EXTRACTIVE RESERVES IN BRAZILIAN AMAZONIA AND GENETIC RESOURCES CONSERVATION

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SUMMARY

This paper discusses the Extractive Reserve as a land use alternative, considering it as socially fair, ecologically appropriate, and with a function of genetic conservation; it focused particularly the State of Acre, in southwestern Brazilian Amazonia. A proposition to improve the Extractive Rserves productivity is suggested, which does not significantly modify its genetic structure, through the Islands of High Productivity. Those would be small culture areas with the species in extraction, using all technology available, surrounded by the natural forest which would work as a protecting buffer against insect and microorganism atack. The role of the Extractive Reserve in in-situ conservation of genetic resources is also commented. It is pointed out the necessity of using local varieties, with the purpose of preventing excessive interference in the natural population genetic structure. The problem of valuation of genetic conservation is considered essential to the full success of the Extractive Reserve.

Key words: Genetic conservation; Extractive Reserves; Amazonia; Valuation.

INTRODUCTION

The high rates of deforestation and forest destruction in the tropical regions have worried indistinctively the whole world. In the First-World countries the main issues have been CO_2 level in the atmosphere and biodiversity, while in the Third-World countries the most urgent issues comprise ecosystem destruction and local population decimation.

Alternatives seeking sustained use of tropical rain forests have been searched for, with many propositions aimed at the full development of the populations in those ecosystems (Hadley and Schreckenberg 1989; Anderson 1990, among others). The involvement of the local communities is essential to the forest management proposition promote land use stability. Therein, Buschbacher 1990 states that: "forest management systems can be envisioned

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This paper was presented at the Tenth World Forestry Congress held in Paris, September 1991

as a chain with ecological, economic and social links; if any one component of the chain is weak, the entire system will fail".

A proposition that has been getting prominent latelly is that of Extractive Reserves in Brazilian Amazonia, derived from a social movement headed by the rubber tappers in the State of Acre in the late 1970's (Allegretti, 1990). This proposition of land use is both socially fair to local communities and ecologically compatible with the Amazonian ecosystem characteristics, as well as in harmony with the land use pattern of that population. The killing of Chico Mendes, world-renowned rubber-tapper leader, symbolizes the struggle for that land use alternative.

Because Extractive Reserve is a management alternative for non-wood forest products, with minimum intervention in the ecosystem, it comprises other important benefits, such as genetic resourves conservation and ecosystem protection, which should be properly valuated. However, for the Extractive Reserve full development, it is also necessary that the productivity of the species in extraction be improved to market competition levels, maintaining the natural forest structure.

This present work intends to discuss: a) alternatives to improve the Extractive Reserve; b) the role of Extractive Reserve in the conservation of genetic resources.

IMPROVEMENT OF THE EXTRACTIVE RESERVES: ISLANDS OF HIGH PRODUCTIVITY

The extraction of non-wood products has been practised for a long time by traditional populations of Amazonia ("seringueiros", "ribeirinhos" and indians). It is a model of a mild use of the forest, with a very low level of environmental disturb to the ecosystem, and could be an interesting alternative for developing Amazonia.

The associated extraction of seringueira (*Hevea brasiliensis*) and castanheira (*Bertolethia excelsa*), mainly in southwestern Brazilian Amazonia, is one promissing example of extracton looking for economic/technical solutions to give support to the social, environmental and genetic conservation advantages. The consolidation of this system through the Extractive Reserves is the target of an advanced extraction (Allegretti 1990.

Homma 1989 emphasized the bad perspectives for the tradicional extraction as an economic alternative. In fact, the very low productivity of this type of land use, in the traditional form that has being conducted, has not permitted the full development of the populations that are practising the extraction. The low competitivity of the extraction, compared to the same species intensively cultivated in other regions and countries, has been pointed out as the main limitation of this form of land use. The low technical level of management of the species in extraction, the difficulties of product transport and commercialization, the inability of marketing, and other problems, limit the sustainability of the traditional extraction.

Extraction improvement in order to become an economic alternative to Amazonia has been the target of those who search for technical solutions of sustained development, which are socially fair to the majority of the Amazonian population and ecologically suitable to the ecosystem (Anderson 1990).

The use of advanced appropriate techniques with the objective of increasing the number of products being extracted from the forest, as well as the increase of productivity to competitive level while maintaining the principle of sustained use, may become a viable way for the neo-extraction.

A way to associate the increase of productivity in the Extractive Reserves with the maintenance of the genetic structure of the species in extraction has been proposed in the form of Islands of High Productivity. They would be small areas (1-2 ha) with the cultures in extraction, pures or in consorciation, in the form of improved varieties derived from local populations, becoming a continuation of the natural populations.

All technology available and proper to the culture would be used in those islands, such as: genetic improvement, vegetative propagation, fertilization, culture treatments, etc., in order to shorten production downtime and increase the area productivity.

