

*The restoration of a lake
basin in Mexico and the
regional social
participatory process.
The case of ORCA*

Joaquin Esteva

**Center for the Social and Ecological Studies (CESE),
Patzcuaro, Michoacan, Mexico.**

February, 1995

Published in México by

The **Center of Social and Ecological Studies (CESE)**

Navarrete 50, CP 61600, Pátzcuaro, Michoacán, México.

Telephone and Fax numbers: (434) 20852 - Tel. (434) 23368

World Resources Institute (WRI)

1709 New York Avenue, NW, Washington, DC 20006 USA

tel.: (202) 638-6300; Fax: (202) 638-0036; Direct Dial: (202) 662-2584

Printed at Graphic Production Workshop (**TPG** morelia)

Vicente Santa María 1615, Morelia, Michoacán, México.

Photographs by

Raul Herrera and Joaquin Esteva

Contents

| | |
|------------------------------------------------------------------------------------------------------------------|-----------|
| Acknowledgements | 5 |
| I. Introduction | 7 |
| The National Scene: Natural Resources | 7 |
| The National Scene: Economic-industrial Development | 9 |
| ORCA's Experience | 10 |
| II. The basin's environmental, social and productive context..... | 13 |
| Location and Environment | 13 |
| The Traditional Purhepecha Culture | 13 |
| Use and Deterioration of the Natural Resources in the Region | 15 |
| The Lake's Environmental Problems | 17 |
| The Government's Response to the Environmental Deterioration | 17 |
| III. Toward an effective management of the basin's natural resources... 19 | 19 |
| ORCA's Background | 19 |
| Establishment of ORCA | 19 |
| The Promotion for Collective Participation | 21 |
| The Working Strategy: Management and Training of Human Resources | 21 |
| Achievements and Impact | 23 |
| Limitations and Adaptations | 27 |
| IV. Key elements for the success of the regional initiative | 31 |
| The Regional Dimension | 31 |
| The Social Subjects | 31 |
| Truly Appropriate Technology | 33 |
| Promoting the Technologies | 33 |
| Appropriating Suitable Technologies | 34 |
| Education Through Participatory Methods | 34 |
| External Funding and Advising in Support of a Training Process | 35 |
| The Autonomy of Both Organizations: A Key Aspect | 35 |
| Independent Funding | 36 |
| Mutual learning between CESE and ORCA | 36 |
| V. Implications and recommendations | 39 |
| The Regional Organization as Central Axis in the Environmental Initiative | 39 |
| Public Administration and the Social Rhythm of Ecological Recovery | 40 |
| Social participation and Human Resource Training | 42 |
| Appropriate Technologies and the Educational Process | 43 |
| The External Advisor, its Relationship with the Grassroots Organizations, and the Role of External Funding. | 44 |
| VI. Conclusions | 47 |
| Attachments | 49 |
| Bibliography | 52 |

13

Acknowledgements

This document is the product of the systematization of twelve years of joint efforts between the Riparian Organization Against Contamination of Lake Pátzcuaro (ORCA) and the Center for Social and Ecological Studies, A.C. (CESE). The global conception of the document was, in first place, suggested by Aarón Zazueta who works for the WRI.

In the general review of the document, we had the valuable collaboration of Javier Reyes, Daniel Márquez and Mateo Pérez, members of CESE. The document was also read and

commented by Tom Fox, Walter Arensberg, Bruce Cabarle and Ann Trupp, all of them members of the Center For International Development and Environment (CIDE) with headquarters in Washington, D.C. The final document was edited by Patricia Gerez. Rita Besana-Zazueta translated the document into English.

It is thanks to the financial aid of the World Resources Institute (WRI) that this document has been published.

I. Introduction

The basin of Lake Pátzcuaro has been the target of several development projects during the last five decades. Many of these projects have proposed its ecological restoration and environmental clean-up with little success. In 1982, in response to the limited achievements of these projects, a large group of Indian and mestizo peasant communities located in the islands and banks of Lake Pátzcuaro, initiated an ecological movement to protect and restore its natural resources. In this way, the Riparian Organization Against Contamination of Lake Pátzcuaro (ORCA) became the first instrument of the communities to articulate their efforts. After more than ten years, the organization and its collective efforts are prevailing.

Several hypotheses can be proposed to explain ORCA's success in promoting ecological protection in the region:

- . The cultural and historical basis shared by the lake communities sustain a strong regional identity among the inhabitants.
- . The cohesive and strategic role the lake basin and its environmental deterioration made the communities aware of the problem and motivated them to organize to search for solutions.
- . The search for alternative solutions started in the communities themselves, and within them, from the groups of producers most

affected by the environmental problems.

The consistent use of participatory methodologies that use ecological activities as means of developing a popular ecological culture, and for the training of local and regional human resources.

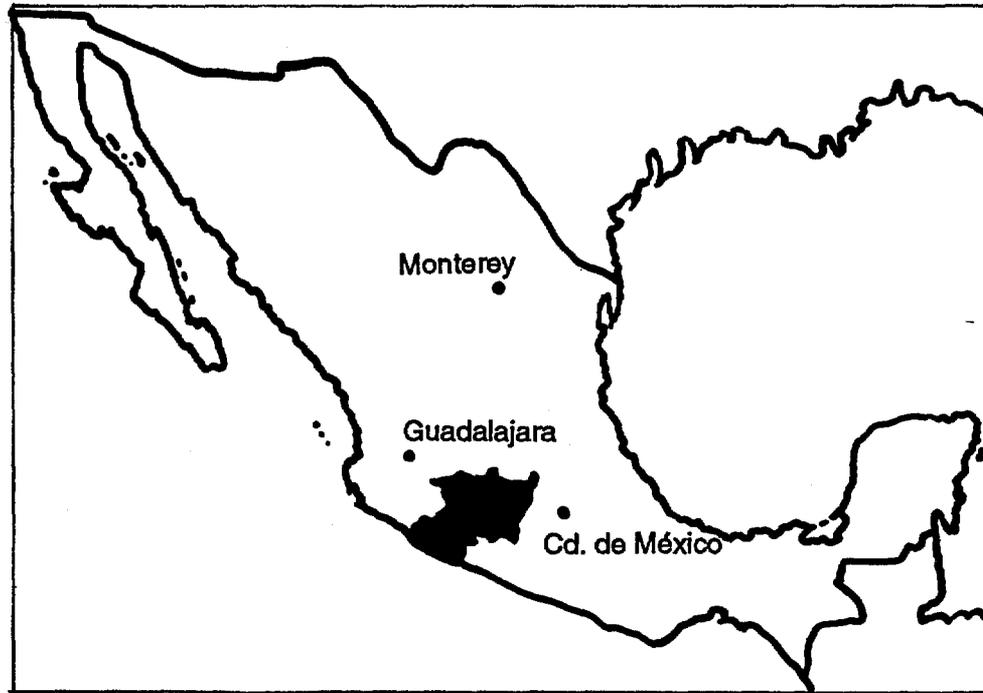
- . Advising and external resources sensitive to the local rhythms and needs which facilitated the development and maturity of an intercomunitarian ecological organization.

The outcomes of ORCA's work have implications for programs of protection and restoration of ecological basins from the perspective of grassroots organizations, within the context of the Indians' social marginality. Several principles and recommendations for government and non-government organizations working in regional environmental protection programs stem from this experience.

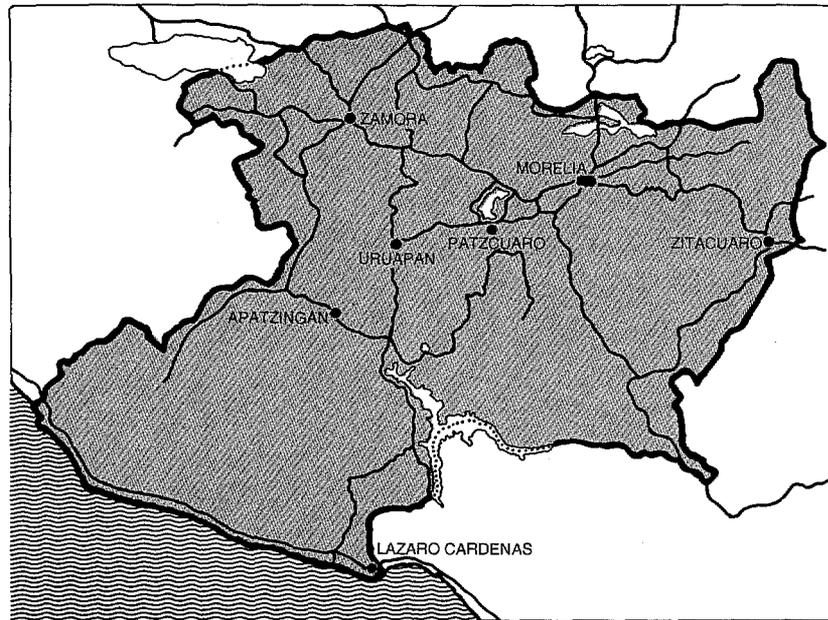
The National Scene: Natural Resources

Mexico is a privileged country in regards to its natural resources. It holds one of the most important places in biological diversity in the world. Its geographic location lends it the characteristic of natural bridge between the biotas of North and South America. In like manner, its rugged topography and geological

México



Michoacán



history have allowed the evolution of numerous species of unique flora and fauna. In its territory, of almost two million square kilometers, there is a great variety of climatic regions and habitats: temperate forests, tropical forests, arid zones and coastal areas. However, this natural wealth is seriously endangered by the development model the country has followed to date.

The 1990 census calculated a total population of 85 million people; more than 50% of which lived in urban areas. In the rural sector, 25% of the economically active people were dedicated to agricultural production. Despite the fact that over one-half of the country's surface is dedicated to agriculture -close to 20 million hectares to agricultural crops and over 100 million hectares to livestock- during the decades of the seventies and eighties, Mexico has gradually been losing its self-sufficiency in food production. Agricultural production contributed positively to the balance of payments up to 1965. It has slowly become a burden, however, having to import up to 80% of the country's food needs in 1980. In 1990, the country imported 3,248 tons of corn. Agriculture's contribution to GNP went from 18.1% in 1950 to 10.7% in 1972. The response of the rural population to the economic and productive crisis has been massive migration to the cities, the national development centers and the United States. It is estimated that currently 17 million Mexicans live in extreme poverty.

This deterioration in production has been parallel to a decrease in the surface dedicated to forestry. In 1980 the forestry surface reached 46 million hectares; however, it is estimated that between 1 and 1.5 million hectares are deforested and used for crops and for livestock

grazings, so as to urban growth and only 5% of this gets restored. During the 1970's, between 70 and 78 million hectares were dedicated to livestock production, and between 10 and 15 million hectares to agriculture (Leff et al, 1990).

