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CASE STUDIES

THE ROLE AND CONTRIBUTION OF MAJOR GROUPS TO PROMOTING SUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS

Background Paper #14

Prepared by the Stockholm Environment Institute and Division for Sustainable Development

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FOREWORD

What approach should we take in addressing the problems of unsustainable consumption and production? I strongly believe that the solution should not be looked for in behavioral change alone, but rather in a combination of technology innovation and behavioral change, as these case studies do reflect. At any rate, technology innovation - notably more efficient and environmentally sound technologies - lie at the heart of sustainable consumption and production for both industrialized and developing countries. However, the real challenge in the years to come will be to ensure that developing countries do not replicate the same mistakes as OECD countries in the modernization of their own economies.

Still today, many dimensions of technology transfer and cooperation between OECD and developing countries take on forms that are not sustainable. Many new technologies are emerging, which will certainly make "leapfrogging" a viable possibility. However to leapfrog, you do need legs. And most developing countries lack the capacity in terms of institutions and expertise to analyze their country-specific situations, to define their needs and to develop the right kind of strategies to respond to these needs.

What is very much needed is something in the nature of a compact between the North and South to assist southern countries to build the necessary capacities and to assist them in the implementation of Agenda 21 and the promotion of sustainable consumption and production. Technology issues are crucial in such a compact and all efforts should be made to raise awareness among developing countries regarding the economic and ecological benefits of eco-efficiency approaches.

It is also important to remember that a large number of the world population live outside the formal economy, in what might be called the "survival economy". These people are deprived of most of the basic necessities of life and must survive on a multitude of survival strategies. For them, access to efficient technologies as well as the availability of credit, would certainly help to create new and important opportunities.

As these case studies demonstrate, there is considerable potential among the major groups to improve production and consumption patterns through a variety of new and innovative approaches. The case studies also show that the "good life does not have to equal wasteful lifestyles". But there are strong barriers to change. What is urgently required is new thinking and innovation within the public and private sectors to better support and promote the important work and initiatives that major groups have so effectively undertaken in their promotion of sustainable consumption and production.

Ambassador Anders Wijkman
Swedish Ministry for Foreign Affairs

26 March 1999

TABLE OF CONTENTS

WOMEN

SOLAR RURAL ELECTRIFICATION,
Vietnam Women's Union, Vietnam

Introduction

It is estimated that two billion people on the planet (70% of the developing world) do not have access to electricity. Kerosene is relied upon as an alternative fuel, but it is dangerous, unhealthy and polluting, especially since, as a fossil fuel, it contributes to global warming. Other alternatives, such as diesel generators and oil and coal burning utilities produce similar environmental consequences. Moreover, connection to national grid extensions can be an expensive option.

Solar photovoltaics (PV) convert sunlight directly into electricity. They are an affordable, economically feasible and readily available source of power. These features make photovoltaics a particularly suitable alternative energy source for rural areas. This is especially important in light of the fact that most household users of solar electricity in the world live in remote rural areas.

Vietnam is mainly a rural country. Most of the population is without access to the electrical grid. As the orientation of Vietnamese energy policy is primarily focused on serving industrial and urban needs, national power grids are therefore designed to service urban and industrial areas.

The Vietnam Women's Union is a large organization with over 11 million members. It has been in existence since 1936 and promotes the strong role that woman play in Vietnamese society. Women are responsible for the financial management of the home as well as many businesses. As a result, the VWU took a strong interest in the Rural Solar Electrification Project. The Solar Electric Light Fund. Inc. (SELF) is an American non-profit non-governmental organization founded in 1990 to promote, develop and facilitate solar rural electrification and energy self-sufficiency. In the course of the implementation of the project, SELCO (Solar Electric Light Company) was created for the purpose of attracting capital investment for the project.

Project Activities

The project was established to enable rural families to harness solar power by using photovoltaics. Initially, one hundred solar home systems were delivered under the first phase of the project. SELF delivered the units while the VWU sold them to the consumers. The price of the systems was equal to their costs. Different power systems (20, 40 and 60-watt systems) were made available to address the varying needs among households. Each family made a 20% down payment on the photovoltaic equipment and agreed to pay for the remaining costs of their solar home systems (SHS) in 4 years, thus replenishing a revolving credit fund operated by the VWU. This was particularly important due to the lack of rural credit available in the country. As part of the scheme, the VWU borrowed funds from local banks to be channeled into the Fund. VWU also served as the collection agency when loan

payments were due. This arrangement was designed to minimize defaults on loan payments. Monthly remittances for solar power were forwarded by the VWU to the district level and then to the provincial level and then finally to Hanoi, where the local currency is converted to dollars. This exchange process facilitated the future imports of photovoltaic hardware.

In addition to providing solar home systems, SELF provided some training on their use and operation. Although the systems required low maintenance, some training was still necessary to instruct local populations on the installation and use of the systems. The purchase of the systems guaranteed free maintenance for a 3-year period.

Since it was felt that public assistance would not be enough to sustain the project, the VWU and SELCO created a cooperative business venture. The plan is to develop a Solar Home Systems programme over the next 10 years that will bring household power and light to some of the 7 million families (about 50 million people) who have no other prospects of obtaining access to electricity in their lifetimes. This is an especially timely initiative, since Vietnam is in the process of designing a national rural electrification master plan with the World Bank in order to integrate renewable sources of energy, including solar PV, into the overall rural power delivery system.

Results

The VWU project has provided electricity for 240 households and to 5 community centers with solar photovoltaics since 1994. It has enabled energy self-sufficiency for rural families without access to the electrical grid. The lights provided by the system are brighter in comparison with the low voltage lighting available from the power grid or power generators. Consumers have demonstrated steady and reliable loan repayment with roughly 200 accounts having been paid in full. In one province, cost recovery had been 100%. These results have reflected the satisfaction with the units as well as the relatively low costs for them.

There is still some resistance to the purchasing of solar units. Power generators are available at low costs in the country despite the fact that the use of diesel fuel is expensive and that the generators potentially wear down. Moreover, some people in remote areas believe that they will be eventually connected to the power grid, thereby precluding the need to buy a solar home system.

Although the use of solar energy is not strongly promoted by the Vietnamese Government in comparison with other Asian countries, Government officials have nevertheless been impressed with the success of the project and the economic viability of the scheme. Growing awareness of the benefits of the project has generated some government interest in developing their own solar system initiatives. Opportunities to bring solar energy to remote areas, far removed from the national power grid, will clearly increase in the near future. It is expected that more companies will become interested in solar ventures in light of the clean development mechanism investments that can be made under the *Kyoto Protocol*. Shell is one such company who has already become involved in similar projects in other developing countries.

Lessons Learned

The project confirms the ability of poor farmers in remote areas to pay and use solar-generated electricity. The Project intentionally kept prices low in order to ensure the solar home system's affordability. However, the project is still relying on the importing of the systems, making prices dependent on fluctuations in the international markets. It is expected that these systems will be manufactured in Vietnam in order to further reduce prices, improve local economies, and promote a self-sufficient Vietnam-based solar energy industry.

Overall, the commercial orientation of the project has had considerable appeal to developing country governments. The venture guarantees a fairly good return on investment, while at the same time enabling rural communities to obtain access to much-needed electricity. SELF and SELCO projects have succeeded in other countries thereby demonstrating that renewable energy can be a more viable resource, from both and economic and environmental perspective, for populations living in remote communities.

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PITAL AGROFORESTRY PROJECT,
CARE-Denmark, Nicaragua

Introduction

The El-Pital region is an ecologically-sensitive and highly-populated area. There has been a high rate of deforestation in the region due to timber and firewood extraction. The soil quality was fragile, volcanic and erosive. The local population is highly dependent on agriculture which is mostly mono-cultural focusing on the cultivation of maize and beans. Lack of crop diversification threatens soil quality and increases health problems due to limited source and type of food. The local farmers have extremely low-income levels and lack affordable credit opportunities.

Government programs have traditionally subsidized collective farmers with agro-chemical seeds, price-fixing, technical assistance and low interest credit. However, this support did not extend to the small-scale private farmers. The change in the Nicaraguan government in the early 1990s resulted in a withdrawal or significant reduction of government support, which had profound impacts on farmers, as well as on the cooperative movement and on agricultural production. Cooperatives gradually disappeared thereby increasing the number of small agricultural producers.

CARE Denmark is an independent, private Danish organization engaged in projects focusing on agriculture, forestry and natural resource management. Its objectives are to support sustainable and long-term projects that improve the livelihoods and security of rural households in developing countries. All of the projects are "participant-driven" with the involvement of women in local development processes highly prioritized. The local population is primarily responsible for the implementation of CARE Denmark projects.

Project Activities

The project took place in the community of Masaya and was designed to assist 1,023 households (6,000 people) to increase agricultural production, while maintaining the natural resources of their farms. Guiding principles of the project were promotion of sustainable agricultural practices and community organization to enhance participation of rural women. The project also aimed at improving the living conditions of poor rural families, limiting environmental degradation such as soil erosion, ensuring the participation of women and the development of community cooperatives.

Prior to the commencement of the project, an environmental impact assessment was conducted that examined, among other things, the economic effects and quantification of the erosion potentially caused by the project. The first set of activities was directed towards soil conservation. Different methods of sustainable agricultural methods were employed including contour plowing, tree production, gully plugs, and alley cropping. Technology and machinery were distributed among the communities, along with specialists to instruct the local farmers about how to use them. In addition, attempts were made to diversify crop production by planting bio-intensive products. These activities were specifically guided by the need to enhance the participation of rural women.

The second phase of activities involved training farmers in integrated pest management (IPM). The training programme consisted of intensive sessions with field staff and the use of cooperatives and farmer's groups including workshops, field days and farm visits. Community groups were also given seeds and other vegetative materials on a rotational basis, supported by small credit funds.

Results

The project participants implemented the project with great enthusiasm. During the second phase of the project, 54 community groups were formed. Forty farming groups directed their focus towards their natural resources management problem with at least 80% of the groups conducting workshops on sustainable agriculture and conservation. In 1997, 30 of these groups formed nine cooperatives that made credit available, housed savings and provided services to the project participants. Women played a key role in the management of these institutions with one of the cooperatives being composed entirely of women. The total capital operated by the cooperatives by the end of the project was almost $ US 44,000. The cooperatives gained legal status which allowed them to apply for credit and loans with local banks and credit institutions. Although credit was equally available to men and women, certain projects such as poultry operations were entirely under the responsibility and control of women in the community. Thus, a "chicken credit" scheme was developed, allowing poultry to serve as 'credit in kind'. The highest loan recuperation rate was seen among women.

The techniques to promote water, soil and agroforestry conservation principles were readily accepted by the local communities and covered a total area of approximately 2,000 hectares.

The impact of the project in the family economy was also significant. The contribution of the agroforestry systems left firewood and wood to be used for consumption. Production of firewood and building poles increased by approximately 3,5000 m3 per year. The evidence of regeneration/reforestation was clearly visible.

The introduction of IPM techniques led to 80% of the project participants to actively use this techniques along with use of organic fertilizers. Some farmers reported up to an 80% reduction in the use of chemical fertilizers and pesticides. These efforts involved collaboration of project leaders, farmers and local research institutions. The experiences learned from the project have now been included in the university curriculum while IPM techniques are now applied by the government.

The emergence of crop diversity has created more produce for farmers to sell therefore generating more income. Approximately 100 vegetable gardens have been created, containing four new crops. Introduction of crop diversity has had lasting changes in local production. Instead of exclusively cultivating grains such as maize and beans, lands were tilled for growing vegetables, cucurbitaceas, pasifloras and others. Many farmers are no longer forced to engage in seasonal agricultural production while migrating to urban centres to work as casual laborers during the off season. Land value has increased by up to seven times the pre-project value, allowing some farmers to hire local day-laborers. Employment in the region has increased by 44 %.

Another benefit was the significant improvement in the population's diet. Diversification of crops

allowed for greater foods choice which in turn enhanced local nutrition. Overall health of the communities has drastically improved both because of crop diversification and due to more stable income patterns created by the project. Significant improvements in the health of children, has been evident.

Lessons Learned

The project provided numerous lessons for the community and for local government. It has contributed to capacity and knowledge building in both government and non-government institutions working in the area – particularly in relation to agroforestry and integrated pest management practices. The benefits of IPM have led to government adoption of these techniques while small farmers, with limited access to funds, have eagerly done so to avoid the high costs of chemical pesticides and fertilisers. Evidence of IPM is the strongest with traditional crops but more research and documented success is needed for non-traditional crops.

The success of the project can be attributed to its well-defined mandate and mission. An extension model was applied in accordance with the socio-cultural reality and conditions of the area. Project management was dedicated yet flexible, demonstrating an ability to experiment and adjust activities according to experiences gained during implementation and according to the changing political, institutional and climatic conditions. Excellent training was provided alongside transfer of the technology—a method, known as the "Demonstration of the Method" practice, that is an essential aspect of any technology transfer undertaking.

Community organisation and strengthening enhanced the sustainability of the project and its becoming a model for a large number of farmers in the neighboring areas. The cornerstone of these changes in Pital was access to small-scale credit. This was greatly facilitated by the increased capacity of the community institutions to administer the funds, develop appropriate rules and regulations regarding loan payback, keep books, and determine the interest rates. In order to ensure women's participation, a gender-balanced access to benefits in primarily technical and production-oriented project was applied. This had been extremely gratifying given the social factors constraining women's access to credit and to joining cooperatives.

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CHILDREN AND YOUTH

EDUCATIONAL GARDENS AND RECYCLING PROGRAMME
Laytonville Unified School, USA

Introduction

The Laytonville Unified School has for many years promoted project-based learning, which emphasizes self-directed learning for the students. The objective is to engage students in complex, real-life projects in order to develop and apply skills and knowledge. The significance of this learning process is that it catalyzes students' inherent drive to learn their capability to do important work and affirms their need to be taken seriously.

Schools, restaurants, hotels, businesses, and other institutions generate a large amount of food waste that require collection and disposal. In response to the large volume of food waste that had been generated from the Laytonville School cafeteria, the school's students decided to develop a recycling, composting, and gardening program.

Project Activities

The student council voted to use their student funds to pilot a large-scale vermicomposting project. The students used redworms to recycle food wastes. They built four large compost bins that were constructed in a way that enabled the children to turn the compost themselves. In addition, bedding such as bulking agents, carbon sources and other material were needed to enable the worms to process the waste. The Laytonville students used discarded newsprint paper, book orders, and colored construction paper for this purpose, which they partly obtained from school district offices, medical clinics and local businesses. Milk cartons were recycled and paper bags were shredded for mulch or worm food for the garden's worm culture beds. Classroom paper was sorted and then later shredded for use in the worm's bins.