Those islands would differ from a traditional culture in that they comprise small modules uniformly distributed throughout the reserve and surrounded by the natural forest ecosystem, besides the existence of genetic variability in the plantation. Those conditions would be appropriate to reduce the inoculation potential of eventual populations of insects and microorganisms associated to the crop culture.

Such cultivation pattern of indigenous species in a region, using the forest as a culture buffer, is the most suitable alternative to "cohabit" with possible pests and diseases instead of trying to combat them, which is the usual approach (Kageyama and Castro 1989). It is important to point out that experimental plantations similar to those herein described have been implemented in the Amazonia, specially with rubber tree, requiring formal experimentation to answer questions as: size of modules, distance between them, genetic variation inside the modules, etc.

It should be stressed that the production technology in those islands must be specific, as their conditions are different from natural forest and standard planting (homogeneous planting). Research is needed to create fit varieties and planting techniques specific to the situation.

The production unit in the Extractive Reserve is the "colocação", which comprises about 400 rubber trees in an area of about 400 hectares (Allegretti 1990). The islands would be settled in areas where rubber trees and other useful plants are scarce, where rubber tappers practise their subsistence culture.

An area of 5% the reserve total (20 ha) in 9 islands of 2.25 ha (150 x 150m) each will locate the islands 500 meters apart, which could work as a barrier or screen against insect and microorganism explosive population growth. The 5% figure comes from the maximum limit allowed of antropic alteration area in the State of Acre (IMAC 1990).

The important is that the 20 hectares of islands can hold about 8,000 rubber trees in a properly managed area, which represents 20 times the number of individuals of that species that existed before.

It is important to say that, although there is a big gap in the formal knowledge of the science to strengthen the extraction, a great number of appropriate technologies is available scattered in Amazonia for all the species in extraction (Anderson and Jardim, 1989; Posey 1985 among others). The great challenge that emerges in that the direction of the research goes toward the necessities of the Extractive Reserves and that appropriate technologies are effectively utilized by the traditional populations in this rational form of forest exploitation.

EXTRACTIVE RESERVES AND GENETIC CONSERVATION

The mild use of forests with a low level of intervenction in the ecosystem, such as in Extractive Reserves, permits the exploitation of forest resources to be compatible with conservation of their genetic resources. This is made possible by taking special care in quantifying and genetically monitoring the species under conservation in order to garantee their conservation in situ.

The preservation of the natural variability of a species for the continuity of its evolution in the ecosystem is the most adequate form of genetic conservation. It is particularly true for the many species of primary tropical forests, notably those in the final stage of succession for which conservation ex situ through traditional germplasm bank is not feasible. Furthermore, in genetic conservation in situ not only the gene pool of the population of species under conservation is apprehended, but also that of populations of associated organisms in the natural ecosystem which are essential to the continuity of evolution (Kageyama 1987).

"The conservation of forest genetic resources, in the case of tropical forest trees, includes protection of this supposed "enemies", competitors and primary consumers which continually select and diversify these resources... This action helps to maintain and condition it in the most correct and efficient manner, even though poorly concordant with the quick-profit economy of the industrial society"(Brown 1987).

The high genetic variability existing in natural populations is gradually eroded in the process of domestication and improvement of the species, and it is being destroyed by the continued and increasing rate of devastation of the Amazon Region. It is worth mentioning that this natural variability is often indispensable to solve problems, particularly those of sanitary nature, of intensive crops. The genes for resistance to pests and diseases of intensive crops normally exist in the centers of diversity of the species in natural forests, where it should be sought in case of need.

The Amazon Region represents an immensurable genetic source, if we consider the resources which represent the populations of thousands of species of its ecosystems. It is worth mentioning some examples of species which are economically important at present, such as the rubber tree, the Brazil nut tree, and the cacao tree. The important source of genetic material for those three species lies in the southwestern region of Brazilian Amazonia, particularly the States of Acre and Rondonia. Furthermore, the State of Acre is related with an area of the Pleistocene Refuge (Prance 1982) and, therefore, is a region of high endemism and genetic diversity.

The Extractive Reserves of State of Acre may perform an important role in genetic conservation associated with extraction, by preserving variability to be used for the three species in intensive crops outside the Amazon Region. Care must be taken to the genetic variability not be eroded in the extraction process, and also regarding the genetic material used in the reserve islands which have to be improved starting from local populations themselves.

The use of improved varieties of species in extraction in the Islands of High Productivity would result a bias in the original population genic frequency, working as a process of genetic drift. The gene flow from the islands to the natural population may affect its genetic structure, which is a function of the selection practised in the improved variety. In order not to introduce another factor of change in the genetic structure, it would be important not to incorporate in the improved variety genes from non-local populations.

