Journal of Sustainable Forestry
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/wjsf20

Joint Implementation in Costa Rica: A Case Study at the Community Level

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Published online: 13 May 2014.

To cite this article: Olman Segura & Klaus Lindegaard (2001) Joint Implementation in Costa Rica: A Case Study at the Community Level, Journal of Sustainable Forestry, 12:1-2, 61-78, DOI: 10.1300/J091v12n01_04

To link to this article: http://dx.doi.org/10.1300/J091v12n01_04

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SUMMARY. The policy of joint implementation is emerging as a new strategy for implementing global environmental aims, especially with regard to regulating the climate change process, where emission source and sink countries agree to develop a joint program upon a mixed argument of partnership and cost-effectiveness. Pros and cons have emerged during the development of this system.

Costa Rica is the first country, together with Norway, to launch such a program jointly, and Costa Rica is also the first country developing Carbon Tradable Offset bonds to be sold on the world market as a new commodity. It is hoped that this initiative will help the country and its inhabitants to create better living conditions and economic growth; however, this new institutional transformation and international acceptance of this new instrument are only just beginning to develop.

This, therefore, provides a very interesting field for research from a distinct perspective. We chose to start searching for positive or negative impacts at the community level. In this sense the paper deals with questions such as: What happens at the community level?; Is it possible

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Paper presented at the Seminar: The Human Dimensions of Global Climate Change and Sustainable Forest Management in the Americas. Brasilia, Brazil, December 1-3, 1997. The authors thank comments from Adam Drucker. The usual disclaimers apply.

[Haworth co-indexing entry note]: "Joint Implementation in Costa Rica: A Case Study at the Community Level." Segura, Olman, and Klaus Lindegaard. Co-published simultaneously in *Journal of Sustainable Forestry* (Food Products Press, an imprint of The Haworth Press, Inc.) Vol. 12, No. 1/2, 2001, pp. 61-78; and: *Climate Change and Forest Management in the Western Hemisphere* (ed: Mohammed H. I. Dore) Food Products Press, an imprint of The Haworth Press, Inc., 2001, pp. 61-78. Single or multiple copies of this article are available for a fee from The Haworth Document Delivery Service [1-800-342-9678, 9:00 a.m. - 5:00 p.m. (EST). E-mail address: getinfo@haworthpressinc.com].

to realize joint implementation with positive local, social and economic impacts?; and What are the necessary conditions for this to become successful? *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: <getinfo@haworthpressinc.com> Website: <http://www.haworthpressinc.com>]*

KEYWORDS. Joint implementation, carbon sequestration, community, secondary forest

JOINT IMPLEMENTATION

The policy of joint implementation is emerging as a new strategy for implementing global environmental aims, especially with regard to regulating the climate change process, where funds from rich emissions source countries are allocated directly to projects in other (poor) countries based upon a mixed argument of partnership and cost-effectiveness. There are in principle different types of projects. These include either allocating funds for the solution of environmental problems in poorer countries or allocating funds to poorer countries as a means of remedial or compensatory action against ones own problems.

The traditional strategy towards international environmental action is based mainly on two different programs. First, the special programs of the international organizations supporting projects in the poor countries with the financial means allocated from the richer countries, or second, on international agreements between emission source countries, which are implemented nationally sometimes with some special support schemes or arrangements for the poorer countries.

The absence of supranational authorities with the power to implement the polluter pays principle (PPP) through pollution taxes and marketable pollution permits together with the general lack of economic incentives in the international allocation of abatement effort, has spurred the development of bilateral bargaining solutions and market creation (Zylicz 1991). Standard economic analysis points here to the decisive role played by transaction and negotiation costs in explaining the patterns of bilateral bargaining solutions to joint and global environmental problems. This standard approach to dispute settlement between parties joining international environmental conventions underlines the role of the question of national sovereignty,

opportunism and power. Dispute settlement builds first of all on dispute avoidance via monitoring, reporting and inspection, then on well specified non-compliance procedures, followed by consultation and negotiation, mediation, conciliation, arbitration and, finally judicial settlement in the international Court of Justice with its special environmental branch. However, all these measures depend on the voluntary participation of the parties (nation states) involved (OECD, 1995). Hence, it is possible for nations not only to avoid binding international agreements but also to engage in prolonged disputes over the actual interpretation of international agreements, if they choose to do so.