The recycling process first originated in the cafeteria, where the students and staff separated vegetable waste from meat waste and other recyclable material. The food waste was weighed and then placed into the worm bins. On average, between 20-35lbs of waste per day have been collected. The students then recorded information pertaining to the health maintenance of each bin, such as the location of buried food, worm populations, pH levels and moisture content.

The primary goal of the project was to return food wastes, and the nutrients they contain, to the garden to provide valuable nutrition for the growing plants. The school's gardens were fertilized by worm compost from cafeteria wastes including vegetables, fruits and bread. As a precautionary measure, the vermicompost was tested and found to have insignificant levels of toxic substances. Protein waste went into a "pig bucket" for a local farmer's hogs. Food grown in the garden was sold to the school lunch program, donated to the community and sold at the Middle School Market.
Results

All cafeteria food and waste, with the exception of meat, milk and cheese from the school, are composted. In the program's first school year: 1636 kg of cafeteria food waste was vermicomposted; 4255 kg of protein food waste was provided to chicken and pig farms; 258 kg of milk cartons as well as 297 kg of tin cans were recycled. Cumulatively, seven tons of sold waste was effectively diverted from the landfill. As a result, waste disposal fees were drastically reduced. The composting of lunchroom waste has provided enormous savings for the school, in the amount of $6,000 during the first year of operation that would have been expended on collection and disposal costs. School garbage has been reduced by at least 60%. There is no further need to purchase fertilizer since the vermicomposted soil is readily available. The practice of washing food waste down the kitchen sink garbage disposal systems was curtailed so that an estimated 103,000 fewer gallons of water were used per year.

Students, teachers and other school staff have all learned of the benefits of reducing, reusing and recycling beyond those benefits that are directly related to cost savings. The experience overall has proven to be a valuable component in the school's project-based curriculum. Decision-making has rested mainly with the students since they are the ones to decide which vegetables to grow in the garden, how to build the raised beds and how to harvest the vegetables. The students have taken over the production of the cafeteria's salad bar and are now planting, processing and preparing all of the vegetables. Student jobs rotate through the collection, weighing, processing and charting of food waste daily as well as marketing, business management and bookkeeping tasks.

The experience of the school's composting and gardening programme has been described in a book entitled "The Worm Café – Mid-Scale Vermicomposting of Lunchroom Waste," which has been used widely as a guide to composting and gardening programs for schools and other institutions.

Lessons Learned

The project has proven to be a considerable success, especially in terms of the project-based learning benefits associated with the programme. Students have taken responsibility for the maintenance of the garden, the composting activities and the financial aspects of running a business. The school gardens were integrated into the existing science curriculum, providing a valuable laboratory for learning. Students had assisted in many aspects of the cafeteria. For example, the math class prepared bread for the cafeteria on a daily basis, while the Applied Science Class prepared the salad bar. Information about nutrition, portion control and marketing has all become integral parts of the learning process. Most importantly, students have learned that they can indeed make changes in their environment and take control over the issues that directly affect their lives.

Contacts

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RETEZAT NATIONAL PARK ENVIRONMENTAL PROTECTION AND EDUCATION PROJECT
Pro Natura, Romania

Introduction

Pro Natura was formed in 1991 with objectives of protecting and preserving different natural habitats, as well as educating the Romanian public regarding the principles of nature conservation. The Retezat National Park is the only national park in Romania and has also been established as a Biosphere Reserve under the UNESCO-MAB (Man and Biosphere) programme. The park consists of deep narrow valleys, glacial plateaus and more than 80 glacier lakes. The park is rich in vegetation, consisting of 5.2 per cent of the world's endemic plant species. The high number of visitors to the park each year has resulted in a number of environmental problems, which were exacerbated by the minimal level of maintenance by park and government officials. For example, visitors left behind considerable amounts of waste, and indiscriminately cut down trees, especially dwarf pines. For their part, government officials not only allowed grazing and related livestock activities in the park, but also allowed unsustainable deforestation activities. The cumulative impacts proved devastating on the delicate alpine ecosystems.

Project Activities

Pro Natura developed an environmental protection and education programme to address these environmental problems in Retezat National Park. The overall programme addressed problems such as overgrazing and impact of tourism . Activities included supervising the park through custodians, patrols and human resource development; creating a system for waste removal; posting of educational notices; engaging the local community to combat the overgrazing problem; widening the partnership for national park management; promoting ecological education and raising public awareness; political lobbying; and developing the Romanian Protected Areas Data Base.

After 1992 marking the first year of the programme, almost 27 tons of waste had been collected and deposited in specially designated sites. Within three years, all of the waste had been removed. By the following year, the Bucura glacier site was totally free of waste. The Romanian National Defense Department assisted Pro Natura's waste collection efforts by using helicopters to transport the waste to a nearby city.

Pro Natura and other NGOs set up the Romanian Rangers Association, which is now affiliated with the International Ranger Association. This Association represents the park's only permanent staff and has undertaken numerous activities to manage the forest in and surrounding the park. Pro Natura has also organized sustained patrols together with the army and foresters. Students who are based at voluntary camps have carried out Park management.

New park rules were established regarding camping, disposal of wastes, fire production and the cutting of dwarf alpine trees. Seminars and conferences, in addition to the distribution of educational materials were used to generate public awareness regarding sustainable practices in the park. Information was also communicated through television, the press and a weekly Pro Natura radio

broadcast. An Internet site was set up at the Student Cultural House and there is now an Internet Navigation Center for students and environmental NGOs, where information about the Romanian nature and related activities can be accessed. Email addresses and website pages of Romanian environmental NGOs, Romanian environmental information, on-line publications, virtual libraries and other useful environmental links have also been featured. Further development of the center is being planned.

In light of their extensive activities, Pro Natura was granted authorization, from the Nature Monuments Commission of the Romanian Academy, to serve as custodians of the park. As a result of Pro Natura's advocacy initiatives, in conjunction with the Deva Forestry Branch, the Governmental Authority of Hunedoara County agreed to establish the Retezat Commission. The Commission is composed of all of the project stakeholders, including Pro Natura, and has as its primary goal nature conservation and sustainable development within the park. Particular attention is dedicated to overgrazing, tourism and legislative reform. In addition, a Guard Control and Education Center was opened with the support of the Deva Forestry Department.

Results

One of the main project results was the establishment of a comprehensive waste management system for the park, marking the first waste evacuation system to be established in a Romanian mountainous area. Most park visitors and campers appear to be disposing of their waste properly and as a result of the educational programs, fewer tourists are camping in unauthorized areas. Polls have shown an improvement of peoples' attitudes toward the environment and a stronger concern about the importance of nature protection

Another important result of the programme was the creation of partnerships with other organizations, businesses and the government. The Regional Environmental Center for Central and Eastern Europe, the Soros Foundation, AIDRom, the Romanian Youth Ministry and private companies have all provided support. Pro Natura and the IUCN-Focal Point Romania have since joined forces to preserve the park. Two IUCN experts visited the park and presented their findings in a book "Best Practice for Conservation Planning in Rural Areas" at the Ministerial Conference in Sofia in 1995 and in 1997, Pro Natura was accepted as a member of the IUCN.

The World Bank is now considering the Retezat Park as a possible model site to be funded by the Global Environment Facility (GEF). In addition, the Romanian Ministry of Water, Forest and Environmental Protection had been stimulated as a result of the project, to develop the "National Strategy for Biodiversity Conservation and Sustainable Use of Natural Resources." Retezat was also one of the natural sites selected as a model for the implementation of a decentralized management system. The management structure will include administration, a park director, park rangers and other staff. The park is also now included in the Federation of Nature and National Parks of Europe. In 1998, Pro Natura won the Henry Ford European Conservation Award.

Lessons Learned

One central lesson that was learned from Pro Natura's endeavors was that the combination of a clear focus and persistent action, dedicated project participants and good partnerships, are all essential to ensuring long-term success. The aggregation of these factors enhanced the perception of Pro Natura as a legitimate and credible organization. This greatly facilitated the achievement of Pro Natura's project goals and objectives. This positive reputation provided Pro Natura with greater legitimacy in its government-focused advocacy efforts. Pro Natura has filled the gaps in the management of the project, but it has also actively recruited the state in resolving many of the problems. Pro Natura started as a small NGO with limited resources but it is now a central partner in the management of a national park.

The program's success has a special significance in the Romanian context. Firstly, the army had become a partner and engaged in a conservation activity with an NGO. This marked a unique partnership where a common purpose underscored their efforts. There was also a strong reliance on public outreach, including radio, television and newspapers, which drew a great deal of attention to environmental issues and the potentially important role that NGOs can play. Moreover, the enthusiasm and commitment of youth led to the mobilization of public support as well as influencing government in their decisions.

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INDIGENOUS PEOPLES

INDIGENOUS SEED VARIETIES PRESERVATION SCHEME,
Zuni Indigenous Peoples and Center
For People, Food and Environment, USA

Introduction

The Zuni Native American homeland is in western New Mexico. Many members of this community farm, garden, ranch as well as pursue other professions. Zuni farmers have developed their own varieties of crops originally from present-day Central America and southern Mexico. Examples include yellow, blue, red, white, speckled and black corn and bean varieties, and varieties of squash. They have also adapted crops imported from Europe, Asia and Africa such as peaches, wheat and watermelons. The resulting local repertoire of farmer developed folk varieties (FVS) forms a unique part of Zuni heritage.

The Center for People, Food and Environment (CPFE) is based in Tucson, Arizona, US. It is a non-profit organization devoted to research, education and action for sustainable farming and food systems. CPFE works with Native American farmers in southwest North America, working on issues that are faced by local communities who are working to recover and strengthen indigenous agricultural systems through the promotion of their seed production. Zuni communities decided to develop a project that addressed the problems of natural resource depletion on their reservation. Money received from a legal action against the United States Government was used to finance the project. A central part of the project included the development of ways to involve Zuni people in decision-making regarding natural resource activity on their lands. The CPFE served as consultants on the project.

Over the last 50 years, Native American farming has declined considerably. Moreover, a dwindling number of farmers and gardeners have started planting more commercial varieties bought from mail order suppliers, stores, and nurseries. Many Native American farmers have experienced difficulties in maintaining their competitiveness even with their own seed crop varieties. Indigenous ceremonies, agricultural practices, and ultimately culture are increasingly threatened by commercial pressure such that indigenous farming may well die out within this generation.

The Zuni peoples regard their folk crop varieties as sacred gifts from their Creator. However, the folk crop varieties are threatened by the rapidly changing markets, laws and biotechnologies, which are largely controlled by corporations and industrial nations, which have sought to use the folk crop varieties for their own commercial purposes. In addition to the effects of the large number of multinational seed companies, the growing extent of genetic engineering in plant breeding, and the number of patents on plants and crop varieties, are all further compounded by a global marketplace that is rapidly expanding into the exotic food market.

Zuni farmers have successfully maintained their indigenous seed varieties by keeping household seed stocks, obtaining seed through traditional family and community networks and through exchanges

with nearby communities. However fewer seeds are now available through local networks because fewer Zuni farmers have been able to pursue their traditional farming livelihoods. In addition, there are now increasing sources of non-Native seeds as well, such as Zuni blue maize, which, if they cross with local folk crop varieties, could result in less well-adapted varieties.

The Zuni project has developed specific ways in which communities can safeguard their folk crop varieties for sustainable agriculture. The overall goal of the project was to better understand the role of folk varieties, to increase their use, and to ensure that the Zunis would be able to control their folk varieties in the long-term future.

Project Activities

Under the educational component of the project, folk crop varieties and the indigenous knowledge of their development and maintenance have been integrated into educational programs, which concentrate on the role of farmer-developed varieties in sustainable agriculture. The educational materials cover a wide range of issues including indigenous planting and cultivation techniques and the maintenance of distinct varieties; seed selection; seed storage and conservation; and seed sharing within the community. Other issues that have been addressed in the project include: the contribution of folk crop varieties to health and nutrition; the value of folk crop varieties for sustainable agriculture; and the potential for improving ongoing folk crop varieties maintenance and development through cooperation with formal plant breeders. Another major concern that is addressed by the project is the need to develop options for ensuring and managing community control of folk crop varieties.

The project examined ways to increase the availability of Zuni seeds. The goal has been to make all local FVs available to anyone in the community who is willing to plant them. This has involved putting FVs in inventory and working with interested farmers to create a community seed exchange network and community seed-bank, including a record keeping system, a management plan, and policies for distribution. The seed exchange network has aimed to create a self-sustaining source of small amounts of seeds of FVs for community farmers to maintain their own seed stock. The exchange network was also designed as a system of *in situ* grow-out for the community seed-bank, minimizing the amount of grow-out required to maintain seed-bank accessions, and therefore avoiding the biological problems as well as the financial and managerial burdens of *ex situ* grow-outs.

Finally, the project initiators intended to increase the planting, diversity, and performance of Zuni folk varieties. It was hoped that more farmers would be encouraged to plant more local folk varieties in order to ensure the genetic health of those varieties.

The project has aimed to help Zuni farmers establish control over their folk varieties. The objective was to create policy options to safeguard the intellectual property rights (IPRs) of the community to their folk crop varieties. Local leaders have been working with agricultural and legal consultants to develop options for safeguarding cultural and legal rights in folk crop varieties, which are based on the communities' needs and desires as well as their capacity for control. As the project develops further, it may focus on policies for the collection of seeds by outsiders, the distribution of seeds from

the community seed-bank, and the use of FV seeds already recovered from the community. It is hoped that the exercise of these rights will assist in monitoring genetic manipulation, private commercial uses and public uses. Moreover, the use of FV names and other cultural symbols in connection with the marketing of seeds or food products will be explored.

Results

The project has been regarded as a success from the perspective of the Zuni participants. The community seed bank is now in full operation. However, many of the seeds that were collected have not shown much of a return. This is attributable primarily to adverse weather conditions rather than a lack of interest or participation. The important groundwork has been done to organize Zuni agricultural activities and to stimulate much-needed appreciation of Zuni sustainable agricultural methods.