How to manage such a complex genetic system as the tropical rain forest, bearing in mind to conserve it in situ, is a very difficult task which requires much research for its comprehension and use. On the other hand, Namkoong 1989 states that the structure of genetic variations may not be, in fact, in any stable equilibrium and its very dynamism may be an important feature of ecosystem evolution; some continuous change may be required to maintain productivity and continuity of forest ecosystems.

Another fundamental question related to conservation in situ in the Extractive Reserve is the valuation of the conservation action, for this value has to result in benefits for the population which uses the resource preserving the ecosystem. Griffith 1987 points out that the cort of the natural forest destruction is unknown, but it may be very high and more and more strategic, because the progress of science will request more and more that pool of genetic material.

Griffith 1987 says that the success of in-situ conservation, as compared to ex-situ conservation, results from the difference to nature between goods and services offered by the two strategies. While in-situ conservation involves rather pure, public goods, the ex-situ form comprise less pure, almost private goods. On the other hand, Sedjo 1989 points out that "naturally occurring plant genetic resources are treated as a commom property resource. The existing management system provides property rights for improved and genetically engineered plants, but is doing a poor job of protecting the wild genetic resources and the habitat in which these valuable resources reside. Since property rights are not now assignable to natural species, the Third-World countries in which the majority of these species reside have no means to derive financial benefits from the utilization of "their" species in commercial applications".

In this respect, Buschbacher 1990 rightly states that "innovative work is needed to advance the state of art of resource accounting (social cost-benefit analysis), and to quantify the economic benefits which the intact forest can provide".

FINAL CONSIDERATIONS

The discussion over alternatives of sustained use of tropical natural resources should deserve a particular consideration in this historical moment so decisive to mankind's destiny, when technology advances very rapidly in detriment to effective actions for preservation of the Third World resources.

It is of prime importance to direct financial resources from all over the world to the full investigation of the tropical ecosystems, and to concrete actions aimed at long-term preservation of the existing resources. It is also indispensable that those actions involve the populations that live and benefit from those resources, and invigorate the institutions that research on those ecosystems.

BIBLIOGRAPHY

ANDERSON, A. 1990. Alternatives to deforestation: steps toward sustainable use of the Amazon Rain Forest. Columbian Univ. Press. N. York. 280p.

ANDERSON, A. and JARDIM, M.A.G. 1989. Costs and benefits of foodplain forest management by rural inhabitants in the Amazon Estuary: A case study of açai palm production. *In:* J. BROWDER, ed. Fragil Lands of Latin America: The search for sustainable uses. Boulder, Colo. Westview Press.

ALLEGRETTI, M.H. 1990. Extractive Reserves: An alternative for reconciling development and environmental conservation in Amazonia. *In:* ANDERSON, A. Alternatives to deforestation: steps toward sustainable use of the Amazon Rain Forest. Columbian Univ. Press. N.York.

BUSCHBACHER, R.J. 1990. Natural forest management in the humid tropics: Ecological, social and economic considerations. *AMBIO*. *19*(5):253-8.

BROWN, K.S. 1987. O papel dos consumidores na conservação e no manejo de recursos genéticos florestais in situ. *IPEF*. Piracicaba, *35*:61-69.

GRIFFITH, J.J. 1987. Economia da conservação in situ de recursos genéticos florestais. *IPEF*. Piracicaba, *35*:85-92.

HADLEY, M. and SCHRECKENBERG, K. 1989. Contributing to sustained resource use in the humid and sub-humid tropics: some research approaches and insights. MAB Digest 3. Unesco. Paris.

HOMMA, A.K.O. 1989. Extração de recursos naturais renováveis: o caso do extrativismo vegetal na Amazônia. PhD Thesis. Univ.Federal de Viçosa. Viçosa, Brazil.

IMAC. 1990. Sistema estadual de áreas naturais protegidas. 18p. Document IMAC, Rio Branco-AC.

KAGEYAMA, P.Y. 1987. Conservação in situ de recursos genéticos de plantas. *IPEF*. Piracicaba, *35*:7-37.

KAGEYAMA, P.Y. and CASTRO, C.F.A. 1989. Sucessão secundária, estrutura genética e plantações de espécies nativas. *IPEF*. Piracicaba. (In press).

NAMKOONG, G. 1989. Systems of gene management: *In:* GIBSON, G.L. *et alii* (eds.). Breeding tropical trees. Population structure and genetic improvement strategies in clonal and seedling forestry. Oxford For. Inst. Oxford, U.K.

POSEY, D.A. 1985. Indigenous management of tropical forest ecosystem: The case of the Kayapó Indians of the Brazilian Amazon. *Agroforestry Systems.* *3*:139-58.

PRANCE, G.T. 1982. Forest refuges: evidence from woody angiosperms. *In:* PRANCE, G.T. *Biological diversification in the tropics.* New York, Columbia Univ. Press. p.137-58.

SEDJO, R.A. 1989. Property rights for plants. *Resources.* *97*:1-4.