On the other hand, we see a growing number of international agreements together with a growing understanding of the global and common nature of many of the environmental problems, that earlier were considered as purely local and exclusively national. In this way, we will regard in principle all kinds of cross-national bargaining solutions, whether multilateral or bilateral, as joint implementation.

Implementation of cross-national/global environmental goals have developed into the following two main categories and associated subcategories:

A. Different Types of International Joint Implementation Projects

1. International aid and support programs of funds for solution of environmental problems in poor countries (e.g., UN programs)
2. International agreements to solve common environmental problems (e.g., Vienna/Montreal CFC treaties)

B. Different Types of Bilateral Joint Implementation Projects

1. State funds for solution of environmental problems in other countries (e.g., Western European countries investing in Eastern European countries, Northern European countries investing in Southern European countries)
2. State funds for remedial or compensatory action of their own environmental problems in other countries (e.g., carbon sink projects)
3. State funds for a mix of 1 and 2 above (e.g., dept-for-nature swaps)

4. Private funds for solution of 1, 2 or 3 above (e.g., environmentalist group financed conservation projects)

In relation to the combating of global climate change impacts of human activities, it is useful to distinguish between different types of strategies and projects. Greenhouse gas emission mitigation can be approached by fossil fuel saving, by substitution of energy sources towards renewable energy, improvements of energy efficiency, changes in industrial technologies and substitution of CFCs, etc., as well as through changes in agricultural practices leading to reduced methane emissions. Furthermore, carbon sink enhancement by changes in land-use and reforestation or forest conservation also plays an important role.

Article 4.2 of the 1992 United Nations Framework Convention on Climate Change recognizes, in principle, joint implementation projects to combat climate change if they meet the prerequisites of actually contributing to the reduction of global greenhouse gas emissions, if this effect is controllable and verifiable, if the costs of achieving the emission targets are lower than purely national investments and if both the investing and the receiving countries are better off implementing the project than not, given the total costs and benefits of the project (Torvanger 1993).

The Kyoto Protocol of December 1997 has now acknowledged and institutionalized the joint implementation strategy towards global climate change. Here the protection and enhancement of greenhouse gas sinks and reservoirs is emphasized both by the promotion of sustainable forest management practices, afforestation and reforestation, and by promoting joint implementation projects and acknowledging emission trading. Emissions of 1990 are taken as the baseline regarding verifiable human-induced land-use change and forestry activities as well as greenhouse gas emissions. The parties to the protocol must include the removal of anthropogenic emissions by sinks in their annual inventory of emissions by sources, which is to be subject to international expert review (United Nations 1997).

POTENTIAL ADVANTAGES AND DISADVANTAGES OF JOINT IMPLEMENTATION

At a global level the projects present the potential advantage of increasing the incentives to reduce greenhouse gas emissions, devel-

oping new technologies, encouraging cross-country commitments and reducing the overall costs of implementation of international targets. Donor countries can benefit from cost savings, obtaining a national share of global climate benefits and new potential investment and export markets. For the receiving countries, the advantage should be in terms of access to additional financial resources, transfer of technologies and potential cost savings due to new technology, obtaining a national share of the global climate benefits, obtaining national and local environmental benefits, job creation and capacity building (Selrod et al. 1995).

Some possible disadvantages of joint implementation have also been recognized. The whole question of monitoring, control and verification of the investment projects is very complex, along with the uncertain effects on technological change and abatement efforts in the donor country, together with the possible distortion of development preferences and opportunities in the receiver country, the increased foreign influence over the management of natural resources and the overall global equity effects of the projects.

THE COSTA RICAN CARBON BONDS

The Costa Rican and Norwegian governments very recently achieved an agreement under the joint implementation initiative. Costa Rica issued carbon bonds (Greenhouse Gas Emissions Mitigation Certificates) for a value of 2 million dollars thereby permitting Norway to buy a sequestration service of 200,000 tons of carbon from Costa Rican forests. The sequestration service will be provided over a period of 25 years through reforestation and forest conservation projects in Costa Rica. The agreement between the Costa Rican and Norwegian governments is designated as a pilot project of the joint implementation program of the Climate Change Convention (CCC) and it is estimated that Costa Rica has approximately 400,000 hectares of degraded land, which could be reforested in a similar way (Tico Times, 1997).