Future activities will include: distributing educational material on seed saving and seeds from the seed-bank to farmers and working with individuals engaged in other projects in the areas of nutrition; natural resource management; agronomic education; and pest control. These activities will be integrated so as to benefit and further safeguard FVs. Another aspect of future work will involve working with farmers to explore the opportunities for commercial production of FVs and the sale of food products made from them at the individual, cooperative, and group levels. Farmers and formal plant breeders will cooperate in maintaining the genetic health of FV populations and to develop improved selection methods.

Lessons Learned

One of the greatest strengths of the project was the broad scope of community involvement. This has been the greatest sustaining force throughout many Zuni generations. It has allowed the Zuni peoples to integrate modern techniques with old traditions. Nevertheless it is inherently difficult for a small community to change patterns of consumption and production when they live in a society dominated by other consumption-intensive cultures.

Contacts

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RIO BLANCO SUSTAINABLE TOURISM PROJECT,
Quichua Community, Ecuador

Introduction

Some proponents of eco-tourism argue that eco-tourism diverts economic activity towards tourism that benefits the local population and the environment while minimizing negative impacts of economic development. Alternative views express a concern for the lack of sustainability or proven benefits of eco-tourism, as well as the attraction of tourists to fragile ecological areas. Both sides agree that local control is essential to avoiding problems associated with economic development by: scaling down production processes; returning power to local units of governance; and concentrating the benefits locally.

The Quichua Peoples live in lowland rainforest areas of approximately 400 km2. The community of Rio Blanco consists of 125 inhabitants and is located in the Ecuadorian Amazon (Napo Province). In 1971, there was an influx of Quichua migrants from the Andean foothills, who moved as a result of population growth and immigration of mestizo (European) agricultural colonists who restricted land supply. Although the area is sparsely populated in comparison to other provinces in Ecuador, Napo and specifically Rio Blanco have experienced high population growth over the last 20 years, one of the highest rates in Ecuador. This, in combination with a rising cost of living, has driven the local population to increase the amount of land that they use for cultivation. The rapid expansion of Napo agriculture has intensified the rate of deforestation above levels observed in neighboring Peru and Colombia. The amount of primary tropical forest has decreased to a level below half of the community's main area of land. Since 1971, the economy of Rio Blanco has shifted from one based almost entirely on subsistence agriculture and hunting, to one dependent on cash crops such as coffee, cacao, rice and maize, as well as cattle ranching. The Quichua typically engage in more traditional forms of agricultural practice such as subsistence farming or a mixed system of subsistence and cash crops farming. However, accessibility to mestizo markets has improved, thereby altering the nature of agricultural production towards satisfying consumer demand outside the community.

Current deforestation rates and a rapidly growing population impose a serious threat to the remaining primary forests in Rio Blanco. A step to control proliferation of lots distributed to Quichua children, when they come of age, was to limit this practice to the eldest son only. However, the success of this scheme may be jeopardized in light of the intentions of the younger children to remain on their parents' lots as adults. This, in turn, potentially adds pressures on the land when they raise families of their own.

Several years ago, the community decided to establish a reserve that demarcated 117 hectares of undisturbed primary forest as communal land, which prohibited hunting and logging. As a result, there is only one lot that is unclaimed in Rio Blanco, forcing some future members to encroach onto the reserve on the nearby Rio Bueno in their quest for more cultivatable land. The reserve is rich in bird and animal life and all but a few hectares contain primary growth forest.
Project Activities

In response to the continuous population growth, the community developed an eco-tourism project to provide an alternative economic activity that protects rather than exploits the forest. Tourism is a major industry in Ecuador, representing the fifth largest source of foreign earnings. Throughout the 1980s, many Quichua expressed reservations towards tourism development, especially when such activities had begun to encroach into their indigenous communities. However, by the 1990s, some of the Quichua recognized the inevitability of tourism and worked to ensure that they would benefit from its further development. Dropping agricultural prices and impending oil development in the area were two other factors, which catalyzed community interest in tourism activities.

In the neighboring community of Capriona, several tourist cabins were built in the traditional bamboo and thatch style. Outreach activities were developed that included intercultural education and exchange, including guided walks through the forest, traditional meals and presentations about the blowgun and trap-making, as well as participation in Quichua cultural programs.

Income is generated directly from the tourists themselves as opposed to being channeled through an intermediary. The community decided to invest the money in a community fund, which is collectively managed. The savings were redirected towards health emergencies, no-interest loans to members, agricultural and transportation improvements such as motors for canoes, and education and artisanal instruction.

Once the decision was made in Rio Blanco to engage in ecotourism, a committee was formed to coordinate the project. The Capriona project would serve as the basis, although attempts were made to learn from that community's experience. For example, tourism income was distributed equally to all members instead of being channeled into a fund for community projects. Work was assigned equitably so that all member-families of Rio Blanco would contribute to and benefit from ecotourism. Cooking, cleaning and cultural demonstrations were assigned according to a rotation schedule.

Results

In the project's first year, the area attracted 158 tourists. Over sixty percent of the earnings, amounting to US $6,000, were reinvested in the project itself. The remaining amount was divided equally among all of the households, with each family earning about $ US 100 representing about one fifth of their normal income for the year. Any loans that were required for tourism infrastructure, such as cabins, trails and bridges, were paid off within the first year of the project.

A survey of the Quichua residents reflected overall satisfaction with the project. All respondents to the survey agreed that life in Rio Blanco had markedly improved after the first year of the project as compared to the quality of life in previous years. The availability of disposable income has greatly improved the lives in each household, which has in turn contributed to the improvement in money management skills have developed as a result. Moreover, the capital generated from ecotourism can be used to develop other businesses. Access to health care and education has also improved.

Some members of the Quichua community have indicated that they did not at first understand the

connection between tourism development and forest preservation. However, there is a growing sustainability ethic in the region, which will no doubt contribute to a better understanding of this linkage. Local residents have clearly expressed their preference for tourism rather than intensified agricultural production, especially since the latter had proven to be more labor intensive and impeded inter-generational transfer of the forests to the residents' children. However, some individuals who had expressed this preference, still indicated their intention to clear more forest for cultivation.

Lessons Learned

Ecotourism development differs from other development projects in that, aside from start-up loans, continuing financial support comes from tourists rather than from governments or donors. This places a smaller burden on governments and allows local peoples to control the extent of the tourism development.

Although enthusiasm for ecotourism may be motivated primarily by financial reasons, environmental conservation has increasingly become an objective of eco-tourism initiatives. Most appreciated the minimal impact that ecotourism projects had presented to their environment. The availability of an alternative source of income that did not deplete natural resources meant that the eco-tourism option could be seen as a win-win situation. The arguably innocuous effect on the cultural integrity of the Quichua peoples has further affirmed the minimal adverse consequences that resulted from ecotourism projects. The project has assisted rural Quichua in acquiring business skills, which will be needed in dealing with mestizo residents as well as with other Ecuadorian and foreign entities. Twenty communities are now part of an ecotourism network that controls a total of 15,000 hectares of primary forest.

Ecotourism is still perceived by some community members as merely providing a way to supplement income as opposed to serving as a viable economic alternative to agriculture. Agricultural livelihoods are unevenly distributed among the population thereby creating a disincentive for larger farmers to subject their income potential to the equitable distribution of benefits under the project. The next goal of the project is to convince community members that the tourism industry provides a livelihood that is economically secure, while at the same time, being environmentally more sustainable.

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NON-GOVERNMENTAL ORGANIZATIONS

SOLOMON WESTERN ISLANDS FAIR TRADE INITIATIVE
IIED, Solomon Islands

Introduction

The export of timber is key to the economy of the Solomon Islands. It accounts for 42 per cent of the total exports and 16 per cent of GDP. Given current harvesting rates, this resource could easily be depleted within 15 years. Until the early 1980s, logging took place on government land or on customary land belonging to indigenous peoples, which was leased by the government. Once these forests had become depleted, logging practices were moved to other customary land, which represented 87% of the total land area. Logging in these areas expanded at a pace that rapidly exceeded the administrative capacity of the government to monitor and enforce license conditions. Corruptive practices and political manipulation were direct results of the overall lack of monitoring. The consequences were most acutely experienced at the local level, where logging operators exploited existing conflicts between landowners, manipulated local leaders or imposed unfair or fraudulent agreements on the local communities. In many cases, forestry companies offered communities employment opportunities and services in exchange for the right to exploit the forest resources on their land. Moreover, royalty payments to forest-owning communities were often paid over a short period of time, in direct contravention of the initial agreements.

By 1994, the annual volume of timber harvesting allocated to foreign companies was more than twice the amount needed to ensure continued sustainable forest harvests. Southeast Asian companies have been increasingly seeking new sources of timber to meet high demand while decreasing supply in domestic markets, creating additional new threats.

Project Activities

Since 1993, a number of organizations had been working with communities to develop alternative long-term livelihoods to lessen the pressure on forest resources. This was in response to the environmental degradation and social injustice that resulted from the logging operations of the 1980s.

SWIFT (Solomon Western Islands Fair Trade) was an initiative started by the United Church to mitigate the environmentally disastrous effects of the logging activities. SWIFT is actually a distinct economic programme of the United Church (the local Methodist church of the western Solomon Islands). However, SWIFT has increasingly taken on business initiatives to support the viability of the local communities.

A number of small-scale timber processing programs have since been developed by SWIFT and other organizations to provide landowners in the Solomon Islands with an economic alternative to intensive logging operations. SWIFT, as well as other timber processing groups like the ETT (Solomon Islands Ecotimber Trust) assists producer groups to:

- develop management plans;
- train personnel in aspects of sustainable forest management;
- facilitate the certification process;
- purchase timber; and
- sell timber to eco-markets in Europe.

Both SWIFT and ETT are members of the Social Chamber to the Forest Stewardship Council (FSC), which is a body consisting of indigenous organizations and social movements that maintain an active interest in sustainable forest management. The FSC has established principles and criteria for sustainable forest management, which are used to assess and certify the forest production process.

ETT sells its timber through a Dutch commercial organization that was specifically set up to trade in timber from sustainably managed sources. Timber is sold at market rates in order to develop the market for certified wood. Producers are required to provide a management plan and to sign a policy statement. FSC certification is only issued when the forest manager guarantees social safeguards such as the workers' right to negotiate and the rights of indigenous peoples.

The area that was covered by the SWIFT project includes the two western provinces that border Papua New Guinea. This area of over 500 islands with a population of approximately 95,000 has been significantly impacted by large-scale unsustainable logging practices.

The initial phase of SWIFT's programme consisted of training courses in forest management and timber grading for landowner groups who were attempting to manage their own forest resources. SWIFT established a loan scheme to enable producers to purchase chainsaw and guide-frame milling equipment. Participants in the loan scheme sold their timber to SWIFT and were allowed to retain half of the proceeds themselves and use the remainder to repay their loans. As a result of the availability of inexpensive capital, numerous groups were established in the regional marketplace. By the beginning of 1995, SWIFT was supporting approximately 240 groups, well above the initial number estimated between 50 to 60.

Initially, SWIFT purchased timber in the absence of strict guidelines for forest management or production. However, local foresters were trained to carry out environmental impact assessments. Once the harvest was completed, producers processed and graded their timber, and stored it for collection by SWIFT. The price paid by SWIFT for the timber was calculated as the margin between the market price and the costs of transportation and handling. First grade timber was to be exported while the second grade timber was to be used for construction activities under the Integrated Human Development Programme, a rural development initiative that was developed and supported by the United Church.

After March 1995, SWIFT became more concerned about the long-term sustainability of forest management, choosing to buy only timber from groups, who had prepared management plans for their forests. SWIFT had provided technical assistance to prepare forest inventories and management plans. In addition, SWIFT developed a series of legal instruments for ensuring producers'

commitment to sustainable forest management. The "Mutual Trust Agreement", the "Environmental Pledge" and the "Organization Management Plan" are examples of such instruments, which must be signed by the traditional leaders of the clan or village wishing to participate in the project. By signing, the community commits to specific sustainable management responsibilities over a 25-year period. In exchange, SWIFT agrees to provide the necessary services to support the implementation of these responsibilities.

A silvicultural system was also developed by SWIFT to address the unique ecological and social conditions of the landowner groups. Under this system, each group's productive forest is divided into one-hectare blocks. Within each block, the number of exploitable trees over 60 cm in dbh (diameter at breast height) are inventoried as well as the young trees in the range of 30-59 cm dbh. Each block is then placed into nine Forest Classes, based on the maximum number of trees greater than 60-cm dbh that may be cut in any five-year period. As trees are cut, a block may descend the class hierarchy, requiring a lower allowable cut over the ensuing five-year period. Ultimately, a block will reach a Class 9 designation, under which logging activities will be prohibited.

SWIFT's certification process was initiated at the end of 1995. At that time, the SGS Qualifor programme certified nine individual producer groups, representing a total forest area of 1,303 hectares of lowland rain forest. SWIFT has since established its own timber trading company in the Netherlands. The weakness of domestic markets has forced SWIFT to concentrate on export markets, primarily in Western Europe. However, the only way for SWIFT to distinguish itself in a highly competitive market has been through FSC labeling. Their policy is to forego an order if they cannot obtain the premium price for the sustainable wood product especially since it is in SWIFT's interest to stimulate a premium market price for sustainable timber. SWIFT relies on the premium it commands through FSC labeling for financing its transport and marketing operations. Unlike other aspects of SWIFT (which are heavily donor-subsidized), SWIFT expects to operate on a competitive, although non-profit, basis. In either case, the smaller number of players involved in the supply chain ensures that a higher proportion of the final price can benefit the producers directly.

Results

The ETT and SWIFT programs have generated enormous interest from forest producers in the Solomon Islands. SWIFT has worked with 300 producer groups, covering 50,000 hectares of forest and has purchased 2,500m3 of timber equivalent to 1400 trees. This has generated approximately US$750,000 in profits thus far for local producers. The price for each tree is about 40 times higher than the price that is offered by logging companies. The high premium price for SWIFT timber has generated much needed income, which in turn allows local communities to meet their basic human needs.

Sustainable forestry has now become fully integrated into the timber production process. The landowner groups have responded favorably to the silvicultural system by regularly inspecting the one-hectare blocks and constantly measuring the growth rate of trees.

In 1995, SWIFT contracted to supply timber for a government construction project in Rotterdam,

under the condition that 30% of the timber was to be certified under the FSC system. Premium price has narrowed the market but SWIFT has taken steps to minimize its expenses such as purchasing a timber yard in the Netherlands, thereby precluding the need to rent space for temporary storage of Solomon Islands timber.