Added to this is firewood extraction. Twenty million Mexicans use it as a source of domestic energy, and it is estimated that 14 million cubic meters are consumed (Toledo et al, 1989). If this trend continues, the country's natural resources will be in critical condition by the year 2000. One of the major national problems is soil erosion caused by deforestation: 22.6% of the country's soils has been slightly eroded; 31.6% shows moderate erosion; 17.7% shows severe erosion; and 8% presents very severe erosion. Only 18.5% of the nation's territory is free of erosion.

In summary, the degradation of the productive potential of the lands due to deforestation and erosion has seriously endangered the natural base for the future development of the country. The impact of deforestation, over-exploitation of the water tables, and toxic waste present a great risk to the most important water bodies in the country. Mexico has few important lakes; several have died or are in a rapid extinction process. The protection of lake basins is currently one of the national ecological priorities, given their economic, cultural and natural significance.

The National Scene: Economic-Industrial Development

The economic development model followed by Mexico since the 1940's, promoted modernization favoring its industrialization

and, therefore, an urban vs. rural development. For this, a policy of import substitution and technification of the countryside was set in motion through the "Green Revolution," introducing improved seeds, agrochemicals and irrigation districts where appropriate. The basis of this policy were the low prices for agricultural products, in order to ensure raw materials for the expanding industries, as well as cheap labor (Hewitt de Alcántara, 1978). After 50 years, this development strategy shows us an indebted country, macrocephalic cities with serious environmental problems, a countryside with a critical loss in its productive capacity and in the quality of life for the population, and an under-capitalization of the rural producers.

The social demands were controlled through the official party and the semi-official union organizations supporting the State's development model (Córdoba, A., 1985). In this way it was possible to ward off the social non-conformities and satisfy the popular classes by addressing limited demands (such as land for some peasants and better living standards for the urban workers).

Although the Mexican government apparatus is made up of three levels (federal, state and local), decisions are centrally made. At the federal and state levels we find the institutions that design and implement economic, social and productive development programs, managing most of the financial resources. The local governments, called "municipios", scarcely survive with the income from local taxes and require federal and state support to cover their most basic needs. This contradicts the federal and state laws, and the Constitution, which gives them the authority to become

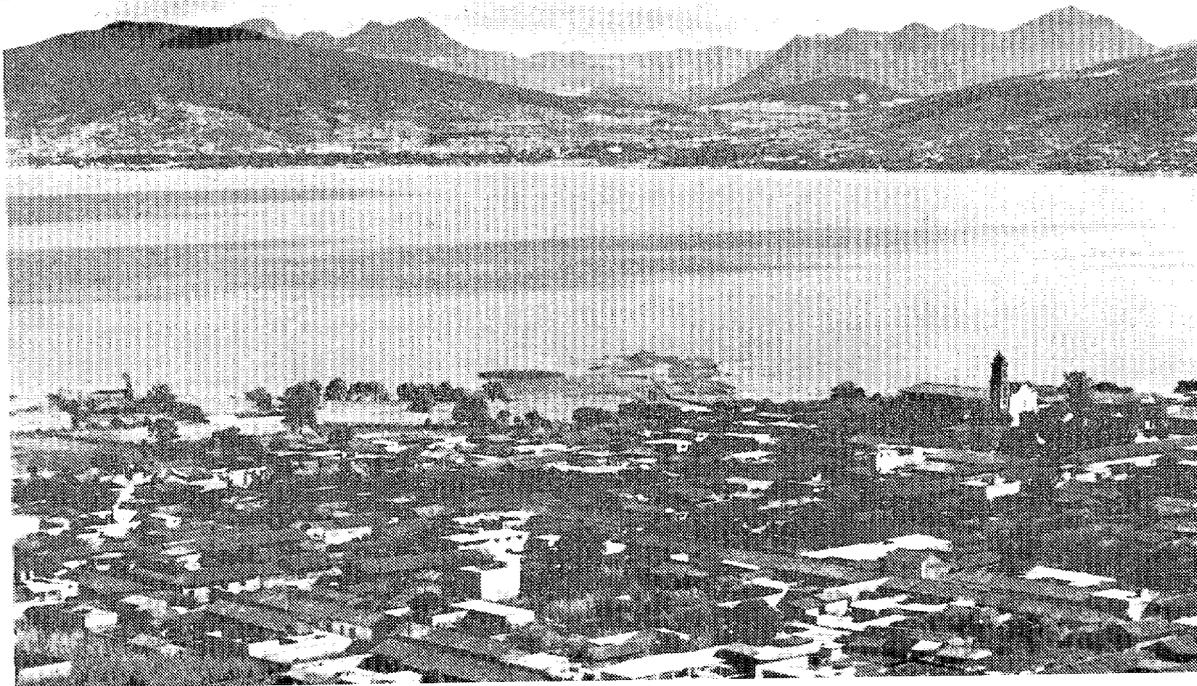
development cells. The new schemes of citizen participation promoted by the present federal administration, seem to be moving toward decentralization; however, much work needs to be done to achieve decentralization and local participation.

During the last decade there has been an increased interest on the part of the government on the environment. The dominant trend, however, has been to consider it as one more sector within the regional or national development plans. The environmental policies have been directed toward repairing the damages, without proposing a change in the technological patterns or in the production practices that cause them. Only recently, the President of the Republic recognized the high costs that the lack of balance between economic growth and ecological conservation have caused.

ORCA's Experience

In this national scene, the ecological restoration efforts of an independent grassroots organization stand out. ORCA is made up of the riparian rural communities of Pátzcuaro, Michoacán, Mexico. This document makes a recount of the rise and evolution of ORCA within the context of the regional social and ecological problems. The document places emphasis on the strategies developed to influence government projects to achieve an effective support for local management of resources and participation.

The final part consists of a set of recommendations for the promotion and implementation of regional ecological projects, based on participatory strategies. These



recommendations encourage the government, as well as other support groups, to promote the communities' self-reliance to identify and respond with effectiveness and growing independence to their ecological problems. In this sense, the document suggests a series of guidelines for a better fit of government actions with the logic of peasant Indian and mestizo communities.

This report is based on the systematization of 12 years of work by ORCA, carried out by a group of ORCA's officers and ex-officers, with the support of a researcher from the Center for Social and Ecological Studies (CESE), which has advised ORCA since its establishment. The systematization and analysis of information was carried out in a series of workshops designed according to the principles

of participatory methodology characteristic of both organizations.

Lake Patzcuaro

ORCA's action communitys



II. The basin's environmental, social and productive context

During many years, ORCA has carried out a set of actions in favor of conservation of resources, environmental sanitation, and ecological restoration. The following pages present the social ecological context of the region of Pátzcuaro and of the process of deterioration that prompted the creation of ORCA.

Location and Environment

The Pátzcuaro Basin is located in the central-west region of the country, 370 kilometers northwest of Mexico City, federal capital of the country. The total area of the basin is 102,600 hectares, 8,800 of which correspond to the lake proper. The lake is at an elevation of 2,040 meters above sea level.

It is an endorreic basin since it lacks an outlet to the sea. It does not have rivers to feed it, and rain is its only source of supply either directly through infiltration. The annual average rainfall is 950 mm; concentrated in the Summer and part of the Fall. In spite of being a relatively small basin, it comprises a great diversity of ecological systems.

Surrounded by volcanoes and mountains, some of which reach 3,300 meters high, it is a region with steep slopes of even 40% grade. Almost all its soils are andosols (of volcanic

origin), which are very susceptible to erosion after losing their vegetal cover. Originally, the basin was a forest, but currently the area with trees comprises only 34%, with forests of oak and pine (SARH, 1991).

The current population is of 112,022 people, distributed among almost 100 settlements around the lake. Of these, 60% are Purhepecha Indians (INEGI, 1991). The main economic activities are fishing in the lake, rain-fed agriculture and wood and clay crafts.

The Traditional Purhepecha Culture

There is evidence that the basin was populated by people dedicated to agriculture about 3,500 years ago. The Purhépechas settled in the area in the 13th Century. In the 16th Century, before the Spanish Conquest, they were the second most important empire in Mesoamerica, after the Aztecs. For their subsistence they developed techniques intensive in the use of their natural resources, as it is evidenced by the pre-hispanic terraces existing in the region.

After the Spanish Conquest (1521-1530), the Indians were concentrated in towns whose organization combined Spanish and pre-hispanic characteristics. During the 16th

Century the Pátzcuaro Basin was the stage of Vasco de Quiroga's and of the religious orders (Agustinians, Franciscans, and Jesuits) humanistic project, based on the utopia of Thomas Moore and on the ideas of Erasmus of Rotterdam. Thus, starting with a humanistic methodology of evangelization, a model was developed based on a structure of corporate relations within each community. This model included an economic organization that leaning toward self-sufficiency fostered, at the same time, the need for an inter-community complementarity that strengthened the bonds of solidarity by specializing each community in one craft. A perfect model of a regional closed economy.

About the middle of the 17th Century, the lands of the Indian communities were seized by the haciendas, which became the dominant economic unit until the beginning of the 20th Century. The communities recovered their lands during the agrarian reform (1917-1940) brought about by the Revolution of 1910.

The Indian communities, like the ones existing at present in the region, were characterized by an internal organization in which the religious, political, economic and family spheres were intimately tied together. The family, the neighborhood, the civil and religious authorities, the community meetings, the collective volunteer work to carry out certain tasks, are all essential elements in the structure and dynamics of the towns. An economy of prestige still exists, based on lavish expenditure during religious festivities, and for which in some communities the "cargo" system is still in practice. This "cargo" system consists in the annual election of people who, with the help of their relatives, organize and defray the costs of

the most important festivities of the community. This system allows people to increase very extensive solidarity ties (in the region, it is common that the elected family have the help of more than 100 friends and relatives, specially in populous communities). The received support implies reciprocity. In this way, the accumulation of wealth is prevented and thus, a marked social stratification that could negatively affect the community's internal relations. It is a mechanism that allows for the redistribution of wealth and that provides a way to go up in the social scale. Beside this mechanism are others with similar objectives which, in short, regulate and reproduce the social life of the community.

The Purhépecha communities have a mixed economy model, both for the market and for subsistence. The unit of production is the family, in which there is a division of labor by sex. The region does not present the ecological conditions for an intensive agriculture, since there are very few suitable plots which are mostly for rain-fed agriculture. For their subsistence, these communities have developed a multiple strategy of natural resource management: a combined agriculture of corn, beans and some vegetables; fishing; craft production; cattle raising; hunting; and small-scale forest use and harvesting. This multiple strategy, characteristic of the Indian communities, has allowed them to use their resources in the long range, preventing their over-exploitation.

