biological, genetic diversity of species, of functional types, landscapes, etc?
- What are the acceptable levels of damage that allow an appropriate lead time for response, with adaptable handling for a sustainable use of the ecosystems or to their preservation?
- Which are the ecosystemic or ethical values of diversity? That is, how many and which species can be lost, and what else do we lose when we lose biodiversity? What are the biodiversity's ecosystem services?
- What are the costs in terms of diversity, ecosystem services, water availability and biogeochemical cycles of crops to contain carbon? What are the proposals within global measures to mitigate the emission of gases with greenhouse effects?
- How to guarantee the viability of the farming systems on which the maintenance of genetic diversity strongly depends?
- How to recover and make systematic the practices, traditional or indigenous, of technologies for sustainable use and handling of natural resources and environmental services as elements for science and technology toward sustainable development (CTDS)?.

- How to deal with the paucity of legislation referring to the protection, sustained use, and economic attraction of natural resources, and to establish mechanisms so that the legislation in force is accomplished?
- How to achieve sustainable agriculture that is economically competitive? How to transform subsistence agriculture, practiced by millions of poor farmers, into a sustainable agriculture?
- How to achieve that the existing technically appropriate solutions are also economically competitive under other conditions?

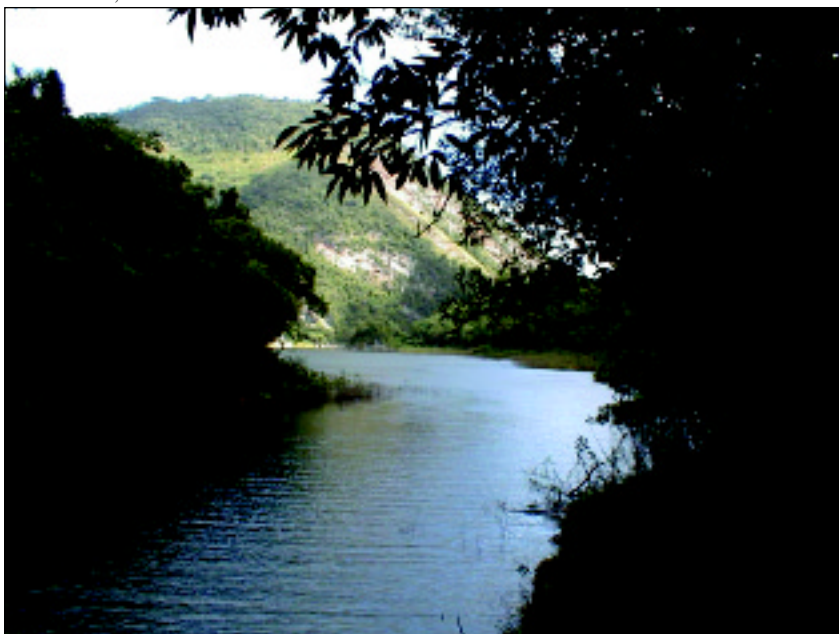
The Republic of Cuba, an archipelago with particular value in its biodiversity, high vulnerability, and fragility as a small insular state, has assumed indisputable commitments to guarantee sustainability in the use of its natural resources. It has elaborated and implemented policies and strategies at different levels and sectors on scientific and technological bases, and led the economic development, food security, health quality and respect for the country's cultural and ethical values with this aim.

As an example, Cuba established the National Scientific-Technical Program in 1995. In this program, "Los Cambios Globales y la Evolución del Medio Ambiente Cubano" (Global Changes and the Evolution of the Cuban Environment) 72 projects have been executed (Figure 4), of them 42 percent dedicated to biodiversity and earth ecosystems, 31 percent to climate and contamination, 13 percent to agro ecosystems and soils, and 14 percent to the coastal zones.

One of the most important projects in this program was the elaboration of the Biodiversity Country Study, which simultaneously had the support of the GEF/UNEP. In this study were identified the main aspects for the elaboration of the national strategy. Today, the National Strategy for the Conservation and Sustainable Use and Action Plan of the Republic of Cuba (Vilamajó et.al) interrelates with the National Environmental Strategy and with sector and territorial strategies, which constitute the main tool of work of the National Biological Diversity Group.