The agreement has been accompanied by a new institutional set-up in Costa Rica. A special national office for joint implementation, called the Costa Rican Office on Joint Implementation (OCIC, Oficina Costarricense de Implementacion Conjunta) is in charge of the international negotiations and agreements. The carbon funds resulting from

the sales of carbon bonds are transferred to the national forest fund (FONAFIFO, Fondo Nacional de Financiamiento Forestal) which invest in national parks, forest conservation and reforestation projects. The monitoring and control of the projects are in the hands of the National System of Conservation Areas (SINAC) of the Ministry of Environment and Energy (MINAE), together with private sector auditors. Individual landowners can submit an application to the national forest fund for financial support for reforestation or forestry protection and FONAFIFO can, furthermore, make use of the funds to support existing national parks as well, and to compensate landowners who must meet regulations on the use of their properties. The Norwegian bonds are worth 10 dollars per ton of carbon. This carbon price has been calculated on the basis of an estimated average income loss per hectare of 50 dollars a year in agriculture and an estimated annual carbon fixation capacity of woodland of 5 tons per hectare, according to a senior Costarican official.

The Costa Rican carbon agreement is based on a mix of public and private Norwegian funds with US$300,000 coming from a private consortium engaged in hydroelectric projects in the area. The Norwegian government is also engaged in a wider joint implementation project between the two countries which includes direct investments by Norway in the modernization of an existing hydroelectric plant, which also has mitigating effects on greenhouse gas emissions in the region. The Costa Rican forestry project copes in this way with climate change both via carbon sequestration and via watershed maintenance for hydroelectric energy production. This can therefore be considered as a really mixed type of bilateral project, a new type B5 (c.f. the first section), addressing environmental problems in both the donor and the receiver country with both public and private funds.

Joint implementation programs, such as in the case of Costa Rica, also allows the generation of several other activities from the same forest without affecting carbon storage services. These examples include: ecotourism; extraction of minor forest products, such as latex, fruits, wildlife, nuts, etc.; and the use and research of biodiversity. Additionally, each one of these activities may generate multiple income streams, because in order to internationally sell the service of carbon sequestration, there is the need for the services of, for example, cartographers, Geographic Information Systems analysts, insurance companies, foresters, engineers, economists, financial system special-

ists, and others. An entirely new economic cluster of activities is therefore being created around the emerging new commodity of carbon services which is only just starting to be traded internationally.

In short, this activity of carbon sequestration seems to be an especially interesting alternative for less developed countries, though it is also attractive for developed ones, because it not only creates jobs and increases income but also stops deforestation and/or may increase reforestation.

THE STUDY CASE: JUNQUILLAL DE SANTA CRUZ

As stated above there are several arguments in favor and against the initiative of joint implementation with carbon sink projects. At the national level, the Costa Rican experience seems thus far to be a good opportunity for the country to show the project benefits, if developed properly and with a good verification component. However, even with such a positive example, several questions remain to be answered. For instance: What are the implications at the community level?; Is it possible to realize joint implementation with positive local, social and economic impacts?; and What are the conditions for this to become successful?

In order to address these questions we visited a project in Junquillal de Santa Cruz. This is a very small community located in the Province of Guanacaste in the Northern part of Costa Rica. Activities in this small town of a few hundred inhabitants have traditionally been related to agriculture and cattle ranching. Currently, unemployment exists due to the fact that agricultural activities have been decreasing. Some large landowners had to abandon their land due to the low international price of meat, the high costs of cattle production and the prolonged dry seasons in these areas. Such land has often been sold to the Institute of Agricultural Development (IDA, Instituto de Desarrollo Agrario), a land-tenure institute, since it was under threat of invasion.

A group of thirty landless families from different parts of the country were grouped together and IDA provided each of them with a small parcel (8-10 hectares) of land in Junquillal, approximately 4 years ago. Almost all the people from this town, as well as the newcomers are farmers. They produce rice, beans, maize and other basic crops, and

raise pigs, cattle and other animals for their landlords. In general they also realize these activities for subsistence purposes, as well as, for the newcomers, raising one cow per family, following their gaining title to the plot of land and receiving some help from some of the organizations described below. The community of Junquillal along with the newcomers have also often faced the threat of forest fires on the neighboring 200 hectares of secondary forest, which also threatens their poor wooden houses.