Use and Deterioration of the Natural Resources in the Region

The climate, the original vegetation, and the type of soils give the region a forest vocation. The arrival of the railroad in 1886, transformed the region into a lumber supplier, thus beginning the exploitation of its forests on a large scale. In 1936 the government decreed a forestry prohibition in the basin. However, in the 1940's a new exploitation phase started, promoted by the increased demand for lumber which resulted from the urban and industrial growth of cities such as Mexico City and Morelia, the capital of Michoacán, and, of course, of the basin towns.

The prohibition stopped in 1973 without having prevented large losses to the pine and pine/oak forests. This situation was fostered by the transgression of the current forestry laws, by the corruption of local public officials and authorities, by the ambition of the contractors, and by the ignorance of many of the peasants about the consequences of deforestation. Thus, the seemingly inexhaustible forest resources decreased so rapidly that the first effects of erosion in the lake's sediments were noticeable by the end of the 1940's.

With or without prohibition (*), the basin forests have been hastily lost. In only 24 years (1963-1991) 45% of the of the existing forests have been cut down, and, during the same period, 93.5% of the lumber -to be competitive in the market- were lost too (Alvarez Icaza y

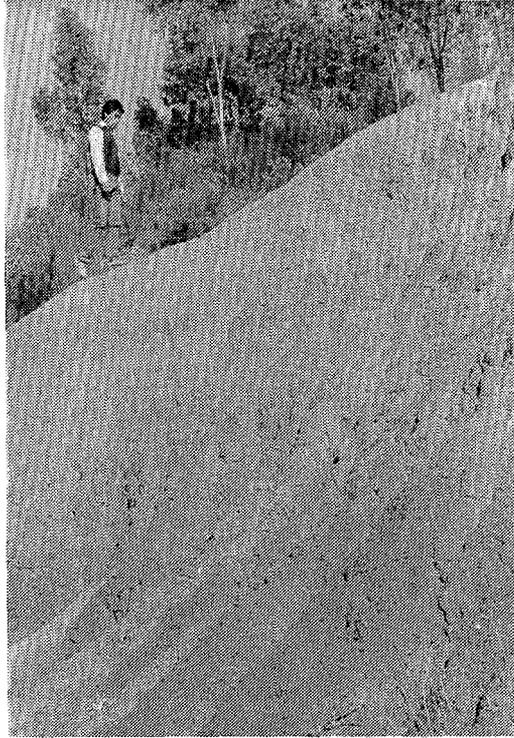
Garibay, 1992). The agricultural frontier has increased to 50% of the soils in spite of the steep slopes that make only 37.6% of the lots suitable for agriculture (SARH, 1983). 50% of the lots cleared for agriculture were abandoned after a few years when they became unproductive, partly due to soil erosion (SARH, 1991).

Currently, the greatest demand for lumber comes from 40 private sawmills, clandestine trade, and firewood for domestic use in the region. Also, there are 800 pottery workshops that use firewood (ORCA, 1990). The introduction of gas kilns has not been feasible due to the low prices of pottery at the local and national market.

The agricultural technologies introduced (use of fertilizers and pesticides), increased the productive capacity of the population. In the long run, however, these technologies have prevented a sustainable development in the region. Their negative ecological impact can be readily observed, along with the local forms of natural resource management, which are more in tune with the environmental characteristics of the region. The most obvious example has been the displacement of organic fertilizers by agrochemicals, giving place to soil salinization. Recently, the interest in natural fertilizers has arisen again, incorporating new techniques, such as compost piles and crops associations.

Fishing is an important source of income and food for an estimated population of 1,500 according to official registers. The

() Clandestine trade or wood robbery have not really suffered significant changes in decades. Though the new forestry law and its regulations give the citizenship the opportunity to take part in the handling of this problem through the Municipal Forestry Committees, public campaigns of accusation haven't prospered, mainly because of the personal insecurity feelings of the potential denouncers.*



incorporation into fishing of people who previously worked in agriculture has promoted in the last few years an over exploitation of the resources. Currently 17 communities do fishing, while 40 years ago only 11 did. This increase in the number of fishermen is also a result of the soft credits that various institutions have provided for fishing during the last decade. At the same time, the massive introduction of health services has helped to increase population growth. The population of the Pátzcuaro Basin increased by 55% between 1960 and 1990 (INEGI, 1991).

The combination of these factors has generated, on the one hand, a greater demand for resources, which extraction (wood), capture (fishing), or intensive use (agriculture) has had to be satisfied at the expense of an excessive pressure over these resources. On the other

hand, it has fostered the temporary or permanent migration of the rural population to the cities in the North of the country, U.S.A. and Canada in search of jobs. In some communities, over 30% of the economically-active population migrates every year.

Definitely, the social dimension of the Pátzcuaro Basin can be characterized today by the presence and interaction of cultural levels, which are unable to concrete organization forms responding to the real satisfaction of the rural populations basic needs. The modernization process beginning in the forties and continued up to date, has been transforming ancient patterns but not eliminating, however, the former values in a mechanical process. Nevertheless, the weakening of environmental and community values is of concern, considering that they have permitted the

Purhépecha communities to survive during centuries, without provoking the present ecological unbalance.

The Lake's Environmental Problems

Deforestation and an expansion of the lands dedicated to agriculture and livestock production have promoted soil erosion in the basin, causing the lake's present critical situation. Official reports estimate that in the last 50 years more than 40 million cubic meters of sediments have been deposited in the lake, and that each rainy season contributes 40,000 cubic meters more. The basin shows signs of erosion on 67.3% of its surface: slight erosion on 14% of it, moderate erosion on 50%, severe erosion on 2.3%, and very severe erosion on 1% (SARH, 1983).

Water contamination is another problem. It has several causes: the direct sewage disposal from the four county seats; the out-of-doors defecation which is common in the 100 settlements in the basin; the open garbage dumps which get carried down toward the lake by the rains; and the increasing need for agrochemicals caused by the impoverishment of the agricultural land. These wastes, deposited every day in the lake, have promoted its eutrophication and the proliferation of aquatic plants. Likewise, the native fish species (some of them endemic to the lake) are in danger of extinction due to the overexploitations and the introduction of foreign species, such as tilapia, trout, and carp.

The records show that the lake's depth has been decreasing in an accelerated way, going

from 7 meters on average in 1981 to 4.9 meters in 1989 (Chacón, 1992). This is due to a water balance deficit given that the annual average rainfall is 902 mm, while the annual average evaporation is 1492 mm (CONAGUA, 1991). Evaporation increases both by the presence of aquatic plants, which cover 10% of the lake surface, and by its increasing shallowness. Another factor contributing to the latter is the water extracted for domestic, industrial, and agricultural use.

The Government's Response to the Environmental Deterioration

The main federal agencies responsible for development projects during the period 1988-1994 in the area of Pátzcuaro have been: The Ministry for Urban Development and Ecology (SEDUE), the Ministry for Fishing ((SEPESCA), the Ministry of Agriculture and Water Resources (SARH), the Ministry of Budget and Programming (SPP), as well as the National Indigenous Institute (INI), and the Ministry for Social Development (SEDESOL). There are branches of these ministries in every state of the republic which work together with the agencies of each state government.

The relationship between the federal, state and local agencies is formalized through agreements. There is a inter-institutional coordinating agency for the planning of these programs working under the name of "Solidarity Committee for the Rescue of the Pátzcuaro and Zirahuén Basins", this being a branch of the special committee named Planning and Development Committee for Michoacán (COPLADEM).

III. Toward an effective management of the basin's natural resources.

ORCA's Background

Two events paved the way for the formation of a regional organization for ecological conservation and restoration. On the one hand, in 1981, the popular movement to stop the establishment of a Center for Research on Nuclear Reactors (CIR) on the lake shore, raised concerns among the population about the security and future of their resources. After many months of putting pressure inside and outside the region, the government cancelled the nuclear project in Pátzcuaro.

This movement had many other positive results besides the cancellation of the CIR: the massive dissemination of information on the issue through radio and television programs, newspaper articles and other media, promoted an awareness on the critical social and ecological reality of the region. Another aspect was the communication between the communities and the mobilization that allowed them to recognize the strength of unity. It became evident, too, that the ecological problems were an important strategic factor to draw the population together.

The movement allowed for the emergence of new regional leaders, some of which were to play an important role in the establishment of ORCA. These were the first leaders who, after at least two decades, were elected and supported

by the communities. In this way, an autonomous and independent leadership was formed which did not need the government's approval to exist.

Later on, at the beginning of 1982, ten communities started a struggle that ended with the permanent closing of a fish flour processing plant. This plant lacked anti-polluting systems and was affecting the quality of the local air, of the lake and of the drinking water in the neighboring communities. These two experiences fostered, in the same year, the conditions for the formal establishment of a regional organization of the riparian and islander communities.

Establishment of ORCA

The interest in participating in the solutions to the ecological problems in the region stayed alive among the groups and people who had participated in the anti-nuclear movement either through the Committee for the Ecological Defense of Michoacán, made up of intellectuals, or through the Riparian Committee made up of community members in 1982. A new encounter between people from both committees resulted in the establishment of a team of promoters of what would become ORCA. This team was formed by fishermen and advisers from CESEI.



These advisers were developing projects on participatory research, adult education and rural development in the region.

The group of promoters was formed during a meeting of a group of fishermen from several communities to discuss the establishment of a fishing municipal cooperative proposed by SEPESCA. The fishermen decided that it was more important to form an organization to protect the lake instead of getting into debt in order to install fish stockyards: "Why installing small stockyards if the big stockyard (the lake) is coming to an end?" In subsequent meetings a strategy and a plan to establish a regional organization were defined.

This idea was promoted through community meetings and had a positive response. Thus, on August 8th, 1982 the organization was established with the participation of representatives from 23 communities. An organizational structure that would facilitate working with a board of directors was proposed. All the lake communities were to be represented on the board. It was agreed to form groups of

communities by sub-regions, based on geographic, economic, religious and kinship criteria. Thus, seven sub-regions were formed which closely coincide with the seven sub-basins in the region. Two representatives from each sub-region were elected to the board and a committee of five people was formed in each community, its members elected by a community assembly. The board of directors would be the highest authority, and each representative would serve for one year. In this structure there was also a group of advisors who would have voice but no vote.

The objectives of the organization are:

- a. To defend the natural resources in the region and in each one of the communities.
- b. To attack the main problems of contamination.
- c. To demand that the government agencies work better, and monitor the completion of their programs.
- d. To succeed in making this way of thinking a part of the regional culture.

The Promotion for Collective Participation

It was not an easy task to initiate ORCA's activities. Motivating the participation of the communities required a great deal of work in each one of them. Before starting any ecological action in the communities, ORCA and the advisors would propose a re-examination of the most significant development experiences that the community could remember. This had a dual objective: firstly, to systematize a large group of development experiences, both negative and positive, in order to discover under which future conditions failure could be avoided. Secondly, the identification of the times and circumstances that gave rise to internal conflicts, as a first step to smooth over any differences between antagonistic groups. When the community trusted ORCA and its advisors, as well as consented to appoint representatives to ORCA, the first work plan was developed, starting with a diagnosis.