Over 90% of the timber produced are now exported, with the majority exported to the Netherlands. In 1997, 1200m3 of five different species of timber were exported, of which 500 m3 was FSC-certified. Some of these products were distributed to major retailers in the Netherlands where they received price premiums of up to 20%. All revenue from the trade is distributed within the community under agreements that are developed with the participation of all the major stakeholders.
It is still premature to describe the impact that the project has had on government practices vis-à-vis small-scale timber processing. The Solomon Islands Government has declared its support for the project but neither forestry authorities nor other government agencies have yet become involved in the project. The lack of government participation may limit the long-term success of the project especially since successful community-based initiatives in the Pacific region have most often depended on participation of local-level institutions, particularly local government.

Lessons Learned

SWIFT had experienced significant success in assisting small producers in the Solomon Islands to earn reasonable livelihoods through the sale of sustainably produced timber to European markets. This success has allowed local producers to pursue their forestry activities without succumbing to the pressure to sell their logging rights to foreign companies. Since timber producers in the Solomon Islands are linked with timber markets in Europe, the importers of sustainable timber have also gained from the overall experience. Strategies such as concentrating on a few species and developing a flexible relationship with large customers, combined with increased supply and awareness of sustainable timber, are expected to lead to an increase in profitability. In addition to the financial benefits, sustainable forest management practices have become integrated into Solomon Island forest operations. Moreover, the project has been quite effective in raising local awareness regarding the overall benefits of sustainable forestry.

At this point, only a few of the groups that are working with SWIFT and ETT have been certified. Cost has been a key factor as well as the low adult literacy rate and limited education opportunities. All FSC accredited certifiers are based in developed countries although developing country certifiers are in the process of becoming accredited. Despite the fact that most certifiers do provide a sliding rate scale, the cost of certification is still beyond the means available to most small producers. In response, SWIFT developed a way of reducing certification costs by certifying umbrella organizations and then ensuring that their members meet the requisite standards. Accrediting local certifying groups may also facilitate the accessibility of the certification process.
SWIFT has now been authorized to award certificates to those producers groups who meet forest management standards. These standards include:

- a commitment to the SWIFT approach and philosophy through the signing of the legal

instruments;

- possession of a business and felling license;
- completion of Area Zoning Maps for the lands clearly identifying productive and non-productive forest areas and indicating there are no ownership disputes concerning the lands;
- possession of proper tools to carry out forest inventories;
- establishment of a team of three people to be trained and tested in forest inventory techniques;
- preparation of management plans after completion of the required inventories; and
- commitment to attend SWIFT training courses.

This method of certification has been recognized as a simplified version of the FSC requirements. The revised certification system has led to the certification of 20 producer groups including 11 out of the group programme. By the end of 1998, 38 producers, managing around 50,000 hectares of forests, were participating in the group certification programme.

Another problem that has been encountered in the Solomon Islands is that the FSC standards are difficult for some groups to understand, let alone implement and comply with. The certification process is time consuming and bureaucratic, placing a heavy burden on small-scale producer communities with low literacy rates. Initially, SWIFT had 12 of its producers individually certified by an umbrella agency (SGS), but this proved to be an expensive option. In response, a "Green Umbrella" group was established to facilitate the process. As a result, 45 groups are now certified with SWIFT having identified a target of 120 further groups for certification. For the remaining participant groups, SWIFT has designed another scheme that acts as a parallel to the FSC certification process and allows small producers, who may harvest only one or two trees a year, to sell their timber at premium prices. Another possibility of "Fairtrade" certification, known as the Max Havelaar system that is prominent in the Netherlands, Germany, Denmark and Switzerland, is also being investigated. On the European market side, consumers have expressed concern about the lack of guarantees to ensure that producers and employees receive fair incomes. One proposal has been to issue additional certificates based on fair trade criteria for wood that is harvested from forests where both environmental protection and sustainable livelihoods for the producers can be assured.

Another relevant factor is that the market of sustainable timber has not yet been fully developed. Few of the species that are common in the Solomon Island forests are well known in Europe. This requires efforts by SWIFT to invest time and money to better understand Dutch buyers' specifications, test the species, attempt to obtain the Dutch quality certificate (KOMO), and raise awareness about the properties and availability of the lesser-known species.

Furthermore, certified timber tends to be supplied in small volumes and over long intervals, thus making it a rather more risky business venture. Most of the trade has been effected through ethical trading organizations that have developed alternative supply chains to the established timber trade. Sustainable timber must compete with other wood, which is assessed for its strength, color, availability and price. One strategy that SWIFT plans to explore is the development of the demand side of Solomon Island timber through vehicles such as buyer groups. The transport of timber through the islands has improved due to the purchase of a landing craft designed for that purpose, as well as for carrying spare parts and other supplies.

Contacts

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SUSTAINABLE PAPER PRODUCTION, ReThink Paper and Earth Island Institute, USA

Introduction

Unsustainable deforestation is one of the most critical environmental issues in North America. Four billion cubic meters of timber are annually felled in the United States. The loss of forests imposes severe ecological consequences, including loss of wildlife and habitat, degradation of riparian systems, increased global warming, and the disruption of local communities and economies. Although labor-intensive and community-based sustainable forestry plans and practices are being put into place, these efforts are still embryonic. At the same time, worldwide paper consumption is projected to expand by 46 percent by 2040. The U.S. is the largest consumer of paper in the world at 91 million tons, with an average growth trend of 2 tons a year. There are 598 paper and paperboard and 190 pulp mills in the United States, most of which process only wood-fiber.

Consequences of the paper manufacturing process raise similar environmental concerns. Emissions and effluent from pulp mills are pervasive pollutants. The use of chlorine to bleach pulp produces dioxin as a highly toxic byproduct. Dioxins have a long life span in the environment and are becoming increasingly concentrated in the food chain. Another concern has been the over-dependence on virgin fibers in paper production. The dominant resource used in papermaking is virgin tree-fiber. Every time a fiber is broken down in the pulping or recycling operations, it weakens the fibers, thereby necessitating the addition of strong virgin fibers. As a result, forest ecosystems are continually threatened unless a substitute is found to replace virgin wood pulp as the primary fiber strengthener.

The Earth Island Institute recognized early on that reducing paper consumption through reduction, reuse and recycling strategies was a central component in any forest preservation efforts. It was specifically concerned with the dependence on virgin fibers in paper production, and as well in promoting recycling efforts. In response, ReThink Paper developed a program to replace virgin-wood fibers with more environmentally friendly, non-wood, fibers including crops such as hemp or kenaf, reclaimed fabric, or agricultural residues such as wheat straw, rice straw, sugarcane, cotton linters, and other “waste” material left over from the harvest process.

Most of these fibers yield more pulp-per-acre than forests or tree farms, and require fewer pesticides and herbicides. Furthermore, fewer chemicals and less time and energy are needed to pulp agricultural fibers because they contain a limited amount of lignin. Lignin is a substance that enables plants to stand upright. In addition, agrifibers are inherently light, allowing for the use of totally-chlorine-free (TCF) bleaching processes, thus precluding the production of highly toxic chlorine byproducts such as dioxin. Overall, the mechanical pulping of agrifibers is a more sustainable process than the use of chemicals, requiring about 37% less energy than wood. The major obstacles hindering the development of these non-wood paper alternatives include high costs due to significant industry start-up costs, smaller economies of scale, and widespread government subsidization of the traditional pulp & paper and timber industries.

Originally, ReThink Paper directed most of their efforts to the development of a consumer campaign.

However, they soon realized that the forest industry lacked the infrastructure necessary to actually implement the desired paper production changes. The pulp and paper companies were resistant to making such changes due to the pre-existing capital-intensive nature of their production and low profit margins. The government had also been investigating the use of non-wood fibers since the 1940s. Currently, ReThink is one of the few, if not the only organization, which examines the supply side of the equation, calling for the integration of environmental priorities at the critical early stages of infrastructure development.

Project Activities

A critical component of ReThink Paper's activities included public education and advocacy of the benefits derived from sustainably produced paper. These efforts included:

- publications and other information about the economic and environmental advantages of non-wood paper production;
- assistance to corporations, non-profit organizations and government agencies in making informed and ecologically sound paper-purchasing decisions;
- collaboration with major printing firms, publishing houses, and design agencies to develop the experience and technical knowledge necessary to provide non-wood paper printing and production services;
- consultation with public officials and government agencies to strengthen environmental regulations pertaining to pulp and paper production; and
- organization of public lectures and presentations on the advantages of non-wood and recycled papers to schools, colleges, government agencies, businesses, and non-profit organizations.

Another component of ReThink Paper's activities has included working with forward-minded industry representatives, who have demonstrated a commitment to develop sustainable production processes. ReThink has also worked with innovators who have developed novel products like agripaper, which uses over 80% of the agricultural residue produced in the mills. Under this scheme, mills are located within a bio-regional model, which ensures proximity to urban areas where there is a constant waste flow stream, and proximity to agricultural lands. ReThink has also worked with smaller pulp mills to produce totally chlorine-free papers, and to use recycled materials and agrifiber pulp.

In addition to its pulp and paper production activities, ReThink has worked with farming communities to develop agrifibers. They have engaged in projects with the American kenaf Society, the North American Industrial Hemp Council and potential hemp farmers in Kentucky. They have also worked with the CRIA (California Rice Growers Industry Association) to develop the market value of agricultural residues.

Results

The promotion of kenaf has produced considerable successes. kenaf stalks provide excellent newsprint, with the fibers in the bark providing an ideal finish for strong, high-quality printing and writing papers. kenaf pulp yield ranges from nearly 50% in the core to more than 60% in the bark, compared to only 43% yield from pine. kenaf has a yield of fiber per acre that is 300% more than tree plantations. Cultivation of the plant creates alternative market opportunities for farmers: the outer bast (woody fibers in the plant) of kenaf alone yields as much pulp per acre as pine, and its core fiber can be marketed for various products including particle boards, potting soil, horse bedding, and absorbents. kenaf is also an ideal product for crop rotation schemes involving legumes, corn, sorghum, and other food crops. As of 1997, only two companies in the U.S. were manufacturing kenaf paper commercially. Overall demand is still not high. However, there are some examples of green companies who have been using kenaf and of publishing firms who have successfully employed kenaf in the production process.

Hemp typically produces around 3,8 tons of dry fibers per acre annually - more than twice that of southern pine. The long “bast” fibers in its bark are ideal fiber replacements for softwoods while the short fibers in the woody core are suitable fiber replacements for hardwoods. In combination, hemp can be used to produce high-quality printing and writing papers as well as specialty grades for packaging and other applications. Hemp can also be used to produce everything from cloth and rope to oil and varnish. Hemp cultivation also provides numerous environmental benefits. It grows rapidly and germinates in the early spring, predating the growth of weeds and therefore reducing, if not eliminating altogether the need for herbicides. Its natural resistance to most pests reduces the need for pesticide use as well.

The main obstacle to the production of hemp in the US is the fact that it is still illegal in that country. As a result, ReThink Paper has become involved in active lobbying efforts to legalize hemp. Some success has been achieved in several states that have agreed to reintroduce industrial hemp on an experimental basis. There is evidence at the state level that more and more governments are becoming increasingly amenable to the prospect of hemp production. In North Dakota, the state legislature approved a measure in 1997 requiring North Dakota State University to study the overall farming potential, market feasibility, and environmental benefits of reintroducing industrial hemp. Similar initiatives that allow for limited cultivation have been passed in California, Kentucky and Vermont.

ReThink’s advocacy efforts regarding the integration of hemp and kenaf in paper production has catalyzed some notable industry initiatives. With the advice of ReThink, Crane & Co. of Massachusetts has been working on new hemp and kenaf-based papers that will be blended with recycled post-consumer waste and recovered cotton rags. These blends reduce the cost of agriculturally based papers since recycled and recovered materials are currently cheaper than virgin non-wood fibers. In southern Texas, Kafus International has been constructing a kenaf-based 85,000 ton/year chlorine-free newsprint mill while Heartland Fibers, a Minnesota-based pulp manufacturers, has commenced construction of a 200,000 ton/year corn stalk-based, chlorine-free pulp mill in Nebraska. The Bank of America has now become a leader of the nationwide Recycled Paper Coalition. It has developed an investment portfolio printed on straw-based paper and has commenced hemp-based paper trials. The company annually saves an estimated 14 million dollars through

maximized paper use efficiency. Mitsubishi Electric America has agreed to reduce its wood consumption and will likely become the first major corporation to eliminate virgin wood based paper.

One major undertaking by ReThink Paper, in conjunction with Greenpeace and the National Resources Institute, involved the *New York Times* and the *Los Angeles Times* newspapers. For one day, agripulp newsprint was used to produce these newspapers as well as the *San Francisco Bay Guardian*, the *Sacramento Bee* and the *Oregonian.* Twenty percent of the paper came from agricultural residue, 60% from waste and 20% from wood chips. The publication editor, who performed an audit, confirmed the high quality of the paper. A similar success story involved the use of a prototype straw-based office paper, used by Domtar and Arbokem, which performed flawlessly in fax machines and copiers.

ReThink Paper has also been working with Lyons Falls, a New York based company that has been blending, on a trial basis, post consumer waste with FSC chips and some non-wood sources. Currently, Lyons Falls is one out of two domestic mills that have been using a totally chlorine-free bleach process. They have contracted with farmers in the American Midwest to grow kenaf and have supported the reintroduction of hemp cultivation. The company has also planned to purchase smaller mills and retrofit them to accommodate non-wood fibers.

The US Government has recently demonstrated interest in the prospect of using recyclable waste and agricultural residue. An executive order (EO 13101 "Greening of the Government through Waste prevention, Recycling, and Federal Acquisition") was signed by President Clinton and endorsed by the President's Council on Sustainable Development. It catalyzed a change in official purchasing policies, ensuring that recycled material, agricultural residue and bio-based materials would be used in the products procured by the Government. The White House, on ReThink Paper's advice, has started to use non-wood/post-consumer-recycled paper to meet the President's needs. Furthermore, ReThink Paper's analysis of wood reduction/replacement opportunities influenced the language of the recently proposed *National Forest Protection and Restoration Act.*

ReThink Paper will be releasing a "Paper Tool-Box" to the public in April, 1999, as a way of influencing producer and consumer decisions. This all-purpose, on-line eco-paper resource guide is being developed for purchasing managers, printers, graphic artists, publishers, non-governmental organizations, companies, public officials, and the general public in order to assist them in adopting more sustainable paper use practices. The Tool Box will describe the benefits of shifting away from the current wood- and chlorine-based pulp and paper production process; provide a comprehensive overview of available tree-free and high-content recycled paper options; offer suggestions for reducing overall paper use; and, explain the diversity of symbols and terms that are used in paper products marketing. It will be available as a web-based system and will lay the foundation for future longer-term initiatives, such as the electronic commerce of ReThink Paper services as well as a clearinghouse for pulp and paper manufacturers, consulting services for operating systems such as intranet, and training seminar services.