IDA along with a program from Food and Agriculture Organization (FAO) has been working with poor rural communities as part of a program called the ''Chorotega Forestry Project'' (Proyecto Forestal Chorotega). This project provides technical and logistic support to 15 small communities in the region. This community was identified as one of the four highest priority communities because of its poor conditions. In order to receive the IDA-FAO organizational support the community was obliged to form an organization, the La Guaria Association (Asociacion La Guaria), of which many community members are now a part of.

Change has come to Junquillal, for both members of their own organization (Asociacion de Desarrollo Comunal de Junquillal) and the Asociacion La Guaria. This began with support for the Junquillal community in order to help them organize themselves to stop and prevent forest fires. The community actually receives the same quantity and quality of support from the different governmental and private institutions involved as do other communities in Costa Rica. However, a two-fold multiplier effect around the new activities can be identified: firstly their participation in the joint implementation program of the country; and secondly the new institutional understanding which is starting to develop in this region. A more detail description of the process follows below.

THE FOREST AS THE NEW ENGINE OF DEVELOPMENT

The Junquillal inhabitants received a course in fire prevention in forested areas. They were initially interested in preventing or eliminating the threat to their community rather than caring very much about the forest itself. However, the training explained why the forest was important to them and how to take advantage of the different products from the forest. Initially they saw the forest only as an obstacle to

agricultural development activities. With this new approach the participants passed from an institutionalized perception of the forest as a source of wood and fire-wood, to one where many products and services were recognized (see Box 1), giving them a new rationale for forest conservation. A new vision of forest was thus introduced.

Several adaptations from traditional knowledge were incorporated into the new activities they began to develop. Some of these opportu-

BOX 1. FOREST PRODUCTS AND SERVICES

Timber: lodging and production of timber for housing.

Wood products: wood for pulp and paper, wood for energy, firewood, charcoal, posts for fences, wood for crafts and Christmas trees.

Non-wood products from forest: medicinal herbs, dyes, ornamental plants, resins, seeds, constructions materials, jeans, chemical substances, linens, fragrances, meat and animal skins.

Conservation: the retention, creation, maintenance, reproduction and survival of animal and vegetable species.

Education: the woodland environment, biodiversity and landscape in general may serve as living laboratories and outdoor classrooms. Or we may coin the term "bio-education" which covers educational activities from kindergarten to Ph.D. research.

Free Leisure: refers to the pleasant, tranquil, desired and needed rest, vacationing or sporting activities around the woods, especially for the local population.

Eco-tourism: refers to paid leisure services in National Parks, private or public reservation areas or vacation resorts.

Maintenance of the hydrologic cycle: refers to water recharge and the maintenance of rivers. Water for human, industrial and agricultural consumption, springs, and water for scenery are dependent on forests, as is flood prevention, water transportation, and hydroelectric plants.

Soil and water quality conservation: run-off and wind erosion as well as sedimentation–which are reduced by forests–may affect the quality of soil and water.

Microclimate regulation: local and horizontal precipitation and local humidity.

Wind and noise control: forests serves as windbreaks (agriculture activities) and noise barriers (housing and vacation homes).

Carbon sink: carbon sink and fixation, protecting the global environment from climate change.

Hunting: Forests are sources of wildlife which also serve as food for rural communities as well as sport for urban vacationers.

Maintenance of biological diversity in the forest ecosystems: ecosystem resilience, maintenance of the forestry capability for reducing impacts on protected areas (buffer zones), natural history, research bank (or library) for future development (of agriculture and pharmaceutical discoveries, for instance).

Cultural and religious services: Rural and indigenous communities also have beliefs, sacred places and cultural values which should be respected. Existence value.