Thus, the activities were started with a series of group reflections about the problems, in order to study and experiment with solutions. The methodology included the formation of work groups, communication within each group, and with the community and the region, through meetings and workshops, and other activities such as research, evaluation, and the performing of community works.

For example, in response to the community work plan of Ihuatzio, in 1983, the construction of filtration dams was started along with reforestation. These were carried out exclusively with collective, non-paid, work. In this way, soil conservation techniques were introduced for the first time. In addition,

through ORCA's regional initiative, the community became a member of REVELAPA (State Plan for Vegetal Restoration in Lake Pátzcuaro). As a result, the work initiated the previous year was expanded significantly in 1984. In this community, the government program found a well-organized, aware and motivated population that made the project feasible in a short time. Their active participation in its implementation and supervision guaranteed that the tasks were done well and were carried out according to the goals established and the funds available.

The Working Strategy: Management and Training of Human Resources

ORCA has been and continues to be basically a promoter and a training organization. Thus, its working strategy responds to general actions that help promoting an effective management of natural resources.

The actions to solve the ecological problems in the region stem from a very simple premise: to promote solutions already proved in the region, such as reforestation and filtering dams. These two strategies are very important measures for soil protection and for preventing more sediment from getting into the lake. ORCA has also participated in different degrees in the adoption of practical ecological techniques. In some cases it has promoted them directly, while in others it has lobbied for their implementation. The set of all the measures either promoted or supported by ORCA in different areas during its 12 years of existence can be seen on Table 1 (attached).



ORCA has played an important role in lobbying the different government agencies for the allocation increase and a better coordination of the resources necessary to continue the ecological programs in the region. The problems in the region are of such magnitude that it is impossible to reach significant goals with only the regional resources. Then, its initiatives have centered on the local, state and federal levels, by establishing contacts with mayors, governors, secretaries of state, and even with the President of the Republic.

At the time ORCA was established, there were 27 programs from 19 government agencies in the Patzcuaro region. Ten of these were participating simultaneously in the area of ecological restoration. Some of these agencies were duplicating efforts, such as in the case of reforestation and soil conservation. Presently, there is a trend to decrease the involvement of these agencies in the programs, leaving only one agency for each program which assumed a "sector head" role, and promoting a more active involvement and commitment on the part of

the population.

Traditionally, the government's environmental restoration programs have been based on economic or food rewards for the participant communities and individuals. This has been especially true in the reforestation and soil conservation programs. These rewards have been counterproductive since there has not been any mechanisms to ensure that the work is being done with the necessary care to produce long-lasting results. Without training or education, the works are neglected. In addition, they have failed to motivate the communities to participate in the ecological restoration efforts of their own lands through their ancestral mechanisms of collective collaboration and individual responsibility.

In this way, the communities' mechanisms of solidarity and internal cohesion have been eroding. These mechanisms are essential in ensuring a genuine motivation and in generating sustainable habits in environmental protection. Through their labor, the communities have built huge churches and repaired their streets

19

and public buildings. In like manner, it is valid to think that the tasks of environmental restoration, at least in part, should be carried out through the same mechanisms that have worked for five centuries in the region.

ORCA's training and educational activities start with the training of its own board members, and other representatives of the communities, so they can promote participation in their own towns. The strategy followed is training in action, strengthened by classes and workshops on specific topics. By the end of their tenure, the directors and representatives have acquired knowledge and skills on a wide range of topics such as: ecology and ecodevelopment; appropriate technologies; public administration and legal and political issues; and conceptual elements and basic tools for research, planning, promotion, communication, training, evaluation, negotiation, and resource management.

In order to promote ecological actions in the communities, diverse communication and training activities are carried out, including:

- . Regional assembly-workshops, in which ORCA's work plans are discussed and analyzed, government programs are evaluated, aspects of social participation are discussed, cultural events are carried out, etc. To date, ORCA has carried out 70 of these regional assembly-workshops.
- . Dissemination of messages on the ecological problems of the region; work progress; accusations; practical alternative solutions; and other issues. This dissemination is done through slide and video presentations, posted bills, bulletins, pamphlets, newspaper articles, posters, radio programs and regio-

nal shows. In total, ORCA has carried out over 400 activities in this area.

- . Theoretical-practical training workshops for the communities to demonstrate and promote the adoption of alternative technologies such as: building of filtering dams for soil conservation, rural stoves to save firewood, non-contaminant latrines, reforestation, and compost production.

Achievements and Impact

ORCA, as an especial agency of the communities to address the issues of environmental sanitation and ecological restoration, emerged in a context where the active participation of the communities was not supported. Moreover, the communities were not ready to assume the responsibility that such an organization implied. In this sense, ORCA has opened new roads, strengthening the positive experiences of the region and, at the same time, facing a series of obstacles originating in government agencies and in the communities. The fact that ORCA has survived for more than ten years is an institutional achievement, given that in the region there are countless cases of groups with a short life. ORCA's main areas of action, where it has been able to have a regional influence, can be grouped into: human resource training, dissemination, organizational strengthening, environmental recovery, appropriate technologies, and negotiation.

The training and education of human resources in the region has been achieved through their participation in ORCA's internal structure. Close to 135 people have served as

board members to date. These people have appropriated the work methodologies described above. After their tenure, some of the directors have become community authorities; while others have become promoters of groups in charge of production with an environmental orientation. Some of them have participated actively in the development of new regional organizations.

In regards to organizational strengthening, it can be stated that as a result of ORCA's actions, two new regional organizations have been established. One of them is the Union of Lake Patzcuaro Fishing Unions, formed in 1990 by 19 fishing community groups. Its objectives are economic in nature but they include an environmental aspect in the protection of fishing resources through better regulation of the capture, restocking of native species, and search for new alternative technologies such as pisciculture. On the other hand, a group of ORCA's ex-officers, in coordination with the CESE, gave origin to a project of sustainable agriculture, oriented to the search of a regional model.

Likewise, ORCA has directly promoted different community

coordinations fronts to negotiate with the government. It also fostered the integration of a communities committee for the completion of the road pavement. In the same way, six communities formed another one to supervise the operation of their plant nurseries because of the lack of professional efficiency on the part of the government agency. Only one of these nurseries survived on a self-reliance basis. The other one is the Committee of Solidarity Committees, formed at the beginning of 1991. This group is made up of 30 committees

established to represent the communities in the government programs of production, social welfare, and ecological rescue of the basin.

ORCA has provided these not necessarily permanent committees with training and consulting in negotiations with government agencies. This includes a better set of proposals, including control policies and mechanisms on the financial resources of the communities and a periodical review of the programs together with the community representatives. Both aspects made possible, for the first time, the basis installation for a social control through community trusts; as well as a series of meetings with information, analysis and evaluation purposes carried out together with all the government agencies.

Since 1984, and thanks to ORCA's work, the communities demand more investments on the part of the government for reforestation and other ecological protection works. As a result, the government now considers the area as a priority in the country's ecological restoration. In recognition of ORCA's work, in 1988 the federal government granted it the National Award for Ecological Action.

In the area of environmental recovery, soil conservation has been the problem which has received more attention during the last decade. In 1984 the overall reforestation goal for the basin was estimated at 24,000 hectares, with an average of 1,000 hectares reforested every year. However, a high percentage of the newly planted trees died in non-humid lands. Achieving a higher success is not only a matter of employing adequate technologies, but also a problem of committed participation on the part of the communities where reforestation is taking place.



How to measure the effectiveness of a participatory methodology within a context where the institutions do not practice it? A concrete case came along in 1989, when the communities rejected the official reforestation program because they believed the policies would cause an internal division in the communities. Then ORCA, with the support of groups of producers from ten communities, carried out reforestation in the same number of communities, with an average of 5 hectares per community for a total of 50,000 trees. After one year, 90% of the trees had survived, which was much better than the average 10% achieved in the communities reforested by the government. This, according to the periodical evaluations done by the same organization.

The success was due to ORCA's promotion of the project with the support of organized groups who were willing to participate in the task of planting trees. Although not very large extensions were reforested, the project was highly effective, and it had an educational and organizational character which was very important for the participants. The government, in contrast, with its dynamic of quantitative goals, bet on the economic offer, which had no incentives for the population.

Along with reforestation, an intensive program of construction of filtering dams has been carried out. These dams were introduced in the region by SARH in 1978 with very good results in a specific area (Cerro Colorado). Between 1982 and 1984 ORCA promoted them and coordinated training workshops for their building in the ten communities with the greatest erosion. Sixty demonstration projects were built in this way. From 1984 on, the institutional soil conservation programs promoted and coordinated the construction of the dams. Between 1984 and 1986, the government announced that it had built 2,000 filtering dams. These restoration programs received funding from the government program for rural employment. This program was implemented under a government-employer scheme. ORCA continued to promote directly some tasks with collective labor, but its function became more relevant in monitoring the performance of the government's programs.

When ORCA started working, there existed no forestry nurseries in the region, only depending on neighbour ones. As a complement to the reforestation program, ORCA supported the communities initiative to build the infrastructure for 8 community nurseries: 6 of them with an annual production of 30,000 trees to provide lumber; one producing 400,000; and the eighth producing one-half million fruit plants. There also exists a governmental nursery capable of producing a million plants per year. However, due to the failure of the institutions in charge to provide technical and financial support to the community nurseries, arguing their non-profit nature; the economical, organizational and educational character of the original project was left aside and forgotten.

ORCA's contribution in the area of appropriate technology has been unique: an example is the case with experimentation and demonstration of dry latrines (clivus). By 1988, 22 lake communities had experimented and built these latrines in public places. The adoption of this alternative to outdoor defecation and to pit latrines has been slow in the households, but it is undoubtedly the most effective and best accepted alternative to date. Presently, about 900 families in the basin have this kind of latrine. There are coordinated programs among ORCA, INI and the communities to enlarge the latrines number very significantly.

Likewise, in order to promote savings in the use of firewood, which is used in 90% of the rural households in the region, the organization has kept an ongoing program of local workshops, resulting in the building of improved rural stoves within 500 households in 20 communities. The demand for these stoves is increasing (*). It is estimated that the use of these stoves prevents the cutting of 500 mature trees per year. Presently, in some communities such as Nocutzepo, the dissemination of the use of these stoves is carried out by the women themselves, and it is possible to think about widening their use, taking advantage of the sensitizing and advances achieved during the last year.

In regards to agriculture, ORCA has pioneered the promotion of alternatives to counteract the use of agrochemicals. In 1987, a regional diagnostic carried out by the

organization detected the need to find substitutes for fertilizers, for they diminish the productive capacity of the soil and pollute the lake. Currently, a group of ORCA's former officials are successfully experimenting with a program intended to become a model of sustainable agriculture for the region. The work takes into account soil management, as well as water, seeds, fertilization and pest control, among other issues.