Lessons Learned

The introduction of the use of agricultural fiber sources has enabled the paper industry to diversify the source of resources used in paper production, while at the same time limiting the pollution associated with wood-based processes. Moreover, new economic activity has been stimulated in rural communities as a result of the increased demand for agricultural fiber sources. By drawing on the vast quantities of agricultural residues, the pulp and paper industry will be able to meets its need for virgin fiber while reducing its reliance on forest resources.

Although non-wood fibers exist in abundance, non-wood paper is less common. The missing link in the production process is non-wood pulp – the immediate product between raw fiber and finished paper. Non-woods must be chopped before they can be sent to a pulp mill. This in turn, will require an increased number of non-wood capable pulp mills, that are located near abundant agricultural resources, storage facilities and convenient transportation routes. Existing facilities such as cotton gins are often amenable to non-wood paper production since they are capable of processing non-wood fibers. The number, location and capacity of North American non-wood mills and their products is the subject of a study currently being conducted by ReThink Paper and the Nonwood Plant Fiber Committee of the Technical Association of the pulp & paper industry. It is hoped that the research will enhance the ability of non-profit organizations and government agencies to increase the availability of pulp on the market.

It is expected that industry's reliance on wood fiber, if left unchecked, will only increase. Paper production requires a significant component of virgin fibers. Paper consumption is also predicted to increase faster than any reductions achieved through recycling and reuse. A more systemic approach is needed to lessen the dependence on wood as the primary fiber source. Galvanizing the marketplace for non-wood production materials and encouraging industry to voluntarily alter its production methods are integral to long-term success. Ongoing leadership from the public interest sector will be instrumental to catalyze these needed changes.

Contacts

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WIND POWER FACILITIES SCHEME
Centro de Conservacion de Energia y del Ambiente, Peru

Introduction

CENERGIA is a non-profit organization whose main shareholders include the Ministry of Energy and Mines, Eletroperu (National Petroleum Company), the National Society of Industries and COFIDE (National Development Bank). Their mission is to promote sustainable energy systems in Peru. Specific objectives included the promotion of the conservation and efficient use of energy; the protection of the atmosphere; and the development of renewable energy. CENERGIA has also been involved in various cooperative projects with selected UN agencies.

The town of Malabrigo is a port town located 600 km north of Lima. There are 1,614 households in the town, with a total of 7,653 inhabitants. Malabrigo is an area that experiences high winds, thus providing excellent opportunities for harnessing wind power to meet energy needs. Originally, the town received its energy from a diesel generator that was connected to less than half of the households. The generator did not function most of the time due to the lack of fuel and limited electricity. All of the big coastal cities, including Malabrigo, were large consumers of fuel for thermal power plants.

Project Activities

CENERGIA undertook to design and develop a wind turbine for the town of Malabrigo. The Ministry of Energy and Mines financed the turbine. CENERGIA supervised the technical design, installation and the operation of the central pilot base. After reviewing the preliminary results of the project, CENERGIA completed a feasibility study for the installation of wind power facilities in the zone of Malabrigo.

Results

Malabrigo is now connected to Peru's power grid through the wind power station in Malabrigo, which generates 250Kwh. As a result of wind-generated energy, the town of Malabrigo has eliminated its dependence on the thermoelectrical power station that was not only erratic in its operation, but environmentally unsound as well. Malabrigo's wind-generated power is particularly significant in light of how much fuel would be required to generate the same level of electricity that is being produced by wind power.

The biggest indicator of success has been the reduction of CO2 emissions. If the same amount of energy generated by the wind facilities had been generated by a thermal power station, the following polluting agents would be produced on average:

- SO2: 8.65 tons;

- NO2: 5.99 tons;
- CO2: 1 331.22 tons;
- Particulates in suspension: 73.21 tons – 0.86 tons of ashes.

The Peruvian government has now expressed its interest in wind-generated production electricity. There are no legally binding obligations on the government to do so, although there is a requirement under the *Law of Electrical Concessions* and its regulations, to establish the mechanisms to facilitate the operation of wind energy facilities. In addition, a proposed law concerning renewable energy, which has developed with CENERGIA participation, has been tabled in the national legislature.

Lessons Learned

It is still premature to assess the feasibility of installing similar wind power stations in other parts of Peru. Moreover, there is a lack of available anemometric instruments available to measure wind velocity. Most of the measurements recorded are carried out at a single point only ten meters high. However, certain lessons can be distilled from the Malabrigo project. For example, the systematic production of wind-energy confirms that the Malabrigo zone responds well to the use of wind power. Communities that are far removed from largely populated areas or where the energy demand is low or concentrated during certain hours of the day can now be linked to the power grid. It is the supply of wind and not load or demand of the community that justifies the extension of the power grid, due to the additional supply of energy to the system. Populations that are located at large distances away from the network, or which have low demand, or whose use of energy is concentrated in certain hours of day, can be interconnected if they rely on important wind resources. This can justify on the supply side, the extension of the transmission lines for additional energy to the system.

One aspect of the project that still requires work is the development of a detailed regional wind map to better coordinate the use of wind energy. It is also necessary that the capacity of engineers and technicians is enhanced in the following activities: processing of projects; wind resource measurement; development of technical skills; installation of air-generators; and the operation and maintenance of wind power stations. It will be important to create a legislative framework and to develop tax incentives to encourage national and international investments in wind energy.

Contacts

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BICYCLE CAMPAIGN
Small Earth Education & Exhibition Center, The Netherlands

Introduction

The Small Earth Center develops national education activities and exhibitions on sustainable development. Originated in 1972, the Center promotes sustainable and healthy lifestyles, based on organic farming, and the sustainable use of natural resources. The Center advises on specific areas such as ecological food concepts, organic production, optimal use of products, reduction of meat consumption, locally produced goods, seasonal food production, and efficient packaging. Small Earth's exhibition grounds include: various gardens; including a fruit, flower and herb garden; an ecological production garden; a rich nature garden; a glass house; solar collectors and PV panels; a restored farmhouse; a publishing house quarterly; and a new visitors' center powered by solar cells.

Project Activities

One of the problems to which Small Earth directed their attention was the fast growth rate of automobile traffic. Inspired by the Earth Summit, they started a campaign to promote commuter cycling. This was part of an NGO-platform to promote sustainable development in the Dutch province of Zeeland. The campaign was designed as an instrument to stimulate the use of bicycle commuting for many firms, institutions and local government agencies. Under the "Cycle to Work" campaign, each kilometer covered by an employee on a bicycle, would be sponsored by the employers. Money would be earned by the bicyclists and then dedicated to sustainable energy projects in other, mostly developing, countries. As a result, alternative modes of transport would be used with reductions in CO_2 emissions and car traffic.

Results

In the first year, the number of participants in the bicycle campaign was limited with only 400 participants in 1992. However, by 1998, the number of people who chose to travel by bicycle instead of by car increased to 4500. There are now over one hundred companies involved in the project. Bicyclists traveled over 4 million kilometers from the period of April to October. If this distance had been traveled by car, over 800,000 kg of CO_2 would have been emitted into the atmosphere. Funds earned from the bike-kilometer-sponsoring programme totaled US $330,000 over a three-year period. This money was invested in a small hydropower project in Bhutan.

By 1998, another NGO, COS Nederland, introduced a similar campaign in six other Dutch provinces. The overall aim of the program has been to initiate a national campaign, with at least 25,000 participants in the year 2000 with 50% increases in each subsequent year. A Climate Fund has since been established with sister organizations in Bhutan, Benin and Costa Rica. Revenue generated from the various bike projects is now channeled to these three developing countries for CO_2 emission reduction projects. In response, the three developing countries have expressed interest to reciprocate

the efforts of the Dutch cyclists by assisting in projects to help preserve varieties of wheat in the Netherlands and by planting other environmentally-friendly crops.

Lessons Learned

The campaign was unique in the combination of positive effects that resulted vis-a-vis the environment, human health and international cooperation. It demonstrated a clear and measurable linkage between total distance traveled and the volume of CO_2 emission reductions. It has furthermore reinforced the important principle that collective responsible individual actions can have considerable positive impacts for the environment.

Contacts

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SOLAR PV-BASED RURAL ELECTRIFICATION SCHEME
Tuvalu Solar Electric Cooperative Society, Tuvalu

Introduction

Over the years, most Pacific Island communities had met their energy needs through diesel systems. However, there have been a number of negative experiences that have resulted from use of conventional power systems, coupled with the desire to restrict expensive petroleum imports in the Pacific Island region. These problems were aggravated by the originally low energy needs of remote communities who possessed a limited number of household appliances.

Tuvalu is one of the smallest, poorest and least developed countries in the world with a small population of 9,043. The country has few natural resources, a low level of biodiversity and is among the world's more fragile and vulnerable economies. Endogenous energy resources are restricted to solar and biomass (coconut husks, coconut shells and wood), and imported petroleum accounts for about 40% of gross, primary energy consumption and is rising rapidly. Government plans to increase the imports of diesel, have engendered considerable concern in light of Tuvalu's particular vulnerability as a small island developing state in an era of increasing global warming. Moreover, diesel power has proven to be unreliable, providing consumers with only up to four hours of electricity per day. The outer islands of Tuvalu have been unable to connect to the country's power grid and therefore have increasingly relied on kerosene lamps. Due to the abundance of year-round sunlight, combined with the high costs of conventionally produced electricity, Tuvalu has proved to be an ideal location for solar PV applications.

The Tuvalu Government had made some initial attempts to address the growing electricity needs of its rural population by introducing alternative energy technology such as solar PV systems. The Tuvalu Solar Electric Cooperative Society (TSECS) was formed in 1984 by the US-based Save the Children Federation, to provide small PV lighting kits to outer island households. In fact, TSECS is one of the few organizations in the world that provides rural electricity exclusively through the use of photovoltaic systems. The systems are owned by the TSECS, which provides flexibility to upgrade systems without a commitment to use them.

Project Activities

TSECS installed lighting kits on each of the eight outer islands and a cooperative branch was established on each island. A minimum of 20 households each deposited US$50 each and committed to pay $6.25 per month to use the household solar system. This arrangement was intended to cover lifetime maintenance of the system and replacement costs for components. However, this scheme could not cover the expenses for the re-capitalization of panels. After the first year of operation, all 170 of the original lighting kits had been installed. However, the systems did not work well and most batteries had failed before the end of the first year of operation.

The second phase of the project, involving the installation of 150 household lighting kits, was more successful since the kits included a battery controller to prevent abusive patterns of use. However,

new problems emerged, as the system was unable to provide the amount of lighting that was needed. The systems were upgraded under the third phase with battery replacement to respond to the dysfunctional systems. Coupled with the technical improvements, the renewed emphasis was focused on improved system use.

The project is maintained by local technicians, as well as visiting senior technicians, who ensure a continual flow of training for the staff. Moreover, expert technical support is available to assist with systems design as well as training development. Technical expertise continued to improve, and this has resulted in a high level of customer satisfaction as well as decreasing number of problems with the equipment.

The creation of local user committees was initiated as an important part of the project. These committees were established to arbitrate disputes between users and technicians about fee collections, disconnection problems and poorly functioning systems. They also provide information about the overall functioning of the enterprise.

Results

It took 8 years before any real project success could be measured. During the first few years of the project, there were several technical problems as well as a supply shortfall in the number of PV lighting systems available for installation, which was caused by inaccurate demand estimates. This was partly attributable to the lack of information on solar system use in Pacific Island countries. A grant from the European Community enabled TSECS to overcome the latter problem and purchase the additional PV hardware and equipment. This was necessary since the initial funding for the project had not been renewed. Currently, all TSECS operating and maintenance expenses have been paid for from revenue generated from membership fees.

In addition, TSECS experienced other technical problems due to unreliable controllers, batteries, and appliances, despite the fact that the PV panels appeared to be functioning well. To rectify the problem, TSECS undertook to redesign the system, develop reliable components and ensure proper installation and maintenance.

By 1994, TSECS was able to provide electricity to as many private households as the local diesel utility (Tuvalu Electricity Corporation). The number of homes that use PV based electricity for its lighting needs is now roughly 450, representing nearly 50% of Tuvalu homes. In addition to access to lighting, households now have access to information through the use of television and VCRs. Solar lighting kits were installed at eight outer island community meeting houses, while half-solar PV vaccine refrigerators were installed in the eight outer island medical dispensaries. There is a large waiting list of requests for household solar power systems, which, if fulfilled, would provide over 60% of Tuvalu homes with solar power.

Data has showed that the life-cycle costs of solar PV systems are marginally lower than diesel systems for households in remote areas, with a difference of about 1-14%. However, higher savings are more common in low-energy consumption households.

In 1994, TSECS developed its largest power project up to that date. This involved the rehabilitation and upgrading of the 265 one and two panel-PV systems, and installation of 150 new two-panel lighting kits. The existing systems were allotted one extra panel. Other upgrades include the replacement of 100 existing, unsatisfactory charge/discharge controllers, the replacement of 50 lights and the installation of 395 low power night-lights. 150 new batteries were also installed. The newly upgraded system was designed to provide four hours of lighting per night or more if not all lights were used simultaneously.

Lessons Learned

The successful experience in the use and maintenance of solar PV systems has demonstrated that these systems can provide a reliable source of electrification for the rural areas of many developing countries. Despite the numerous technical problems, the dedication and commitment of the management and personnel has ensured the viability of the programme. The project has been especially effective in villages with few consumers having only a limited number of appliances, or for those areas of low population density where the viability of diesel-based systems is at issue. Household-sized PV systems can provide reliable power at costs less than diesel systems, which are more commonly used.

The success of the TSECS initiative is attributable to several factors. The initiative maintained a well-trained staff with local and visiting technicians. Local user committees were able to communicate directly with the utility company. The project exclusively focused on PV systems and made systems of different sizes available to meet the varying electrical needs. And users had financial resources available to them.