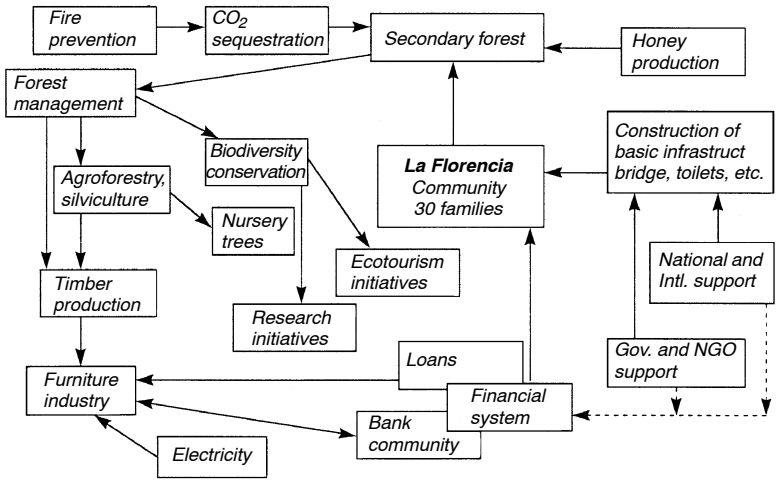
nities to use the forest arise as very ''new'' possibilities for them, and in some cases it was very difficult to change the institutional understanding and learning to this new rationale of considering the forest as a different multi-product source. Some activities started almost immediately, for instance it was considered possible to use a lot of partially burned wood for cooking, instead of looking for firewood every day, or to make use of this wood as timber. Other possibilities take more time, for instance the idea of using the forest as bank for carbon dioxide (CO_2) absorption and fixation of carbon and to sell this service internationally. But because this secondary forest was state owned (IDA property) it was necessary to obtain permission from them. After discussions about how to give such permission, some ideas developed along these lines and IDA agreed to rent the property with the 200 hectares of secondary forest to the Asociacion La Guaria, for 99 years in exchange for a nominal rent of a few hundred dollars, under the understanding that the community would protect and manage the whole forested area.

FOREST MANAGEMENT AND INCENTIVES

The community of Junquillal are changing their patterns of production. They began to change their ideas of deforesting these areas and start with the only activity they knew how to work in (pasture and agriculture), and switched to work with forest as much as possible without abandoning some agriculture activities for subsistence. Personnel from IDA itself helped people from La Florida (the old squatters) to receive some training with regard to how to manage their forest. Some technicians from the Ministry of Environment (MINAE) and IDA local offices trained them to extract wood from the forest without damaging the rest of the forest and how to move within the forest without getting lost. They also received training with regard to the construction of alleys and rampart works for the prevention of forest fires, so that if a given area of forest catches fire it would not spread so easily to other areas.

Forest engineers also gave them the idea to apply for the incentive called Forest Protection Certificates (CPB in Spanish). CPB are provided by the Government of Costa Rica to people who decide to manage their forest without harvesting timber. Instead they receive approximately 40 dollars per hectare per year for 5 consecutive years.

GRAPH 1. Cluster of Forest Junquillal de Santa Cruz, Guanacaste, Costa Rica.



This incentive is part of the ''forest services payment'' approved in Forestry Law #7575 of April 16, 1996, with funds coming from the first joint implementation transaction between Costa Rica and Norway. In future it is expected that it would be possible to collect resources from the selling of other services from forest. This is the rationale behind a law indicating ''forest services'' (for instance water cycle maintenance, biodiversity conservation, etc.) instead of a particular forest service (only one of the services). In other words, following approval of participation in this program, these people are receiving approximately 8 thousand dollars per year in order to provide forest services to humankind. This activity and the money it provides is creating a chain of production around the forest which did not exist before. This chain of production can perhaps best be illustrated by the cluster of activities in Junquillal illustrated in Graph 1. The payment from CPB is being used to buy building material for maintaining the fences around the forest and to pay salaries for fence maintenance and trench building against forest fires. But it also helps the community to pay a small amount as their contribution for the electrification of La Florida, Junquillal. The availability of electricity has presented the community with new opportunities as they are now able to have ma-

chinery for working with wood, pumping water and other development activities.

WOOD EXTRACTION, THE FURNITURE WORKSHOP AND OTHER ACTIVITIES

According to their own management plans only the extraction of partially burned wood from previous fires is permitted, since this forest has not been allowed to be harvested, nor has it caught fire during approximately the last three years. The extraction is done with oxen in order to reduce the impact to the rest of the forest to a minimum.