ORCA shares today with the other mentioned groups, the facilities of CONALEP (National College for Professional Education) where training activities, assemblies, workshops, technological experimentation and demonstrations are carried out; these installations were at first intended to accomplish agricultural activities but were not being used at the moment ORCA negotiated and obtained their utilization. The activities that take place in the CETA (Centre for Experimentation of Appropriate Technologies) are complementary within the training, dissemination and experiences exchange ORCA does in the communities. The CETA is shared by ORCA with sustainable community projects, the latter oriented to attend the specific needs of women groups.

ORCA's initiative has also been fruitful in environmental sanitation works through calling the attention of the authorities and officials to undertake them. It has achieved a slow decrease in the sources of pollution through its negotiations with SEDUE. ORCA pressed for the establishment of systems to treat waste in

(*) *The improved rural stoves are built with mud and sand, explaining their name: LORENAS (lodo: mud, and arena: sand). They were developed in Guatemala trying to make a more efficient use of the firewood, so as to reduce the smoke and the heat to which women were exposed. Lorena stoves are cheap and can be built with local supplies. At present, they have been adopted in several parts of Mexico and Central America.*





gas stations; in a fish processing plant (which is the main industry in Pátzcuaro); and in the sewage of the main county seats. It is important to mention that the latter hasn't completely found solution because there is no budget to install tubes and thus separate the pluvial from the sewage waters. All of these were throwing their waste directly into the lake. Parallel to this, ORCA has insisted on the creation of sanitary landfills for human solid waste, and is starting a garbage recycling program in Pátzcuaro.

There also exist other positive aspects of ORCA's environmental work. These could be mentioned as follows: the negotiation to regulate lake water extraction has achieved the cancellation of one of the most important pumping systems regarding its environmental impact. It has also negotiated with Petróleos Mexicanos the damages restoration caused by the opening (in 1981) of a way for a gas pipeline in San Miguel Ncutzepo that caused the throwing of about half a million of cubic meters of mud into the lake waters (SARH estimations).

It is possible to summarize ORCA's achievements and impacts, remembering that the actions for ecological restoration of the Patzcuaro Basin mean a greater concern on the government's part, and, at the same time, the stimulation of an ecological culture in the population. It is obvious that the old economic development trends are difficult to eradicate and that only with a permanent and coherent educational effort and social participation would be possible to reverse the patterns that have been accepted as normal for so long. In this process, ORCA has strengthened the mechanisms of mutual help in carrying out the communities' ecological efforts, and has established a social participation and ecological promotion system as well as human resources training in the region.

Limitations and Adaptations

ORCA's search for alternatives in resources management has followed the path of «trial and error.» In the case of protection of the basin's forest, it initially struggled for the

establishment of a prohibition on tree cutting. However, when the experiences in the basin and in other regions in the country were analyzed, it was recognized that prohibitions were not the most efficient method to prevent excessive tree cutting. It was observed that in all the cases this measure promoted clandestine cutting and that the most effective alternative was to give the communities a direct control over the use of their forests.

Current forestry practices are phytosanitary, due to the presence of pests. Nonetheless, ORCA has encouraged the communities to care for their forests, by requesting immediate technical assistance in order to avoid the expansion of the pests. One of the problems they face are the highly bureaucratic procedures. The authorities take too long to respond to requests, and this favors pest growth.

The promotion of some technologies has required adaptations. Such was the case with latrines and rural stoves. The models used for experimentation and demonstration were not sufficiently efficient. The use of latrines of the Vietnamese kind required a very complex process for people who are used to pit latrines or outdoor defecation. In 1989 an evaluation was carried out and it was found out that out of 22 latrines, 7 of the latrines were working well, 7 in a regular way and 8 were not working, the last ones located in public places; it mainly was because of lack of maintenance. This situation has been corrected.

With regards to the rural stoves, it was necessary to make a series of adaptations to the original model, brought from Guatemala, in order to reduce its use of firewood and to adapt it to the regional needs. The result was a model which is modified according to the needs and

resources of each community, and thus it has had greater acceptance.

It was also necessary to make adjustments to ORCA's organizational structure. The board's tasks during the first four years were shaped by themes or problems: «Garbage;» «Sewage;» «Forestry Issues;» «Treasury;» and «General Issues.» In 1986, a need to adjust the structure and organization mechanisms in order to have a greater capacity for self-reliance was identified. It was agreed that the old structure created dependency of the ORCA's directors by the CESE's advisors.

After consulting with the riparian and islander communities, it was agreed to change the tasks to: «Communication;» «Research and Planning;» «Works;» «Initiative;» and «Treasury.» This new division of functions forces some specialization and semi-professionalization of the board members. It also results in better training for its members and in less need for advising from CESE. Moreover, the period of service for the directors was increased to two years, with changes staggered (3). Now every year seven new members are incorporated, who coexist with another seven from the previous period. This prevents the permanence of leaders, provides training for more people, and passes knowledge and information horizontally. Other changes were to decrease the number of representatives to one per community and to expand the social base by 20 producer groups -men and women- organized from the communities with CESE's assistance to implement programs on health, supplying, etc. (see Table 2).

On the other hand, community diagnoses have been also improved, above all, considering their methodologies and contents. As a starting

point, ORCA coordinated diagnostics and plans mainly based on the population vision, together with information and data extracted from institutional studies. ORCA is performing today deeper diagnoses, adding, clearly and precisely, the study and reflection on the community environments, resulting in a more integral and educational methodology. In the same way, the local perspective has a regional dimension; for this they have longer range proposals and diagnoses than in former years, above all, starting with the preparation of the «Plan Pátzcuaro 2000», a multidisciplinary and interinstitutional, non-official, effort.

The social and technological limitations that ORCA has confronted have been surmounted thanks to the systematic process of reflection and evaluation on their work strategies and policies.

This does not imply that it has been a linear growth process for the groups and organizations. At times there has been stagnation and retreat, but these have been overcome through truly participatory, ongoing, feedback mechanisms. After twelve years of uninterrupted work, it has become clear that organizations such as ORCA have earned legitimacy, and have started to have a real influence on the development policies of the region. Enough time has passed to evaluate their work. This shows the delusion experienced by all the programs that seek to make substantial changes in short periods, by centering their strategies on large financial investments. The creation of a new, less predatory culture is not a task for a few years, even less when the ecological restoration is not isolated from economical and political factors.

26



02

IV. Key elements for the success of the regional initiative

The Regional Dimension

A common history and a set of ecological problems shared by the communities in the region were the bases for the grassroots regional organization.

In the basin of Lake Pátzcuaro there have been countless attempts to establish community organizations around agricultural and craft production. On a lesser scale, the creation of second degree structures through inter-community cooperatives was also attempted. However, the outcomes of these dissipated over the time. These organizational failures were due to the difficulties in organizing the different Indian communities, with an unequal degree of technical and socio-economic development, into manufacturing and commercial organizations. The ORCA's case derives an important conclusion after analyzing the experiences. This lesson indicates that the strategy oriented to the formation of second level groups and organizations (fishermen, craftsmen, farmers), supported only on the base of economic factors to start a regional movement of environmental character, has certain limits.

The first social instrument was ORCA and the key to its birth was the recognition of the cohesive character of the lake and its ecosystem. This character goes beyond the cultural and

productive differences that exist among the communities in the region. In effect, in 1981 it was clear that the problems of contamination, and the ecological problems in general, are cohesive elements between groups with diverse economic activities, degrees of development, and market involvement. The integral character of the ecosystem determines that a change in one of its parts has effects on the whole.

It was the awareness of the fishermen in perceiving the ecological problems as the cohesive force in all the communities what led to the establishment of ORCA. This involved the acknowledgement that the concept of a cultural and ecological region, together with the work in the communities, were essential in solving a great deal of the problems that afflicted them as parts of an ecological unit, the basin of Pátzcuaro. ORCA's strategy was decisive in uniting the scattered efforts and transform them into a slow, yet growing, movement in favor of new forms of social behavior towards nature.

The Social Subjects

Decision making, control and management of the initiatives resided at all times in the social subjects, through the representation of the communities in ORCA.

ORCA is a popular representative

organization in which its members are elected as representatives in community meetings. The participation of members from the different productive sectors of the communities was promoted from the start: fishermen, farmers, and craftsmen. In many towns the same person may perform these three activities, while in others there is some specialization which gives origin to trade unions. With the exception of the islands, in the rest of the towns, farmers are the most important sector.

This explains that at the beginning it was the fishermen who promoted ORCA, because it was in the lake where the effects of the ecological crisis were felt with greater intensity. In addition, in 1982, they were in a better economic situation due to the daily sales of their capture and the availability of free time that fishing at night provided them.

When ORCA was first established, there were some agricultural communities that were reluctant to accept the importance of collective participation in the tasks of ecological restoration that were identified. They argued that the problem of the lake belonged to the fishermen and that these had larger incomes than the farmers, who were exposed to countless problems in order to harvest their low-priced crops. This did not mean that there was a general rejection of the fishermen's proposal. Many peasants could understand the negative effects of soil erosion on the productivity of their lands and on the lake.

Through collective discussions in community and regional meetings, ORCA's board was able to develop better communication among the sectors in order to address, for the first time, the problems common to both fishermen and farmers, such as soil

erosion. This helped create a consensus that was strengthened with the construction of public works with inter-community participation. In this way, from the start, there were peasants on the board of directors and even one of them became president during the third round. This has become a periodic event.

ORCA insisted on the importance of insuring the greatest farmer participation in order to avoid deviations from the organization's objectives and to maintain credibility in the communities. Some teachers were appointed to the first boards since they are highly respected due to their preparation. However, in 1987 their participation was evaluated and it was deemed as not positive since their teaching responsibilities prevented them from fulfilling the responsibilities that the organization required. From then on, all the representatives elected by the communities have been fishermen, craftsmen, or farmers, with the exception of some construction workers who combine this activity with one of the other three. Although this makes of ORCA an organization directed by people with almost no education, it has been a very important factor in keeping its authenticity and in keeping it faithful to the objectives identified by the communities.

The direct management of the organization by the producers, together with its loyalty to democratic election mechanisms and its financial independence from the government, have enabled ORCA to remain as an autonomous organization and independent of the State.

Thus, it has been decisive for the ecological movement in the region that ORCA's social subjects be the rural communities, owners of

most of the natural resources, and that its management had been in charge of the most important groups of producers. These are the people who, at the local level, use and manage natural resources.

Truly Appropriate Technology

ORCA has focused on the promotion of technologies suitable to the needs of the population, as well as to the forms of organization and the resources existing in the region.