Membership in the TSECS has been based on the availability of new PV units, and not on the number of households willing to join the cooperative. The TSECS and not the users own the systems, although users are shareholders in the TSECS. The autonomous nature of TSECS has provided flexibility to adapt to or change systems without user investment. However, the shareholders are represented in island committees and a national committee consisting of chairs of each island committee. Users have been able to communicate with management through their Branch Committee members when conflicts arise with users and agents, particularly regarding disconnection problems, and the collection of fees for poorly functioning systems. There has also been a constant flow of information regarding the expenditure fees and the improvements in service to be proposed, as well as a complaint mechanism when action taken by TSECS is considered inappropriate.

Fee collection has been handled through an independent agency, and this has proven to be an effective means of preventing the diversion of funds to other projects. Issues of patronage and familial ties do not arise since the fee collection has been performed by a national organization. Payment plans have been structured to accommodate differing abilities to pay. Technicians are full time employees of TSECS and are stationed on each island, enabling them to visit each household once each month to perform technical checks and to collect fees. This has prevented any abuse of the system and has preemptively identified problems at early stages. Senior technicians from the main office have been

auditing the performance of island technicians on a bi-annual basis and have assisted island technicians when difficult problems have arisen. Moreover, the national office has provided an ongoing training programme for field technicians, which has contributed to the improvement of performance and customer satisfaction.

After almost 15 years of operation, TSECS has gained a great deal of experience in providing solar energy services. They have realized that the reliability of the components is particularly critical in remote sites. Moreover, they have learned that equipment must be rigorously standardized from the initial installation, since the mix of different types of panels, controllers and batteries has led to problems with spare parts support and systems integration. The long-term success of rural solar programs has been largely dependent on good institutional design and organizational performance and effectiveness.

In addition to the early technical problems, TSECS had encountered some difficulties in other aspects of its operations. The board of directors consisted mainly of rural members who lack business and management skills. As a result, there had been a consistent emphasis on short-term gains. Members had refused to earmark collected fees for the purchase of replacement components, opting instead to retain the money to earn interest and for replacement batteries. There had also been some instances of corruption and theft, especially since record keeping had not always been properly maintained. In response, the government has been considering transferring the management of the cooperative to a utility company. However, it is important to note that the problems experienced by TSCES are similar to problems that have plagued numerous other types of cooperatives. Prevention of these problems has been shown to depend on strong government monitoring as well as strong technical and financial support from external sources.

Future success with solar PV programs is still dependent on the development of institutional approaches for maintaining the systems. Ownership and maintenance of the systems by utilities appeared to be the preferable option. At the institutional level, the best method under this system is the one where the electricity is provided on a fee-for-services basis. TSECS has provided a good example of how the effective combination of these factors can contribute to long term viability of solar energy projects. A strong institutional structure can make the organization more attractive to prospective donor funding, which TSECS was in fact, able to develop throughout the second to fourth phases of the project.

Contacts

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ECO FORESTRY INITIATIVE, SUSTAINABLE FORESTRY MANAGEMENT
Greenpeace Pacific, Melanesia

Introduction

The rainforests of Melanesia are extremely rich in biodiversity, representing the largest remaining tracts of untouched forests in the Asia-Pacific region. These rainforests provide habitats for 9000 flowering plants, fragile mangrove swamps, hundreds of endemic bird species and the world's largest butterfly. Moreover, many local communities depend on many of these resources for their survival. These resources are under serious threat from industrial scale logging practices, which threaten to destroy the remaining forests and cause massive social disintegration. Logging impacts the drinking water supplies and fishing streams, and destroys wild game, medicinal plants and other subsistence resources.

Indigenous communities own more than 90% of Melanesian land, under a customary tenure system that has been upheld in the national constitution. The lure of better services and infrastructure as provided by multinational logging interests, have often misled the communities into the false belief that large-scale logging is the only option for them. Landholders are eager to acquire access to education, health care and transport, but they have been reluctant to oppose local or national leaders who support industrial logging. Those communities that have succumbed to these offers have been forced from subsistence livelihoods into poverty and dependence, particularly because less than 5% of the value of each log actually reaches them. Many villages have been forced to decide on whether to liquidate their forest resources, or to reject those offers and to attempt to utilize their traditional, cultural and natural assets in order to sustain community needs, local ecosystems and their Melanesian lifestyle and cultural identity.

Faced with this pending reality, certain enterprising Melanesian communities have begun to develop alternatives to industrial-scale rainforest logging. There has been an increasingly demonstrated interest in using local resources but not at the expense of community or environmental integrity. As a result, Melanesian villages have been linked with export markets and external partners in order to develop a viable and sustainable alternative to industrial logging. Connections have been made to supportive foreign markets, enlightened businesses and non-Melanesian non-governmental organizations. These communities approach NGOs like Greenpeace, who have facilitated the partnerships by linking local efforts with external expertise, resources and markets.

Project Activities

Project activities have included small-scale sawmilling, ecoforestry initiatives, training, management plan development, community-based conservation, and development alternatives. One particular example involved the Komuniboli village, which succeeded in forcing the Republic of Korea-based logging giant, Hyundai, off their customary land in 1983. In the following ten years, the Komuniboli forests had been managed pursuant to ecological guidelines. In addition, the community established the Solomon Islands' first and only ecoforestry training center (KTC) that has since assisted hundreds

of landowners to adopt chainsaw milling. Further along the coast from Komuniboli, landholders belonging to the East Simu Association were also able to successfully defend their lands from foreign logging interests.

In 1994, the Solomon Islands Development Trust, Greenpeace and the NZ Imported Tropical Timber Group (ITTG-a joint timber trade and conservation NGO association) started to work together to develop integrated support programs as well as clear ecological and social standards for the emerging ecoforestry industry. Although villagers were aware of the value of sustaining their forestry resources, they had not yet learned how to properly cut ecotimber. The efforts to provide instruction on how to cut and mill trees proved to be insufficient because of an insufficient number of Komuniboli villagers with sound forest management training. Local communities, appreciating the opportunities that ecoforestry offered, requested Greenpeace and SIDT to assist with information, training, field support, funding for equipment and marketing expertise.

The Ecoforestry Programme has now been focused on ecoforestry training, community organization and on-the-ground technical support. The New Zealand Government contributed funding for the pilot training course while Greenpeace campaigned to raise awareness of and the market demand for ecotimber in New Zealand. The ITTG was also helpful in linking ecotimber producers with green consumers in New Zealand, where there was shown to be an increasing market-driven demand for sustainable wood products.

Destructive log extraction required heavy bulldozers running dirt roads, leaving forests degraded into a sea of vines and rendering waterways muddy holes no longer fit to drink. Under the ecoforestry schemes, large machines were prohibited thus decreasing the volume of soil erosion. Only small tracks made by cutting some of the small trees were allowed and timber was carried out by hand.

Milling impacts were also mitigated by ecoforestry practices. Most logs are now milled in the forest as opposed to being hauled out, which consequently engenders soil erosion. Moreover, tree felling is performed to ensure minimal damage by locating the operations in gaps in the forest canopy and away from young trees.

One of the important elements of ecoforestry is the community involvement in the development plans that incorporate different types of land uses as well as a management plan on how the forest is to be sustained. The Plan identifies the boundaries of customary land such as village areas and community gardens, then designates the desired areas for protection from logging. It sets aside areas for building houses, as well as allots areas for small-scale milling and reserves areas in which small trees are growing.

Under a similar plan, the Zongo peoples have been able to set aside forest reserves, swamp ecosystems and tambu (taboo) sites. Harvesting has been carefully planned in marked one-hectare blocks with all trees properly identified. Timber volume is assessed and used to calculate the sustainable timber yield. Trees are then directionally felled. Natural restoration is aided by selective weeding out of vines, which potentially smother young seedlings. The big trees that will be cut must be over 60cm in diameter and the amount of trees to be removed must not be more than two per

hectare. An additional benefit is that ecotimber enterprises provide income and employment for the communities, who in turn, undertake the responsibility of sustainable forestry management.

In Papua New Guinea, a group of villagers from Nangumarum in East Sepik Province have been running a profitable sawmilling operation for over six years. Initially, the project activity included the cutting of timber on the land owned by villagers. As word of the “wokabaut somil” (mobile sawmill) spread, landowners from surrounding villages began to invite the sawmill operators to cut trees on their land. In this way, no trees would be cut without the full support of the customary landowners. Moreover, the landowners have been able to constantly monitor sawmilling operations in their forests and with the assurance of fair payment for their timber. This scheme has enabled the people of Nangumarum, who have not been formally trained in ecology or forest management, to obtain practical experience.

The portable sawmill operation is brought into the forest by hand and set up adjacent to the trees that are to be felled. On average, about three or four trees are cut and milled before the sawmill is moved on, leaving behind a gap in the forest canopy of up to 400 square meters. The rainforest is therefore better able to recover when the canopy is minimally disturbed in this way. The trees are milled on the spot and the timber is then carried out along narrow bush tracks. The sawmills are located up to a kilometer away from existing roads so that the cut timber is carried out by hand. This in turn prevents the need to construct new and environmentally damaging roads.

The success of the project has depended on the degree to which support could be obtained from the Komuniboil and Zongo communities. Many members of the clans felt that they could undertake ecoforestry themselves. Others wanted to proceed with the project but were unwilling to do any work. As a result, community involvement had proved to be essential. The community has now been fully engaged in removing the cut timber, with the involvement of community youth organizations, church groups and women’s groups. The sawmills have provided employment for the villagers and have assisted in slowing the growing trend of young people leaving their villages to obtain employment in the towns and cities.

In Collingwood Bay, PNG, the 4,000 Maisin live in seven villages. They control 200,000 hectares of tropical rainforest, ranging from alpine areas to a spectacular and diverse coral reef. The area was classified as having the "highest biodiversity conservation value" in a recent National Conservation Assessment. No timber concession has been provided for the area, although timber companies and the PNG government expended considerable efforts towards this end.

The Maisin possess a rich cultural heritage that has allowed them to sustain a robust subsistence economy and stable social institutions. They had traditionally used tapa cloth made by pounding the bark of the mulberry tree that is cultivated in local gardens. Bark from trees planted in Maisin gardens and dyes from leaves are used to paint the tapa cloth. Traditional patterns are hand painted onto the thin bark using natural pigments from the forest. The Maisin had not yet translated this traditional practice into a commercial enterprise to export tapa cloth paintings.

In 1993, the Maisin declared their unified opposition to large-scale logging and expressed their

intention to preserve their natural and cultural heritage by developing their own community-centered and managed enterprises. Greenpeace assessed the degree of community commitment that would be required in order to establish a tapa cloth export business. They took account of the community dynamics and recruited individuals to assist in further development of the project. The common goal was to improve the tribe's quality of life, while insuring the integrity of the local forest environment as well as ensuring an equitable distribution of benefits that were to be generated from the project.

The Maisin and Greenpeace created an export market for tapa cloth paintings to provide an alternative income source to industrial logging. Developing the training and skills did not prove to be problematic due to the pre-existing local marketing of tapa cloth. With the support of Greenpeace, Maisin leaders were able to exhibit their tapa cloth paintings at the University of California's (Berkeley) University Art Museum (UAM). This exhibition broadened the scope or public exposure to the paintings and catalyzed more public education about the links between environment and development issues in Melanesia.

Results

The success of the programme in the two Solomon communities has since generated interest in other communities on the islands. More communities are now beginning to recognize the appeal and viability of alternative livelihoods to large scale logging activity.

Initially, the sawmill was intended solely for the village house building project. However, the community members decided to establish a village timber yard where timber would be sold at market rates. The two sawmills produce between two and three cubic meters of timber per day. Approximately half of that timber has been sold locally with the remainder sold in the nearby town of Wewak and other urban centers. The project was designed primarily as a vehicle to garner revenue and direct those funds into the community.

The Berkeley exhibition successfully established Maisin tapa painting as an art form and stimulated an embryonic market. Five hundred paintings were sold in 1995, with sales estimated to increase to over 2,000 per year in the subsequent years. A company now imports the paintings to the US and additional exhibitions have since been held in other American and European cities.

The profitability of the paintings led the Maisin to develop their own systems to respond to orders and to manage their export business. Moreover, the Maisin endeavored to ensure that the tapa enterprise provided an ongoing incentive to protect the Maisin's forests and downstream coral reefs. In response, the Maisin established the Maisin Tapa Business Group (MTBG), which has been responsible for the tapa export enterprise. The Maisin Integrated Conservation and Development Association (MICAD) was also formed, which has been responsible for the facilitation, coordination and financial aspects of the business as well as other community conservation and development activities. It was important that links be established with organizations that could provide technical assistance, access to information, training, market research advice and financial support. Conservation Melanesia, a local NGO, commenced work with Greenpeace and the Maisin to design and implement a participatory planning process. With advice from Greenpeace, the MTBC developed policies,

systems, and practical guidelines for tapa purchasing and export.

One of the major conflicts that arose from the tapa enterprise involved the need to protect indigenous custom while at the same time to develop a cash economy. Efforts to deal with these issues as well as furthering development and environmental protection initiatives have since fostered an ongoing process of collaborative problem solving. The business enterprise had also been re-organized to respond to the need to benefit individual artists as well as the wider community. The new system now provided for individual artists to receive the normal village price for tapa from the MTBG. However, the MTBG plans to sell the tapa to overseas importers at marked up prices with profits from that venture going to the entire community.

Despite these initiatives, the needs of non-tapa producers still continue to be unmet. The community decision-makers had to decide on how to use the profits from exports. MICAD restructured itself to include community-appointed board members from each Maisin village as well as representatives from key community groups such as women and youth. MICAD's mandate was expanded to include coordination with external partners, encouragement of community participation in identifying and implementing specific conservation and development initiatives, and the facilitation of community education and training.

Finally, the tapa enterprise has been shown to have minimal environmental impacts. Bark for the tapa paintings comes from trees that can be planted in gardens and dyes for painting from leaves. The bark and roots of wild plants are sustainably harvested and nurtured in the wild or replanted when the resource becomes scarce.

Lessons Learned

The central lesson of the case studies, in which Greenpeace was involved, has been the importance for communities to determine their own paths, based on their own particular needs. Self-education and organization were necessary to community empowerment and for sound decision-making about the future of community forests. What proved significant about this initiative was that the Melanesian communities have been able to employ their own indigenous approaches to forest use and protection, while at the same time, continuing to meet community needs.

The activities and initiatives of the communities have demonstrated that there are numerous viable alternatives to industrial-scale logging. Working at the village level, building on traditional practices and using community institutions proved to be the cornerstone to the success of these specific initiatives. Widespread participation of the community in determining project design was also pivotal. The NGOs have been able to provide much needed technical assistance and advice, bridging the gap between traditional and market-based cultures.