Cuba has also integrated with regional and world efforts in relation to scientific and

Habanilla Dam, Cuba



technological research. It is interesting to stress the role played by the Inter American Institute for the Research of Global Change, which through the promotion of comparative studies and focus on important regional themes, has been creating capacities to better understand the impact of global change in the past, present and future in the 19 member countries.

## Political agenda - international framework

The international agenda has set a series of international goals difficult to attain. They target the treatment and possible solution of the main problems affecting humankind: hunger, poverty, improvement of living conditions and health, in which biological diversity, due to its importance for human beings, has occupied a leading position that commits nations to its conservation, particularly, its sustainable utilization (See Box 1).

### BOX 1

The global tasks of the millennium, proclaimed by the millennium summit in 2000, establish the eradication of extreme poverty and famine as a goal of paramount importance to respond to the most essential needs of development.

The Sixth Conference of the parties to the Convention on Biological Diversity (CBD) examined this issue, which was explicitly reflected in its Ministerial Convention and adopted by Decision VI/26, committing the parties to implement the Convention more effectively and to substantially reduce the current biodiversity loss rate at the international, regional and internal level by 2010, to contribute to the palliation of poverty.

Undoubtedly, the Johannesburg Summit marked an important point and provided an important space for the critical role of biodiversity and ecosystems' resources and services, to fulfill the Millennium Objectives.

The best reason for this declaration is that biodiversity is among the five aspects of the Program promoted by the UN Secretary General known as WEHAB (Water, Energy, Health, Agriculture and Biodiversity), recognizing these elements, which should be paid the greatest attention, as priorities to resolve humankind's major problems.

Chapter IV, paragraph 44, on biodiversity



establishes: the fundamental role of biological diversity to attain sustainable development and elimination of poverty; the essential nature of biological diversity for the existence and welfare of human beings; the Convention as key vehicle for the protection and sustainable use of biological diversity and the equal distribution of benefits from using genetic resources.

The Implementation Plan's Chapter VII on the "Sustainable Development of Small Developing States" considers these countries a special case, in terms of environment and development, and calls for a number of actions at all levels.

Among these major actions are:

- Speed up the Action Program implementation at the national and regional level, with adequate financial resources.
- Implement a sustainable management of fisheries with the support and strengthening of the regional management bodies for fishing.
- Provide assistance for small islands to attain a sustainable management of their coasts and sea. -Support small islands in the development of their domestic capacities.
- Foster the completion and begin operation, under agreed upon terms, of social, economic and environmental vulnerability indexes, and other related indexes, as tools to allow for sustainable development.
- Assist small islands in support of local communities and adequate national and regional organizations, for the manage-

ment of risks and threats, preparations in the face of disasters and mitigation of extreme meteorological events and other emergencies.

- Examine the implementation of the Barbados Action Program.

It can be said that to attain a sustainable development, in harmony with the conservation and sustainable utilization in small islands, at least it is indispensable to:

- Have the adequate knowledge of biological diversity to define its potential and establish priorities for its preservation and sustainable use.
- Have the necessary political and legal framework to guarantee the elaboration of development programs on a sustainability base, and particularly, to establish the control over the already established regulations.
- Guarantee that conservation and sustainable utilization of bio-diversity resources are included in the programs and plans for economic and social development.
- Guarantee territorial planning adequately comprising the environmental principles and criteria established at the national level.
- Check and strengthen the planning and control process of fishing activities.
- Have National Management Plans for tapping species, based on research results scientifically supporting the management plan.
- Attain the recognition of the Comprehen-



sive Management of Coastal Zones, as the only way to reach a real consensus between socioeconomic development and the preservation and sustainable use of coastal and sea resources.

- Guarantee the active participation of local people and governments.
- Have an educational and environmental promotion program targeting all sectors, especially workers and decision-makers.
- Fortify the necessary institutional, human resource and financial capacities to accomplish the predicted results.
- Strengthen Regional Cooperation and Coordination by exchanging information and experience among countries of the area.
- Have access to the required financial resources.