ORCA has had, among its main functions, the promotion of suitable environmental technologies. This has meant identifying and disseminating technologies that do not require high economic investments, nor excessive sophistication. This is to ensure that the groups of farmers and the communities have control over their management and use. Above all, ORCA has looked for technologies coming from the communities, the region, or as a result of an adaptation to the needs and dynamics of the regional ecosystem. In promoting any technology, ORCA favors participation and mutual help in such a way that its adoption becomes an educational process and not just merely a transfer.

ORCA concentrates on technologies for environmental restoration and sanitation, as well as in energy preservation. The two most important practices on soil conservation have been reforestation and construction of filtering dams. The latter are considered a variation or improvement of the prehispanic terraces that still exist in some areas in the region. In regards to environmental sanitation and energy saving, ORCA promotes dry latrines, lorenas

stoves, clay ovens to cook bread, manual pumps for water extraction, as well as compost production both at the family and community levels.

Promoting the Technologies

In ORCA's promotional work, experimentation and demonstration of low capital and intensive labor technologies have been key. These technologies offer specific, effective alternatives, and strengthen the control of the communities over the rehabilitation and better use of their natural resources. More sophisticated technologies are not rejected, but they are used only when there is no other option that complies with the economic, cultural and sustainability criteria defined by the organization.

In this methodological process CESE participates as a facilitator in identifying the problem and the alternative technological solutions. An initial evaluation of the identified technologies is carried out according to the defined criteria. The next step is a selection of solutions and an experimentation to train ORCA's officers and representatives and to measure their effectiveness and results. When there is a positive background in the region for a particular technology, there is no need for a rigorous experimentation. Next is the phase of demonstration and training in the communities through practical workshops.

Then ORCA follows up by supporting the communities in expanding the practice, promoting more workshops and tasks in the case of public practices such as reforestation, and building stoves in the households, in the case of private practices.

In some cases, the phases of experimentation, demonstration and massive production have been shared with government programs. Such was the case with the construction of filtering dams for soil conservation. Table 2 exemplifies the process followed using this project.

Appropriating Suitable Technologies

The process of technologies acquisition is at present in different degrees of evolution. The communities have appropriated these techniques to such a degree that their use has been generalized and they do not require technical assistance any more. This was noticed when, after getting no response from the government on what to do about Patzcuaro's sewage treatment, the communities proposed to build filtering dams along the main river so they could function as oxygenation modules for a primary treatment. Later on, faced with the problem of soil erosion caused by the opening of roads for the gas pipeline, the solution was proposed by ORCA. This solution considered not only the building of filtering dams, but also planting grasses, reforestation, building structures to slow down the water currents, etc. This showed that the communities can make theirs an effective technology with relative ease.

Education Through Participatory Methods

ORCA promotes the participation of the population in the search and implementation of better ways to manage the natural resources

through educational, analytical, and collective work methods.

For ORCA there is a big difference between actions for ecological protection and ecological development projects. The former rests on the premise that the latter are formative processes in which the population consciously participates. As it was earlier mentioned, the region has been the stage for many institutional actions for ecological protection based on a relationship of contracts with the communities. In these cases the educational component has been practically non-existent. The institution designed the program, motivated the community with some kind of reward, and encouraged it to participate in the implementation of the activities.

ORCA, by virtue of being an instrument of the communities, promotes the participation of the population through methods of analysis and collective work. A long process that begins with community consultations and goes on to regional meeting-workshops is defined in the community workshops. Every moment is an opportunity to identify and analyze problems and present solutions in such a way as to make the work an educational process and to promote responsibility. The community diagnostics and the development of community action plans are framed in this context. It is a participatory strategy that allows for the structuring of work relations through organization, generation of knowledge, socialization, training, the systematization of experiences and the evaluation of results.



joint management process between two non-profit civil organizations in which the external organization supports and advises the grassroots organization so it can progress and reach growing levels of self-reliance.

The results show that a joint initiative based on the institutional and financial autonomy of both organizations is the best way to shorten their processes for self-reliance. Currently, ORCA is practically self-reliant in the normal operation of its projects, although still requires occasional advising. Having achieved an acceptable level of conceptual and operative self-reliance, ORCA intends to keep its relationship with CESE, since their coordination is essential to strengthen the progress of the environmental movement in the region.

Independent Funding

When ORCA was first established, some resources for its support were donated by the communities. These resources, however, were not enough to create an organization with a

semi-specialized staff and a basic infrastructure for efficient operation. Keeping a sustained and autonomous work rhythm has required external financial support. Funding from private agencies which support processes, as opposed to specific projects, has enabled ORCA to have a permanent fund to give small grants to the people who hold positions in the organization, for the operation of the different assignments, and for training and community promotion.

With the support of the external advisor, effective mechanisms were established for the internal management of the resources. An important aspect was to foster confidence in the treasurership of the organization. At present, ORCA is completely healthy in its internal finances.

Mutual learning between CESE and ORCA

In the same way that ORCA has benefited from CESE's advising, CESE has benefited enormously from this relationship. Thanks to

32

this experience, an educational methodology linked to a specific ecological problem has been successfully validated. CESE possesses now principles, methods, and specific techniques to promote organizational, diagnostic, planning, communication, training, and evaluation processes for ecological efforts with grassroots organizations. Added to this is all the communication and training materials that have been produced throughout the experience.

In order to be able to respond better to ORCA's requests for advising, CESE has established contacts with different organizations similar to it, with the intention of exchanging work experiences. In this way, CESE has expanded its network of relationships with groups dedicated to development, the environment, and education; both in the academic sector and with environmental and social promotion groups. ORCA has also developed relationships with the citizenship, integrating into networks and debate fora.

The favorable impact ORCA has had on the communities has been strengthened by the advisers' work, who besides supporting ORCA are promoting projects of productive and educational character with women's, craftsmen's and fishermen's groups as a contribution to a global strategy of ecodevelopment. These groups have been at the forefront in the communities with their participation in diverse ecological tasks for soil conservation, reforestation, manufacture of rural stoves. The mentioned groups have involved in a special way in the rescue of traditional healing practices, protection of fishing resources, sustainable agriculture, and others.

Recently, all these groups had the opportunity to share a place in the Centre for Appropriate Technologies (CETA), operating under the ORCA, CESE and CONALEP coordination.

33

V. Implications and recommendations

The Regional Organization as Central Axis in the Environmental Initiative.

The current national policy on the environment states that the ecological arrangement should respond to an «Ecological Regionalization» of the country. The region as a geographical unit represents a powerful action framework for the planning and implementation of activities to restore the environment and for a better management of the natural resources. This is due, in part, to the fact that the problems in a locality are frequently tied to the management of natural resources in other places. Such is the case of the sedimentation of Lake Pátzcuaro. This sedimentation is a result of the clearing of forests and the erosion of the highlands around the basin. Nonetheless, the criteria for regionalization should also include elements that would lead to a search for solutions through the organization and coordinated action of the local population.

First Recommendation: ORCA's experience shows that in order to produce effective actions, the «official regionalization» should go beyond the characteristics of the natural ecosystems and consider historical, cultural, economic, and political aspects as well.

ORCA's experience has demonstrated that a social control over the use of the resources the state allocates to ecological recovery can play an important role. Specially since these organizations are able to propose alternatives which, integrating the needs and interests of the local population, make a better use of the state's resources.

The case of ORCA has demonstrated, too, that natural resources management from a regional perspective which responds to the needs and interests of the local population, requires, on the one hand, the promotion, creation, and strengthening of structures and mechanisms for collective participation within the communities, and on the other, mechanisms that allow for an inter-community promotion and coordination that would lead to a dialogue with the government on the basis of feasible proposals.

Second Recommendation: It is essential to create and strengthen independent grassroots organizations which promote and keep watch over the good management of the natural resources. Without pretending to propose the case of ORCA as a model that can be replicated elsewhere, the promotion of this kind of organization can be achieved through **processes** similar to the one followed in the development and strengthening of ORCA. Taking as a

starting point the needs of the local population and gradually building the regional organization upon the cultural, organizational, economic, and political basis.

Public Administration and the Social Rhythm of Ecological Recovery

The Mexican Constitution designates the counties as the country's «development cells.» In theory, it is through the counties that the planning, coordination and, to a great extent, the implementation of programs should be carried out. In reality, the counties, particularly the rural ones, lack the fiscal resources to carry out programs and projects. Frequently they are only spectators of the development activities carried out by state and federal agencies.

In the case of Patzcuaro, the severity of the environmental problems, and the few resources of the local populations, make necessary the participation of the State in restoring the environment. In order for the State's actions to become a long lasting contribution to the region's environmental reconstruction, they should adapt to the local needs and rhythms. The best way to achieve this is by democratizing the planning and development agencies through which these activities are performed.

In the case of ORCA, some officers working at ministry level understand the significance of real participation by the beneficiaries of development. Nevertheless, at the local decision-making levels this has not always been supported. The case of the Committee for Planning and Development of the Pátzcuaro Region (COPLADEM), in which the social organizations do not have clear legal status

that would guarantee the endorsement of their proposals, and in which the counties have only voice but not vote, is an example. The decisions are made by the representatives of the federal and state agencies, which have the funding to implement projects in the area.

ORCA, together with the four counties that form the basin of Lake Patzcuaro, have stated the need to change COPLADEM's structure to increase the authority of the municipal governments in orienting the development of the region's potential with the support of the grassroots organizations. This would directly contribute to strengthen the planning and action capacity of the counties, in accordance with the Mexican Constitution.

Third Recommendation: It is necessary to deepen the democratization of the planning and development agencies created by the State. For this, the structures of the regional development organizations (COPLADEM) should be reorganized by incorporating the counties and the civil society organized with vote, as well as by giving them financial resources to enable them to carry out activities responding to the needs identified locally.

One of the main limitations in the development policies and government programs in Mexico, including those related to the environment, has been their difficulty in adapting their actions to the rhythm and needs of the rural and Indian communities. This problem of the rhythms is key in trying to make the population adopt new practices.

This problem arises, to a great degree, from the «**forced march**» through which the changes are introduced in the communities. The

35



programs and projects are defined by external agents using technical criteria, which frequently are out of phase with the interests and real capacity of the communities. In light of this situation the government officials, interested in results, look for easy ways to complete the projects, such as by hiring community members to build works. However, as it was seen in the case of the government programs of reforestation and construction of filtering dams, this leads to a fictitious rhythm of ecological recovery. On one hand, though it can be stated that peasants have now a better opportunity to speak about their needs in order to carry out the local planning, there are no consistent methodologies to go beyond the mere fact of the making a list of requirements by the local committees or authorities. It frequently happens that, for lack of an adequate analysis, the solutions are not real but apparent.

On the other hand, though the participation of the hired population in restoration, sanitation and other works implies some kind of learning, this is never enough to give them a global comprehension of problems and their solutions,

nor does it imply the social and individual creation of a new ecological conscience. The lack of a consistent training on basic values, principles and concepts for the construction of a sustainable society, leads to the ending of the educational impact of the projects at their completion, with high probabilities of leaving them aside in a short time.