Contacts

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LOCAL AUTHORITIES

BOZI DAR ECO-VILLAGE
Municipality Of Bozi-Dar, Czech Republic

Introduction

Bozi Dar is a village of 10,000 people situated in the Krnjnè Mountains. It is heavily polluted due to emissions from numerous coal fired heating plants and stoves in both municipal buildings and private dwellings.

The Czech Government introduced the *National Air Improvement Programme* in 1992. In 1993, the municipal council of Bozi Dar decided to improve the town's environmental quality within the framework of that programme. As part of its strategy, the municipal council recruited the Czech NGO, EkoWATT (founded in December 1990). Its aim has been to promote environmentally sound energy production and consumption. Their activities include: energy and financial analyses of energy management for households farms and businesses; EIAs for energy projects; energy audits and feasibility studies for industry, services, municipal and residential buildings; information studies on renewables; regional studies of energy management and environment for local planning authorities; and the organization of courses and seminars for energy management and local government. EkoWATT has been selected as the official Energy Consultation and Information Center of the Czech Agency of the Department of Trade and Industry.

Project Activities

One of the first activities undertaken by the municipality was the drafting of the *Ten Commandments for Ecological Measures in the Village of Bozi Dar*, specifying the environmental needs of the area. These included numerous energy conservation measures and the use of alternative energy sources based on the environment and energy needs of the municipality. The municipality conducted a study that revealed that half of the buildings in the village were heated by coal or electricity for periods of up to 10 months per year. The municipality chose the use of solar heating for space and water heating and wind for electricity production to replace the use of fossil fuels. The goal was to reduce the overall energy consumption in the village.

The project began with the renovation of municipal buildings and the installation of solar heating systems. EKO/Tep Company with EkoWATT initiated the project. One building was chosen that was deemed unsuitable for mountain areas. Its concrete outer shell was worn away by the harsh climate, its windows were falling apart, and the roof was leaky and not insulated. A complete reconstruction of the building was ordered to address all of these problems at once. The Czech Energy Agency and an EU loan assisted the project. A new electric boiler room and central heating system were installed, while solar energy equipment was also installed. In the following year, the windows and the main entrance door were replaced, and the attic was reconstructed and insulated.

This led to the insulation of other houses and buildings with doors and windows replaced by more

energy efficient forms. A photovoltaic system was also implemented. Under the European Union's program, the heating system and insulation for a block of flats was modernized in Bozi Dar. The building was insulated by the RAJASIS system, using polystyrene and the windows were replaced by new thermo-insulated (vacuum) double-glazing. Fifteen solar collectors were installed on a newly insulated roof. The collectors supply hot water and central heating. A 36 kW electric boiler is used as the secondary source of heat. A wind power plant was built as well.

Results

The results of the retrofitting have led to an overall energy saving of about 60% for the village as a whole compared to pre-project consumption levels. Twenty-three pieces of coal-fired heating equipment were disposed of. Air quality in the area has improved and fire risks have decreased, due to the replacement of many of the coal fired stoves and heating plants. New space that became available as a result of the dismantling of the coal-fired stoves and heating plants was converted into 4 new apartments within the municipality's complex. The aesthetic quality of the buildings has been enhanced by the renovation of buildings. The retrofitting has also led to increased awareness and interest among the public, in large part encouraged by reports in the local press. The project received the first prize award by the Sasakawa Peace Foundation.

Bozi Dar is now increasing its reliance on solar heating systems and solar heating pumps. There are numerous municipal buildings with heatpumps and solar collectors. These include the town hall, a prefab house and a building that houses an ecological and consultation center. The municipality of Bozi Dar has revised their government strategy to incorporate sustainable energy options into their plans. In light of Bozi Dar's favorable wind conditions, the use of wind farms is now being developed.

Contacts

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DISTRICT HEATING SYSTEMS
Government of Gotland, Sweden

Introduction

Gotland is the largest island in the Baltic Sea off the eastern coast of Sweden. The island has a total population of 60,000 in 15 towns and villages. The main sources of employment are from the public sector, tourism and agriculture. Gotland had been heavily dependent on mainland Sweden for its energy, which was derived mainly from oil. Electricity was transferred by way of a single, direct current cable from the mainland that was disrupted on a daily basis. In Visby, the capital of Gotland, the consumption of energy was dependent on non-renewable sources such as oil. This created a pollution problem, especially in Visby where the air quality was noticeably affected. Visby has been declared as an UNESCO world heritage site and most of its medieval buildings had been threatened by CO_2 and sulfur emissions.

Project Activities

The project was initiated by the Gotland Electricity Company (GEAB – Gotlands Energiverk AB), which is partly owned by the municipality. In order to address the energy problems and the consequences stemming from the use of non-renewable energy, the municipality examined the potential for introducing a district heating system as well as increasing the use of wind energy.

The Government of Gotland developed the use of district heating systems to satisfy the energy needs of the island's population. District heating is a system that uses steam from a power station to heat a district and is especially well suited to densely populated areas. The heat is distributed by means of low-pressure steam or high-temperature water mains to energy users. Fuel is used in a more efficient manner with considerable emissions reductions. District heating is more economic when the users are situated close to the power station. Otherwise the cost of distribution is rather high.

Another project involved the development of wind power sources. A Swedish energy company undertook a feasibility study on generating wind power in Gotland. GEAB facilitated this development by modifying the existing electricity grid frameworks to accommodate the transfer of wind generated power. Initially, measuring stations were installed to determine the volume of wind power that could be generated and a 75 kW windmill was constructed followed by a 1.5 megawatt windmill and then a 3-megawatt windmill, representing one of the largest wind generator facilities in Europe.

Results

Overall, the government has been satisfied with the energy-producing capacity of the projects. There is no other area in Sweden that derives such a high percentage of its energy from renewable energy sources. Current estimates indicate that 10% of Gotland's energy originates from renewable resources. Overall, almost 10% of Gotland's energy is locally produced. The air quality in Visby has improved considerably, especially in the old town area. A study conducted by Stockholm University has confirmed this change, noting that there was a decrease in fungus in the town that feeds on high sulfur concentration in the air.

In terms of cost, energy is available at lower costs to consumers due to the variety and flexibility in the overall energy system. Island residents now pay less per kilowatt per hour than the rates on the mainland. There are now 11 different sources of energy in Gotland. These include heat pumps situated in the Baltic Sea, the extraction of methane from sewage and from the town landfill and wood chips from sawmills. All of these methods are integrated into the district heating system. During the summer months, energy is derived primarily from renewables, whereas the reliance on fossil fuels is greater during the winter months. The only drawback from the growing use of district heating is over-dependency, creating problems for energy users if and when the system breaks down.

District heating systems are now installed in other localities in Gotland including Hemse, Klintehamn and Slite, which are all totally dependent on renewable energy. In Slite, the district heating system had used the excess heat that had been transferred from the concrete factory, which is the largest user of electric energy on the island. The factory powers a large greenhouse, which produces high quality tomatoes and cucumbers for the island. The vegetables are now sold year-round on an island where a harsh climate has resulted in difficult growing conditions. This produce is also sold on the mainland market, thereby creating more job opportunities for Gotland inhabitants.

There has indeed been a positive impact on energy consumption, since the share of domestic energy sources has become much higher. This has catalyzed local inhabitants and companies to develop their own energy sources. Small and medium enterprises (SMEs) have demonstrated an interest in using new sources and the municipal government has encouraged this trend, especially since it results in both energy savings and a return on investments

Gotland's local population has favorably received the use of wind power. The large wind facilities are especially beneficial since they use less space and increase the amount of energy produced. However, some Gotland-based companies have questioned the utility of the larger structures, which have often malfunctioned.

Since the implementation of the wind power project, the company commenced selling shares to the public, which could be purchased without any tax consequences. The amount that could be acquired was based on personal consumption. With the help of national subsidies, Gotland inhabitants purchased over 100,000 shares thereby increasing the use of wind power on the island.

There are now 150 wind power generators in Gotland. The municipality owns some, but the majority of them are privately owned under common ownership schemes or other arrangements. Small companies, individuals, and farming companies are also involved and sell their excess energy to GEAB. As a result, local energy production has eliminated dependency on fluctuating energy prices. GEAB's primary role has been to assess the network of wind producers. This has proven necessary due to the inconsistent supply of wind power, which results from a seasonal and climatic conditions. In some instances, the energy grid has been disturbed due to the numerous fluctuations. Moreover, there is a limit on how much wind energy can be channeled into the electricity grid. Recently, the EU had agreed to install cables to handle these energy fluctuations. According to 1997 figures, 10% of the energy produced on the island was actually derived from wind energy.

Tourism has also benefited from the use of renewables and there has been a dramatic increase in the number of visitors to the southwestern part of the island where a majority of the wind generators are located. The influx of tourists has furthermore increased the number of ancillary businesses. Renewable sources of energy also provide additional income for farmers through the renting of land for wind power generators or the selling of wood for wood chips.

Lessons Learned

The introduction of renewables has had a positive impact on the overall economic development of Gotland. From an energy efficiency perspective, it is preferable for islands to produce their own sources of energy. Domestic energy is always vulnerable to price changes when they are dependent on mainland sources. Companies tend to provide energy at high costs due to the great expense involved in transferring the energy. As a result, there is considerable political support for renewable energy and wind power in Gotland and a clear mandate has been expressed, requiring assistance for wind projects, as well as their inclusion in the general economic development planning of the island.

The government plans to improve the grid system to provide the district heating as well as wind power. The Gotland Energy Plan announced the island's goal of obtaining 90% of its electricity through the districting heating system by 2005. In order to meet this goal, the island's capability to use district heating, including the expansion of the system to accommodate more buildings, will be enhanced.

Over the next ten years, the municipality will attempt to double the amount of wind produced energy and reduce the CO2 emissions on the island by 10% in 2005. The grid system needs to be over-hauled to better accommodate capacity problems. GEAB, together with two companies, are currently working on a research project, which will result in the installation of a 50 MW underground cable from the south-western part of the island to Visby. The cable will transfer the electricity from large-scale wind power that is concentrated on the southern part of Gotland. One challenge will include developing a method to export electricity to the mainland power grids.

In addition, a special plan is being devised to deal with the energy needs of the tourist trade as well as the energy needs of summer residents. In response to the fluctuations inherent in procuring wind power, the government is undertaking surveying and monitoring exercises to ensure that the grid will provide a more reliable source of energy. This is necessary to meet the proposed target of 40% renewable energy use.

Due to the success of the land based wind generators, the next step will be to install these generators at sea. Five generators exist outside the West Coast of Gotland with plans to install more generator there in the future.

Contacts

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REGIONAL RECYCLING SCHEME
Appalachian Regional Recycling Consortium (ARRC), USA

Introduction

ARRC is a cooperative recycling service that was created through an inter-agency agreement among several planning district commissions. The ARRC initially served twenty-one counties and five cities in the Appalachian region of Virginia, consisting of over one half million people, although this has expanded to include three more counties and one more city. ARRC's primary goal is to assist rural local governments in addressing the unique challenges in attempting to reduce their waste stream and comply with recycling requirements. These challenges include: low population density; increased distance to markets; low or negative value of many recovered materials; and the lack of positive experiences with regionalization.

There is an increasing abundance of recovered materials ready to be processed or to be re-manufactured into new products. However, in rural areas the lower volumes of recovered materials, combined with the distance to "traditional" recycling markets and the low or negative dollar value for materials in those markets, greatly increase the costs of comprehensive recycling programs. As a result, there is a considerable need for new "in-region" business development.

The ARRC provides comprehensive services to local government, industries, recycling coordinators, and entrepreneurs. ARRC services include: regional recycling services; industrial technical assistance; recycled product development/business assistance; workshops and seminars; educational information; recycling equipment information; market information; recycled product sourcing; and regulatory and legislative updates. They have developed specific programs that reflect ARRC's strategy to use an integrated systems approach in order to combine the vital issues of environmental sustainability, economic development, and the need for mutually beneficial in-region market development to increase recovered materials utilization.

Project Activities

One project involved conducting a survey of participating localities. The conclusions of the survey demonstrated that the disposal of scrap tires was a big, and common, problem for them. The ARRC provided assistance to the local governments and completed a Cooperative Agreement with the Department of Environment Quality, Waste Division. The Department provided funds to implement the Regional, Mobile Tire Shredding Program for all of southwestern Virginia. This was part of a "current flow" demonstration project, where financing was directed to implement the Regional Mobile Tire Shredding Program from the Waste Tire Trust Fund. Revenue for the program was generated from a 50-cent tax on new tire purchases.

The Regional Tire Shredding Project was to be implemented in three phases. A shredder was provided under Phase One. Within months, a mobile shredding service began which visits each predetermined locality on a regular basis. The shredder can be moved easily and produces a rough

3-inch primary shred with a maximum throughput capacity of 1,000 passenger tire equivalents per hour. It can handle all passenger tires, light truck tires, and over the road tires. Participating localities accept Virginia tires from individuals, local tire haulers and local tire dealers. The program also assists the localities by providing information on local beneficial utilization projects and works on market development. Most of the localities charged a handling or disposal fee to accept the tires.
Under Phase 2, a new shredder will be used to produce chips from the same range of tires and tire shredding would expand to 12 new localities.

A second initiative was the Recycling Business Assistance Program. The aim of the project was to assist entrepreneurs who were working to create or expand small-scale businesses that used recovered materials to manufacture products. It was hoped that this would foster the development of environmental and economically sustainable businesses in southwestern Virginia. Under the program, the ARRC has provided business development assistance ranging from feasibility studies and material sourcing, to business plan development and financial package assistance. Anyone who is planning to start a business that produces a value-added product utilizing at least 30% post-consumer recovered material is eligible under the program.

The ARRC developed the Recycling Industrial Technical Assistance Program to promote the use of locally recovered materials by local industries. Another objective was to provide integrated solid waste management assistance. Information and assistance necessary for industries to successfully include recovered materials as a substitute for part of the manufacturing feedstock would be given. It was hoped that the integration of recycled materials in manufactured products would boost the competitiveness of industries at the local and international levels. The basic part of the RITA strategy was to provide the information and assistance necessary for industries to successfully reduce the volume or toxicity of the waste they produced and/or to include recovered materials as a substitute for part of their manufacturing feedstock. Moreover, the inclusion of recovered material content would also meet the growing requirement for this in many federal and state contracts.

As part of this program, the technical assistance that was provided included waste audits, pollution prevention information, technical assistance for process modification, and material sourcing.