This calls for priority actions, among them:

- Completing the outline of national strategies to preserve and make a sustainable use of biological diversity and proceed to Immediate implementation
- Outline national general guidelines for adequate territorial planning and incorpo-

rate environmental considerations to decision making.

- Outline general line of action for an integrated management of Coastal Areas, as starting point to study and adopt case-by-case development programs.
- Establish environmental regulations for tourist development.
- Establishing national monitoring systems for each element of biological diversity, allowing invigoration of the state and evolution of those components, and adopting the decision best suited at a given moment.
- Work for institutional improvement and training of national human resources.
- Outline and work intensely on environmental education and promote focus on every sector of the population, establishing the most suitable mechanisms to achieve involvement of local government and communities.
- Establish and implement the evaluation of the environmental impact in socioeconomic development programs.
- Define the areas, ecosystems and species requiring special handling to secure their preservation, restoration and sustainable use.
- Develop, among priorities, methodology for the economic evaluation of the resources of biodiversity.
- Increase the levels of international cooperation and coordination, especially at the regional level.

Finally, it is necessary to stress that biological diversity can only be seen as a resource for sustainable development if it is given a comprehensive and systematic approach, clearly revealing the existing interaction between society and nature.

## Bibliography

- CALLICOTT, J. B. 1977. Conservation values and ethics. Pages 29-55. "Principles of Conservation Biology". G.K. Meffe; C.R. Carroll, and contributors, editors. 2nd. Edition. Sinauer Associates, Sunderland, Massachusetts.
- CEPAL, 2003. Ciencia y Tecnología para el desarrollo sostenible: una perspectiva latinoamericana y caribeña. Serie Seminarios y Conferencias. No. 25, 52 pp.
- COMARNA, 1993. Las Pequeñas Islas y el Desarrollo Sostenible. Conferencia Global sobre Desarrollo Sostenible de los Pequeños Estados Insulares. Informe Técnico. Ciudad de La Habana, Cuba. 33 pp.
- FAO, 2001. Forest Resources Assessment (FRA)2000. Main Report. FAO Forest Study 140. Rome, Italy.
- GESAMP, 1996. The contributions of science to integrated coastal management. Reports and Studies, No. 61, 66 pp.
- HILLARY, A. 2001. El tesoro Escondido: los ecosistemas marinos. Conservación Mundial 2/2001. pp. 13-14
- MITTERMEIER, R.A., N. MYERS, J.B. THOMSEN, G.A.B. DA FONSECA, AND S. OLIVIERI, 1998. Conservation Biology 12: 516-520. "Biodiversity hotspots and major tropical wilderness areas: approaches to setting conservation priorities".
- SALABARRÍA, D. M. 1997. Vulnerabilidad de los Pequeños Estados Insulares. Informe Técnico Reunión Regional del Convenio de Lucha contra la Desertificación y la Sequía.
- SERRANO, FRANCISCO 1998. Lineamientos para el planteamiento territorial del turismo en pequeñas islas del Archipiélago de los Canarros. República de Cuba. Tesis de grado. 115 pp.
- UNEP, 1995. Global Biodiversity Assessment. Summary for Policy Makers. 46 pp. World Travel Tourism Council. Agenda 21 for the Travel and Tourism Industry: Toward Environmentally Sustainable Development. 77 pp.
- VILAMAJÓ, D.; VALES, M.A.; CAPOTE, R. P. Y SALABARRÍA, D. Eds. 2001. Estrategia Nacional para la Diversidad Biológica y Plan de Acción en la República de Cuba.
- WRI/IUCN/UNEP, 1992. Global Biodiversity Strategy. World Resources Institute, Washington, D.C.

VIMANG is the brand name of Cuban line of 100% naturally occurring products whose main ingredient consists of a unique mixture of compounds (polyphenols, terpenoides, steroids, fatty acids and microelements extracted from different varieties of *Mangifera indica* L (mango).