Fourth recommendation: In order to achieve participation and adoption of new practices in the management of natural resources, the government programs and projects need to respond first to the needs identified jointly with representatives from the communities. In spite of the type of project the community prefers (potable water, electrification, etc.), the environmental aspect has to be integrated to every diagnosis and selection of alternative solutions, considering their environmental impact, that needs also to include criteria on economical, cultural and technological sustentability, from the local and regional point of view.

36

The problem of rhythm is also a serious one at the operative levels. The federal government's budgetary policies and schedules have shown repeatedly that they are out of phase with the reality of the communities, as well as with the seasonal changes. These are essential aspects in any program. The funds that arrive months late cause problems in the maintenance of machinery, decrease in production in the nurseries, etc. In addition, this causes the loss of confidence from the communities toward the government agencies which, in turn, decreases the people's motivation to get involved in new programs.

The creation of local mechanisms to manage funds, such as bank trusts, opens up the possibility for the communities of managing the funds provided by the government, by keeping in the bank an amount that could sustain the programs during the months the external funds are late. However, this is still tied to changes in the cabinet, specially when there is a new president: the funds are frequently frozen during the first and last years of each presidential term.

Fifth recommendation: It is important to decentralize even more the management of funds in bank trusts and to look for other mechanisms to ensure that changes in the cabinet and the presidential terms do not interfere with the rhythms of regional development. These would ensure the continuity of the projects and activities that respond to the local needs.

Social participation and Human Resource Training

In the Pátzcuaro region, since the late 1970's, integrated rural development projects were initiated under the auspices of the Regional Center for Adult Education and Functional Literacy for Latin America (CREFAL). These projects sought to develop precise methods to promote social participation in the rural communities. For this, it was considered necessary to stimulate processes of training for organization in such a way that the population could have influence on the decisions made in regards to policies related to their own development. The educational aspect was highlighted repeatedly for there cannot be a feasible social change without education.

The government agencies agreed on this strategy in diverse documents. However, the institutions responsible for promoting development have kept their old extensionist style. This style is characterized by teaching skills merely through training and by transferring technologies without analyzing with the communities their cultural, economic, and ecological implications. This reflects the existing dichotomy between the approaches of the development policies in the country, in force for over a decade, and the way the agencies work in the region.

From ORCA's experience, it can be asserted that formal authorization or invitations are not enough to achieve the participation of the population. The promotion of participation is a long learning process; a process of training of human resources and strengthening of organizations capable of confronting the challenges that arise. Diverse experiences,

including ORCA's, demonstrate that programs with the participation of regional organizations require to be understood as medium and long term processes.

Sixth recommendation: To ensure long-lasting impacts, the government programs in the Pátzcuaro region (and any ecological restoration project that promotes local participation, from the State or from private agencies) should build local capacities in organization management, analysis and research; educate others; and act as spokesmen of the grassroots before the public administration. This can only be achieved through the development and adaptation of teaching methods suitable for the culture and schooling of the population involved.

A characteristic particularly essential for ORCA's progress was its capacity for reflection and learning from its own experience. In several occasions self-reflection helped in making difficult decisions that were key for its development. An example is the decision to elect only peasants as community representatives and do without the contributions that the teachers, with their better schooling, could offer. Another example was the decision to limit the tenure of board members. This required the ongoing training of the leadership, but has been a very effective way to prevent the centralization of decision-making within ORCA.

Seventh recommendation: Any environmental restoration, community promotion, and technology transfer program should include the systematic and periodic

analysis of its experience to be able to understand better its progress and failures, and to redirect its actions. For this, it is necessary to develop and adopt reflection and analysis methods suitable to the educational and cultural levels of the participants.

Appropriable Technologies and the Educational Process

In the case of adoption of alternative technologies, the communities are very cautious in assimilating them. There are well-defined criteria for adoption that should be considered when undertaking campaigns. One of them is that the communities have a technological system intimately related to their lifestyle and system of perceptions, to which technology should be added. The clay stoves, designed to save firewood, have been successful in Mesoamérica because they are ideal to cook corn tortillas. In contrast, out from Mesoamérica, they would not be considered as a viable alternative because they do not respond to the needs of the population -they do not eat corn tortillas. In general it has been noticed that the rhythm of adoption of technologies is faster when they satisfy local needs or improve existent facilities, their control being easier through the training of local human resources as well as the horizontal transmission among members and families in the population.

From the point of view of the relationship between technology and culture, the regional initiative also means a reevaluation of those traditional practices in the Indian communities which guarantee a more harmonious relationship with nature. This, without rejecting new practices, as has been demonstrated by the

successful adoption of the improved clay stoves and the construction of soil conservation works. This really means an optimization and improvement of the traditional practices as a result of the scientific research application.

The ecological concept of development or eco-development, requires an educational proposal, or eco-education. In this regards, the official educational policy through its environmental education programs, has been very limited because its programs are out of touch with the other activities carried out in the region. Its environmental education activities in the area are limited to dissemination campaigns on topics such as recycling garbage, reforestation, and others. On the other hand, it fails to identify the educational aspect of the activities it promotes for the ecological restoration. This inability is due to the fact that its relationship with the community is practically reduced to that of employer/employee, placing emphasis on technical issues.

In contrast, in order to promote this kind of work, ORCA develops a series of activities that are initiated with a group reflection on the problems, and then go to study and experiment with solutions through mechanisms that promote community participation. Thus, the population acquire skills and knowledge that enable them to reach a level of self-reliance. For example, ORCA currently produces its radio programs, creates bulletins and posted bills to spread regional news, designs and leads regional planning and evaluation meetings and workshops, designs and coordinates studies and research, experiments and disseminates technologies, and presents initiatives to the government.

Eighth recommendation: To promote the adoption of technologies that contribute to a better management of natural resources, the official agencies should integrate their educational programs with their ecological restoration projects. This can be achieved by starting its projects with group activities to reflect on the problems identified; following this with the study and experimentation of solutions with the community. This would enable the local population to acquire the skills and knowledge to continue with the ecological reconstruction activities once the programs end.

The External Advisor, its Relationship with the Grassroots Organizations, and the Role of External Funding.

The external advisors have played a fundamental role in the successful development of this experience. CESE's work strategy, based on participatory educational and research-action methods around specific problems of the peasants' reality, has fulfilled its mission in achieving the creation of a regional self-reliant organization.

In order to have the methodological elements that would enable it to provide a systematic support to the nascent regional organization, CESE developed in 1983 its «Strategy for Participation in Research, Training, and Organization.» This strategy stated that CESE's work subject was the totality of the riparian communities, and that eco-development was its line of action. This had three main areas: environmental sanitation, energy savings, and ecological restoration. The objective of this

29

strategy was to accompany ORCA in the roles of adviser and trainer.

The way in which the external funding of ORCA took place played an important role in its achievements. As was mentioned earlier, from the start ORCA had its own funding. During the fiscal period ORCA's funds were kept in joint accounts with CESE, but the funds were clearly for ORCA's operation. The access to funds and the need to manage them in a responsible manner was a strong incentive to get CESE and ORCA to develop accounting and cash management systems suitable for the organization. Thanks to this ORCA has always managed its funds with an exemplary financial transparency.

Ninth recommendation: The advising agencies, which frequently are non-government organizations, should establish the self-reliance of their advisees as their main goal. For this, it is fundamental to establish clear functions that would keep an organizational and financial autonomy between the grassroots organization and the advising team.

On the other hand, funding was oriented toward the process of strengthening ORCA and was given consistently and without interruptions for several years. This gave ORCA and CESE the flexibility to adjust their plans and define the projects according to the opportunities that better fit the strengthening strategy they had outlined.

Tenth recommendation: Funding for the strengthening of the participatory initiative of grassroots organizations should be provided gradually, in a way that would empower the

organization in the management of financial resources. As was mentioned earlier, this requires intensive capacity-building efforts on the part of the advisor during the early stages. However, it requires, too, the willingness of the financing institutions to channel funds directly to the grassroots organizations. As this is a slow process that can last several years, it requires medium to long-range financial commitments to support the programs. This would allow the activities to fit the most suitable opportunities, in order to accomplish the outlined strategies.

Both CESE and ORCA have benefited from this work strategy. For the advising organization (CESE), the benefits stem from its learnings in the development of strategic and methodological options, for ORCA has maintained a system of recording and evaluation of its programs and methods. As it was mentioned earlier, it is thanks to these analytical tools, that it has been possible to propose the changes that have strengthened ORCA's capacity for self-reliance. This systematization of strategies and methodologies is an area neglected by the government agencies, thus promoting habits that lack creativity.

Eleventh recommendation: It is urgent that the government agencies perform systematic analysis of their successes and failures in order to learn from their experiences. This is particularly important for governmental institutions, which consistently have results that are quite below the expectations, and who have not carried out any kind of systematic analysis of their working strategies and methodologies in the region.



VI. Conclusions

The rescue of lake basins in the country is one of the environmental priorities of the government. Experiences like the one presented in this paper indicate that the social participation of the population is essential to achieve an objective such as this. The participation of regional organizations, coordinated with local populations, shows, in the Pátzcuaro case, a way to be encouraged in order to shorten the ecological recovery times so as to set up grounds for a new culture in accordance with the building of sustainable societies.

Given the great complexity of the environmental problem of lake basins like Pátzcuaro, it is impossible for a regional organization to face successfully every issue. As the problems commonly derive from an inadequate management of the resources because of external pressures suffered by the communities, and also because of the haste urbanization and subsequent ecociding processes, the Pátzcuaro basin is today in a

restoration and detoxification stage. This has determined that ORCA's priorities had been mainly directed towards these working areas. Nowadays, environmental sanitation, energy savings and restoration works are practiced in every community in the region participating in ORCA.

The latter, has not avoided, however, the ORCA's attacking, directly or not, of the very productive aspects, although the deepening of actions in this field has been assumed by union groups, as the peasants and fishermen. This shows that it is feasible to develop -in the managing of basins- organizational processes which are complementary among themselves, in such a way as to achieve impacts in different fronts at the same time. In this sense, ORCA's task goes beyond the works and negotiations already performed and has fostered, through its own example, the formation of other groups sharing values, strategies and methodologies. To a great extent, thanks to ORCA's effort, the

popular movement in the region is at present quite dynamic, diversified and with a greater awareness about the importance of the ecological dimension in any development project than before ORCA's work.

The immediate future presents to ORCA two principal challenges that have to be faced jointly with other organizations committed with the restoration of the Pátzcuaro basin. On one hand, it should collaborate through its own experience, to develop a project for a more and more integral management of the basin's natural resources. On the other hand, they should expand and consolidate the participation of the communities in the government agencies of regional coordination, where the decisions on development policies and programs are made. Its purpose being the consideration -on the governments part- of its opinions and points of view on the formulation of environmental policies for the area. In the next years, for a positive solution of both challenges, ORCA should double its educational efforts, not only considering the treatment of aspects such as ecology and environmental technologies, but also taking into account the social environment attention, fostering the training of a regional citizenship capable of getting involved in the task of creating a more sustainable society.