Because there is enough wood for several years, they decided to ask for assistance from the Institute of National Learning (INA, Instituto Nacional de Aprendizaje) in order to learn about furniture construction. INA trained all the inhabitants of Junquillal who wanted to participate (men and women) in handicraft production, wood carving, and the construction of windows and doors. As part of the training a small workshop was constructed. FAO provided a loan/donation for the necessary equipment for them to start their work and the money will be repaid to a revolving fund in their own bank–Bancomunal (described below).

FAO also gave a cow to each one of the new families in order to provide them with milk for their children, on the understanding that this would be repaid through small installments over several years to Bancomunal.

Additionally, as part of the forest management activities they also received training from INA with regard to apicultural activities. They received thirty beehives with which to initiate activities. The women have been trained in bottling the honey for menfolk to sell in grocery stores in the nearby town.

ELECTRICITY IN TOWN

In order to work with the machinery in the furniture workshop it was necessary to have electricity, therefore, the whole community decided to use part of the money from CPB to finance a down payment

of an electricity network. Installation and the electricity service was contracted to an electrification cooperative in Guanacaste, COOPEGUANACASTE (Cooperativa de electrificacion de Guanacaste). Additionally each family that participated contributed 15 thousand colones (approximately 60 dollars). Their residential connection and their own meter was also sold by COOPEGUANACASTE and is being repaid each month as part of the electricity bill. Unfortunately, some families are far away from the center of the town and from the electricity lines; these families still do not have electricity nor enough money to pay for the service connection.

RESEARCH AND REFORESTATION

Most of the people who received a plot of land from IDA are now dedicating some small areas to reforestation and tree nurseries. They decided that because they were not going to harvest the secondary forest, and that in the future they or future generations are going to need wood, this would be a good solution. They have four hectares of forest where they are learning silviculture techniques and are planting and testing the adaptability of some native trees from this zone, such as ron-ron (*Astronium graveolens*), pochote (*Pochota quinata*) y teca (*Tectona grandis*). They are also experimenting with some agroforestry techniques on their own properties and hope to develop more knowledge with regard to this.

Additionally some of the people from the Asociacion La Guaria are trying to enrich patches of the forest. They are planting neem trees, which contain an active ingredient that can be used as a pesticide.

BIODIVERSITY AND ECO-TOURISM

The reduction in deforestation and the adoption of fire prevention activities has allowed the secondary forest to grow more naturally with less disturbance. As a result, wildlife is also returning which includes squirrels, deer, iguanas and various species of birds.

Some people, students from universities and technical schools among others, are interested in visiting this area, while others want to know more about the social, ecological, and economic experience this

community is developing. The Association is considering the possibility to apply for permission to build a lodge for visitors. This permission must be obtained from the Tourism Institute and must comply with several conditions in order to receive a tourist and be approved as tourist place. The project is currently under consideration by the Association and if approved it will go to the National Institute for approval.

BANCOMUNAL

The Junquillal inhabitants are also creating a bank called Bancomunal. This is really an endowment fund which is managed by the members of the community who contribute deposits and participate in record keeping, administrative and accounting work. The group from La Florida have a kind of Bancomunal where they deposited the money from the CPB and they are also depositing the FAO loan/donations. A group of four community members and one from the bank administers the money, approves loans for the furniture workshop and to families, and keeps records of payments and non-payments. The deposits also earn interest which allows the capital value to grow.

OTHER ACTIVITIES

There are other organizations participating in several activities which are not directly related to the forest resources, but are indirectly related because Junquillal's new dynamism. For instance the non-governmental organization (NGO) called World Vision (Vision Mundial) give the community the necessary material for building a bridge over the nearby river. At present no bridge exists and this constituted a danger for people when crossing it, especially in the rainy season. The Ministry of Road Construction and Transport (Ministerio de Obras Publicas y Transportes) helped them with the design and inspection, and the Social Assistance Institute (IMAS, Instituto Mixto de Ayuda Social) is providing the necessary salaries (160 dollars approximately per month) to the workers from the community who are building the bridge. This NGO is also helping them to build a wheel for potable water and to buy a water pump and the necessary pipes to make connections and bring water to several houses in the community.