42

Attachments

TABLE 1
WORKING LINES AND ACTIVITIES OF THE ORGANIZATION

| AREA AND ACTIONS | ACTIVITY OF ORCA |
|-------------------------------------------|---------------------------------------------------|
| Forestry | |
| . Firefighting and fire | Communication and dissemination prevention |
| . Firewood saving (loreña stove) | Experimentation, demonstration, and dissemination |
| . Community nurseries | Initiative, training, and organization |
| . Pest control | Initiative |
| . Reforestation | Promotion, experimentation and works |
| Agriculture | |
| . Agrochemicals (problems) | Research, dissemination |
| . Soil conservation (dams, dykes) | Initiative, promotion, works |
| . Fertilizers (compost) | Experimentation, dissemination |
| . Water-saving systems for irrigation | Research, initiative, dissemination |
| Environmental sanitation | |
| . Biological systems for sewage treatment | Research, works |
| . Dry latrines (clivus) | Experimentation, demonstration, and expansion |
| . Garbage separation and recycling | Initiative, dissemination |
| . Sanitary landfills | Initiative |
| Construction | |
| . Stabilized material (adobines) | Experimentation, demonstration |
| . Improved bread ovens | Experimentation, demonstration |
| . Solar heaters | Dissemination, training |
| . Manual pumps for water extraction | Experimentation, dissemination |

TABLE 2
CHRONICLE OF THE PROCESS FOR THE SELECTION AND ADOPTION OF
APPROPRIABLE TECHNOLOGY IN RESTORING DEGRADED SOILS IN THE
PATZCUARO BASIN.

| YEAR | ACTION | PHASE | RESPONSIBLE |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------|
| 1977 | SARH starts soil conservation program in a critical area of the basin | Experimentation | Government |
| 1982 | ORCA's first general work plan proposes the promotion of projects for soil conservation. The SARH experience is known and evaluated. | Evaluation | ORCA |
| 1983/1984 | ORCA coordinates workshops for the construction of filtering dams in 10 communities with serious erosion problems, with an outcome of 60 demonstration works | Demonstration | ORCA |
| 1983 | ORCA negotiates with the Governor and the President for funding for the soil conservation program | Expansion | ORCA |
| 1984/up to date | The government approves and carries out regional soil conservation programs in 18 communities with an approximated total of 20,000 works, according to official reports. This prevents the entry of 2 million cubic meters of sediments into the lake | Expansion | Government |
| 1987 | ORCA builds 22 oxygenation modules for the primary treatment of sewage from Patzcuaro the city of Patzcuaro | Generalization | ORCA and the |

44

Table 3.

COMPARISON BETWEEN THE WORK SYSTEMS OF ORCA AND THE GOVERNMENT AGENCIES, IN REGARDS TO ECOLOGICAL RESTORATION PROJECTS

| FUNCTION | ORCA | GOVERNMENT |
|----------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Planning | Discussion and approval of a general plan during regional and community workshops | Regional plan defined by the institutions. |
| | Integrated process of organization, training, communication, evaluation of each objective and goal | In relation to goals |
| | Self-diagnosis on social environment during community workshops with participatory research methods. | Suggests self- diagnosis by community without specific methods |
| Implementation | Community workshops and tasks (non-paid work) | Paid work |
| Management | Autonomous (control of financial resources by the board, and the communities) | Community trusts (control of financial resources by the community, the government and the official banks). |
| Evaluation | Permanent, systematic, centered on goals, objectives, strategies, and work methodologies | Incidental, non systematic, and centered on goals |

45

Bibliography

- ARRANGOIZ, Jaime; ESTEVA, Joaquín; DE SCHUTTER, Anton. 1983. Educación y Formas de Organización Social. En: Educación de Adultos: Nuevas Dimensiones en el Sector Educativo. México, Centro de Estudios Educativos.
- CENTRO DE ESTUDIOS SOCIALES Y ECOLOGICOS, (CESE).1985. Informe Preliminar sobre la Situación Forestal en la Cuenca de Pátzcuaro. CESE, Pátzcuaro, Michoacán, México.
- CENTRO DE ESTUDIOS SOCIALES Y ECOLOGICOS, (CESE).1988. Crónica de Cincuenta Años de Ecología y Desarrollo en la Región Lacustre de Pátzcuaro (1936-1986). CESE, Pátzcuaro, Michoacán, México.
- CHACON, Arturo. 1992. Ecosistema Lacustre. En Plan Pátzcuaro 2000. Fundación Friedrich Ebert. México
- COMISION NACIONAL DEL AGUA (CONAGUA). 1991. Diagnóstico Ecológico de la Cuenca del Lago de Patzcuaro. Morelia, Mich. México.
- COORDINACION RURAL, A.C. 1981. Estudio Fisiográfico de la Cuenca del Lago de Pátzcuaro. Vols. I y II. CRAC, Pátzcuaro, Michoacán, México.
- COORDINACION RURAL, A.C.1981. Resultados de la Investigación Exploratoria en la Región Lacustre de Pátacuaro. CRAC, Michoacán, México.
- CORDOBA, Arnaldo. 1985. La Formación del Poder Político en México. Ed. ERA. México, D.F.
- DE ICAZA, Pedro y GARIBAY, Claudio. 1992. Producción Agropecuaria y Forestal. En Plan Pátzcuaro 2000. Fundación Friedrich Ebert. México.
- DELEGACION FEDERAL DE PESCA. 1982. Estudio Limnológico pesquero. Termopluvimetría. Primera Etapa de Rehabilitación del Lago de Pátzcuaro. Pátzcuaro, Michoacán, México.
- ESTEVA, Joaquín. 1985. Organización Social y Procesos de Desarrollo en la Región de Pátzcuaro. CESE. Pátzcuaro, Michoacán
- ESTEVA, Joaquín y REYES, Javier.1990. La Investigación Participativa en Apoyo a la Formación de Sujetos Autogestivos. El Caso de la ORCA. En: Memorias del IV Congreso Nacional de Investigación Educativa. IMCED. Morelia, Michoacán
- HEWITT DE ALCANTARA, Cynthia. 1978. La Modernización de la Agricultura Mexicana, 1940-1970. Siglo XXI, editores. México. 319 p.
- INSTITUTO NACIONAL DE ESTADISTICA, GEOGRAFIA E INFORMATICA (INEGI). 1991. XI Censo General de Población y Vivienda, 1990. Aguascalientes, Ags. México.
- LEFF, Enrique et al. 1990. Medio Ambiente y Desarrollo en México. Centro de Investigaciones Interdisciplinarias en Humanidades. UNAM. México
- NUÑEZ, Miguel Angel. 1989. La Agricultura Tradicional en la Cuenca de Pátzcuaro. CESE, Pátzcuaro, Michoacán.
- ORGANIZACION RIBEREÑA CONTRA LA CONTAMINACION DEL LAGO DE PATZCUARO,(ORCA). 1985. Los Idus de Pátzcuaro. En: Casa delTiempo. Universidad Autónoma Metropolitana. México, D.F.

46

ORGANIZACION RIBEREÑA CONTRA LA CONTAMINACION DEL LAGO DE PATZCUARO (ORCA). 1990. El uso de la leña en la región de Patzcuaro. Patzcuaro, Mich.

PIZA, Antonio. 1988. La Experiencia en Organización y Educación Popular de la ORCA. En: Educación Popular en América Latina. CESO, Paperback No. 4. México, D.F.

REYES, Javier, ESTEVA, Joaquín y TELLEZ, Arturo. 1990. El Ecodesarrollo, la Investigación Participativa y la Educación Popular en la Región de Pátzcuaro. En: Recursos Naturales, Técnica y Cultura. Estudios y Experiencias para un Desarrollo Alternativo. UNAM, México.

REYES, Javier. 1988. Ecodesarrollo y Educación Popular. En: Educación Popular en América Latina; la Teoría en la Práctica. CESO, Paperback No. 4. México, D.F.

REYES, Javier. 1990. Problemática Ambiental y Participación de la Sociedad Civil. Documento de Base para el Foro sobre el Trópico Seco. Día Mundial del Medio Ambiente. CESE. Pátzcuaro, Michoacán.

SECRETARIA DE AGRICULTURA Y RECURSOS HIDRAULICOS,(SARH). 1983. Resumen de Actividades 1978-1982 y Actividades 1983 del Programa de Recuperación de Suelos y Control de Azolves del Lago de Pátzcuaro. Morelia, Michoacán.

SECRETARIA DE FOMENTO RURAL. 1983. Restauración Vegetal de la Cuenca del Lago de Pátzcuaro. Morelia, Michoacán.

SECRETARIA DE DESARROLLO URBANO Y ECOLOGIA. 1985. Memoria del Primer Encuentro Purépecha Sobre el Manejo Tradicional de los Recursos Naturales. SEDUE, México, D.F.

SECRETARIA DE DESARROLLO URBANO Y ECOLOGIA. 1984. Reunión Regional de Ecología. Costa del Pacífico. SEDUE, Morelia, Michoacán.

SECRETARIA DE FOMENTO RURAL Y DELEGACION FEDERAL DE PESCA. 1982. Memoria del Reconocimiento Batimétrico en el Lago de Pátzcuaro. Pátzcuaro, Michoacán.

SECRETARIA DE FOMENTO RURAL. 1984. Restauración Vegetal del Lago de Pátzcuaro. Proyecto REVELAPA. Morelia, Michoacán.

TOLEDO, Víctor M. y BARRERA, Narciso. 1983. Ecología y Desarrollo Rural en Pátzcuaro. Instituto de Biología. UNAM. México.

TOLEDO, Víctor M.; CARABIAS, Julia; TOLEDO, Carlos y GONZALEZ PACHECO, Cuauhtémoc. 1989. La Producción Rural en México: alternativas ecológicas. Fundación Universo Veintiuno, A.C. Colec. Medio Ambiente # 6. México. 402 p.

TOLEDO, Víctor M.; ALVAREZ Pedro y AVILA Patricia (editores). Plan Pátzcuaro 2000. Fundación Friedrich Ebert. México.

UNIDAD DE ADMINISTRACION FORESTAL No. 5 (UAF). 1991. Relación de industrias de transformación de productos forestales en los municipios de la cuenca de Patzcuaro. Patzcuaro, Mich., México.

WORLD RESOURCES INSTITUTE et al. 1988. World Resources 1988-89. An Assessment of Resources Base that Supports the Global Economy. A Report by The World Resources Institute and International Institute for Environment and Development. Basic Books, Inc., New York.