An NGO called America's Friends (Amigos de las Americas) in collaboration with the Ministry of Health and an organized group of twelve young boys and girls from the Junquillal community are building 60 toilets, 20 dry ones and 40 wet ones. The beneficiaries dig two meter holes where they are going to install the toilet. The Ministry of Health with some external donations provides the materials and one person to supervise and advise. This youth group together with Amigos de las Americas (a small group of youths participating in grassroots activities) carry out the rest of the work.

PROBLEMS AND LIMITATIONS

All these successful initiatives are also facing a large number of problems and limitations. One of the most important bottlenecks is the absence of the potential to commercialize the craft and furniture products. La Florencia, Junquillal is far from the nearest town and the road is very bad. Regular transport for merchandise does not exist and must be previously contracted, which is therefore very expensive. This barrier to the commercialization creates production disincentives as well as discouraging new activity in general. This also results in outward migration in search of better conditions in the Central Valley and Limon, especially by those who have recently acquired new skills. Of the twenty people who finished the furniture course only 2-3 continue producing windows and doors. Trained women abandoned these activities, in spite of the fact that they were producing the most interesting and beautiful carvings.

Members of the community complain because of deforestation in the nearby forest. Though the secondary forest they are protecting has been neither burnt nor deforested by them, there are other people legally and illegally cutting trees. They argue that while they are taking care of their forest, the Santa Cruz Municipality grants forest harvesting licenses with little consideration of forest management criteria and in some cases inspectors have been bribed. Additionally the Municipality and the MINAE do not have the enforcement capabilities to control deforestation. In this sense the community has sacrificed what they consider to be an option for survival–agricultural activities on forest land and the selling of timber–while others continue to deforest.

Other people who were supposed to repay the cow loan to Banco-

munal have not done so and in some cases they have sold the animal. Those who have already made the repayment complain and will not support any request for further loans to the former. Additionally, due to the lack of commercialization of their products and the loss of interest in production, only some people are using the equipment. Therefore, others consider that they are using tools and machinery which partially belongs to them. In this sense some conflicts are arising within the community and their Associations. However, many community members expect that most of these problems can eventually be resolved.

LESSONS LEARNED

Joint implementation projects should be viewed from many angles and considered with respect to the issues of cost-effectiveness, environmental effects, equity, linkage dynamics and the learning effects of the specific projects. The Junquillal community, as described above, is an especially interesting example for exploring such questions and effects. Forestry projects are in this regard an especially complicated issue, in that the forest provides a whole range of services and products and, accordingly involves a wide range of actors and stakeholders. A joint implementation program in itself is not going to solve the problems at the community level. However, if accompanied by public and private initiatives, it definitely generate an important change.

A systemic and dynamic understanding of the forest system is therefore necessary in order to avoid a strict conservationist bias to the carbon sequestration projects of joint implementation. In a certain sense, we are talking about a new rationale for the forest sector, which not only includes traditional wood products, but also many services. The production and commercialization of these services also needs to be set in the context of a whole set of inter-linkages and a cluster of activities, which if understood and encouraged correctly can become an engine of development for the community and the country. Thus, in spite of our example much more research needs to be done to clarify the necessary conditions for this kind of projects to become successful at the national and the community level.

Joint implementation programs, such as in the case of Costa Rica, also allow the generation of several other activities from the same forest without affecting carbon storage. Examples include: ecotour-

ism; the extraction of minor forest products, such as fruits, wildlife, nuts, etc.; and the use and research of biodiversity. Therefore, it seems it is possible to realize joint implementation with positive local, social and economic impacts. Additionally, each one of these activities may generate multiple income streams, because in order to sell internationally the service of carbon sequestration, there is the need for the services of, for example cartographers, Geographical Information Systems analysts, insurance companies, foresters, engineers, economists, financial system, and other specialists. An entirely new economic cluster of activities is therefore being created around the emerging new commodity of carbon services which is only just starting to be traded internationally.

In short, the activity of carbon sequestration seems to be an especially interesting alternative for less developed countries, though it is also attractive for developed ones, because it not only creates jobs and increases income but also helps to reduce deforestation and/or may increase reforestation activities.

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