Finally, the ARRC developed the Southwestern Virginia Waste Exchange to expand materials reuse opportunities. The exchange would occur across many states, and thus greatly facilitated the efficient transfer of large volumes, continuous supply, or “high-value” commercial/industrial by-products and “waste” materials. In order to meet the needs of local businesses, individuals and recycling coordinators, the exchange has provided a mechanism for the effective exchange of smaller quantities of one-time or “lower value” materials on a local scale. A locally focused, transferable electronic waste exchange database was also established. Systems were also set up to facilitate custom searches and “match searches” between materials available and materials that are required.

Results

By the end of 1994, over 200,000 tires were shredded in southwestern Virginia at a rate of approximately 25,000 tires a month. Sixteen localities at 14 locations were serviced. Over half of the

material produced by the program was used in local projects such as erosion control and subgrade fill for roadways. Phase II shredding equipment yielded a product with a market value as high as $30.00 per ton.

The business assistance programs have been used by many local businesses. Under the Recycling Business Assistance Program, over 45 entrepreneurial clients have received some form of assistance. Currently, there are 14 active clients. Similarly, over 12 industries have requested services under the Recycling Industrial Technical Assistance, ranging from waste audits to market referrals.

Lessons Learned

The challenges encountered in delivering all of the programs included: the diverse needs requiring multiple response options: the changing regulatory climate; dwindling funding sources; and the reluctance of state governments and local inspectors to support alternative beneficial utilization of materials. However, the ARRC has remained committed to assisting Southwestern Virginia by striving for waste reduction, resource conservation and recycling while also recognizing the needs for job creation, retention and expansion through sustainable partnerships. The efforts of the ARRC have demonstrated that by encouraging the business and local communities to recycle, new economic opportunities can indeed be generated for the region. This will become increasingly important as the demand for more environmentally sustainable goods increases. Moreover, the reusability of waste and other by-products have also led to new products with high market value and have eliminated the need for further consumption of new materials.

Contacts

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MEADOWCREEK LOCAL FOOD PRODUCTION
Community of Meadowcreek, USA

Introduction

In 1986, the community of Meadowcreek developed an outreach program that focused on sustainable community development, environmental concepts and practices, and alternative energy strategies and implementation. Its facilities included an education and a conference center, situated on 1500 acres in the Ozark Mountains, where demonstration projects have been developed for local food production, environmentally sensitive lifestyles, alternative energy methods, and rural community development.

Project Activities

The purpose of the programme is to link institutional food services, such as cafeterias or restaurants, to local sources of food products. The project is based on sustainable community development principles, with the overall objectives of rural community revival and the re-establishment of food production as meaningful, profitable and desirable occupations. The goals of the programme were to: provide jobs for rural people; connect consumers with local food growers; promote healthier, environmentally-sensitive, and humane agricultural methods; increase purchase of food items from local sources; and feature local food items in area supermarkets, food outlets, and eating establishments.

The project entailed a collaborative effort with students at the Hendrix College in Conway, Arkansas where a campus wellness programme was underway, which examined student nutritional needs. The students conducted a study on the sources of the food served on campus, revealing that wholesalers filled campus food orders with products obtained from across the United States and Mexico. Only seven per cent of the cafeteria's meal items actually came from Arkansas. Meat, vegetables and dairy products were shipped from distant places, despite the availability of those products within a few miles of the college campus. Consequently, the school administration mandated its food service operations to obtain its food supplies from more local sources.

However, a number of difficulties were encountered in the implementation of this new strategy. The kitchen was equipped to use mainly processed foods, while local farmers were incapable of supplying products in the form and amounts needed by the institution. As it turned out, local foods were actually more expensive, especially if they carried the "organic" label. Moreover, students were conditioned to eating fast foods thus requiring a readjustment of their tastes. In light of these problems, an educational strategy had to be developed and new systems and procedures devised to facilitate the use of local food commodities.

The Hendrix Local Food Project attempted to address these complications with a wholesale strategy. This included: preparing menu plans that used food from local producers; preparing a list of menu items at the beginning of the season so the farmers could adjust their production accordingly; designating one farmer as the delivery person so that the local produce arrived one particular day each

week at the food service; and labeling menu items to inform the students of the local production sources, as well as nutritional content.

Results

Numerous benefits were derived from the project. Fresher and healthier sources of food were available for food-service patrons. Farmers were able to gain access to new markets, thereby sustaining small-farm livelihoods. New partnerships among groups within the community were formed. Moreover, the project generated income that could be potentially reinvested into the local economy. The increased production of local foods produced stimulated new farmers' markets and the development of a community supported agricultural project.

Meadowcreek advised and assisted the college in increasing its utilization of local food from seven per cent to thirty per cent in three years. This amounted to over $200,000 in food-generated revenue that was spent in the local community each year.

Lessons Learned

While project revenues were indeed significant, it was felt that the amount could have been increased if permanent distribution systems and more farmers could have been added to the scheme. The project still faces the challenges of lacking a community-based supply system and limited support from other institutions in the same area. One institution, a state school, has been restricted from utilizing local products due to a complicated bid structure mandated by the state government. Other schools having similar programs have had limited success, mostly due to the resistance of food service personnel, distribution problems and lack of producers who can supply commodities at the appropriate times and in the manner required by institutional dining operations. College administrators have not endorsed the project, viewing their dining halls as auxiliary services that have little relationship with the educational mission of the schools. Most institutions hire external vendors who have pre-existing relationships with large food distribution companies, who in turn, block local farmers from access to these markets.

As a result, it was felt that local food projects required an interdisciplinary/cross-sectoral team approach. The Hendrix project was effective because the participants included the college's administration, the food service's administration, kitchen staff, patrons (students, faculty, staff), funding agencies, rural development leaders, agricultural extension services agents and farmers and farmer groups. Student involvement was important in the project's success. Moreover, the project served as a vehicle for practical experience in research, market analysis, agricultural production techniques, reporting, institutional food systems, and community development.

The next stage in the Meadowcreek Local Food Project is to develop a system that links producers and consumers in the tri-county area of the Ozark Mountain region of Arkansas - a region that is severely economically distressed. Firstly, the new project will involve a restaurant and organic canning kitchen facility in the small tourist town of Leslie. It is hoped that the Leslie process will benefit from the experience gained from the Hendrix College Local Food Project as well as Meadowcreek's own

kitchen/food operation. The restaurant will feature menu items that utilize locally raised or grown organic foods. During the late evening or slow times, the kitchen will be used to can organic food items for marketing and distribution to other outlets such as schools, grocery stores, hospitals, and industrial plants. In addition, food operations will be located in other areas of the tri-county region.

Several school districts plan on operating gardens on the school grounds as a learning tool for students and a source of menu items in the cafeterias.

Contacts

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TRADE UNIONS

VOLUNTARY AGREEMENTS—Benzene Accord
CUT Brazil, Brazil

Introduction

Benzene is regularly used in the metal and petrochemical industries of Brazil. This chemical is carcinogenic, posing grave danger to humans on exposure. It can have severe effects on the central nervous, hematopoietic, immunological, and genetic systems. In 1985, thousands of workers were reported contaminated with benzene. More than 3,000 cases of health problems, attributed to benzene exposure were known by 1993. This was a great source of conflict between employers and employees, causing the government to take action. .

Legislation on benzene use was proposed by the national government. However, CUT Brazil (Union Workers Confederation) perceived that a regulatory response was not the most effective way to address the extent of the problem. They held reservations about the proposed government controls on benzene because of the government's institutional limitations. There were insufficient human resources dedicated to enforcement efforts. The technical knowledge of the people delegated to administer the government program was lacking. Moreover, implementation was problematic when the government could not count on the support of workers.

Project Activities

A voluntary legal instrument to control benzene in the workplace, known as the *Benzene Accord*, was negotiated between industry leaders, government officials and trade unions. All were equally involved in the preparation and drafting of the *Accord*, although CUT Brazil had a major role. The *Accord* provides mandatory requirements for all companies or sub-contracted companies that manufacture, carry, store, use or handle benzene, its liquid mixtures or derivatives, to register with the Ministry of Labor. Benzene is defined as a carcinogen and safe levels of exposure are identified, while companies are committed to clear standards and procedures.

Under the *Accord*, a *Program for the Prevention of Occupational Exposure to Benzene* must be implemented for any users of benzene. The program is to be designed for the continuous improvement of benzene use, with the ultimate purpose being to reduce the environmental concentration levels of benzene. The *Accord* is administered at the plant level by a representative group of benzene workers who have full responsibility for monitoring and enforcing the program. The group offers suggestions on benzene management and observes the implementation of safety measures that are aimed at eliminating risks to workers health. Periodic inspections are performed where there is benzene, including leakage, spills and other accidents where benzene is emitted into the environment. The group also monitors the companies' execution of all of its obligations related to benzene. Members of the group are subject to a minimum 20 hours of training, provided by the employer, on the risks of benzene, effects on worker's health and methods of control.

Under the *Benzene Accord*, the employer is required to cooperate with the Worker Group. They must also grant full access to information and records related to benzene, provide time off for employees to perform group duties and make office and equipment available to them as required. Companies are also obligated to introduce procedures that prevent the release and dispersion of benzene and undertake studies and research to achieve that end as well as benzene replacement.

A Permanent National Commission on Benzene was created under the *Accord*, where workers organizations, including CUT Brazil, are equally represented. The Commission is responsible for: overseeing developments; monitoring compliance; promoting studies; supplementing laws and regulations; and providing alternative control measures. Once a company has met its commitments under the *Accord*, the Commission issues a Certificate of Controlled Use of Benzene. Where there are disagreements in how to implement the *Accord*, the Commission is to analyze and propose solutions.

There are mechanisms under the *Accord* to ensure that it is being complied with. Where a company is in default of its obligations, complaints can be made to competent agencies. Violations of standards or procedures under the *Accord* can lead to the imposition of penalties.

Results

The use of benzene has been reduced and in some cases replaced by less harmful chemicals. Technical changes in the industry have occurred. The *Accord* has also encouraged investments in cleaner production and the use of alternatives. As a result of these developments, there has been a huge decrease in reported illnesses caused by benzene. Compliance with the *Accord* has not been a problem to date. The penalty provisions under the *Accord* have not been invoked. In addition, management of chemical risk has improved. Workers are more informed about how dangerous chemicals, such as benzene, should be handled. Consequently, companies are subject to greater scrutiny of their production processes. The *Accord* has also generated technological changes in industry, moving away from the use of benzene, and encouraged investments to that end.

Although there are a number of successes attributed to the *Accord*, some difficulties still persist. The *Accord* is limited to larger companies thus its scope does not extend to small and medium enterprises. There is also a lack of institutional dialogue between the different organs of government.

Lessons Learned

The *Benzene Accord* is an excellent example of how a self-regulated program can yield positive results when workers and trade unions are involved in its implementation. It set favorable conditions for employees, employers and the government to effectively transform the work environment where benzene is used. Compliance is no longer an obstacle to achieving environmental objectives where these partnerships exist. Voluntary agreements offer governments an effective mechanism to manage the environment without committing great resources to that end. This can guarantee sustainable production processes that are suitable to all involved actors.

The *Accord* has had a significant impact on national environmental health policy in Brazil. Benzene use is much more scrutinized due to the involvement of workers. They are more aware of how to use hazardous chemicals and more informed when ensuring that their employer is fulfilling their obligations under the *Accord.* Workers' conditions have also improved, resulting in a lower number of incidents of benzene related illnesses. Where workers have the opportunity to alter the workplace in a sustainable fashion, both the external and the internal environment benefit.

Contacts

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CHEMICAL SUBSTITUTION
Graphical Workers Union, Sweden

Introduction

The chemical and printing industries are important employers in Helsingborg. However, these industries are major polluters and producers of waste. Harmful substances, used in the production process, have regularly been discharged into the municipal sewer systems. The chemical products that were used included organic solvents, paints, lacquer and fixers, which resulted in waste containing heavy metals, cyanide and different acids, alkaline and toxic substances. Community sewage treatment works were unable to handle these substances with a resulting negative impact on sewage treatment. Water quality had deteriorated to the point that biodiversity loss had become evident. These substances would ultimately appear in the nearby waterways.

In Sweden, local authorities were targeted as the primary actors in implementing the recommendations in Agenda 21. One of the working groups under the Helsingborg Agenda 21 project, was set up to address possible solutions to this environmental problem. Project participants included concerned companies, trade unions and local government. One of the trade unions, the Graphical Workers Union had long since, been committed to the working environment, promoting both occupational safety and health issues as well as the environment. During the mid 1980s, the local branch of the union in Helsingborg, LO Facken I Helsingborg, had proposed measures against the use of several hazardous chemicals within the printing industry out of concern for worker health and safety. This evolved into the adoption of a more holistic approach where the linkages between the internal and external environmental problems were addressed.

Project Activities

LO Facken I Helsinborg formed an environmental working group to examine the use of harmful chemicals. Working with the local environmental authority and industry, they created a substitution process for harmful chemicals. The project was based on several fundamental principles.

- The principle of producers' responsibility for developing more sustainable systems for production.
- The replacement of harmful chemicals where sound alternatives are available.
- Maximum circulation and reuse of waste that is caused by production.
- Maximization by local governments of their buying potential, making environmental demands through their purchasing power.

Seminars were held in the participating companies, in order to create awareness of the environmental degradation caused by the chemicals. At first, industry appeared to be reluctant to make any changes. However, they finally agreed to cooperate to introduce vegetable-based alternatives to harmful chemicals into their production activities. An effective recycling programme was also introduced.

Results

Several cleaning agents and solvents have since been substituted for their more harmful counterparts. Moreover, the use of isopropyl products has ceased. Inputs are now used more efficiently while several substances are recycled. Impact on the municipal sewerage system is minimal while water quality has significantly improved.

The changes in production methods did not have a negative effect on the printing industry. The opposite has occurred and now the concept has been applied by other Swedish towns and cities, rapidly becoming common practice all over the country.

Future initiatives will involve improving the circulation of chemicals and expanding the use of vegetable substances in the production process. There is additional work that must be done to restore wetland biodiversity. Salomon-stairs are now being constructed in addition to other restoration and clean-up activities. The “second phase” of this project has resulted in the creation of 15 to 20 new “green jobs”.

Lessons Learned

The success of the project illustrates the important role of partnerships in implementing a sustainable production initiative. The synergy created by such partnerships has, generated the necessary momentum to address all environmental problems. The involvement of local business, trade unions as well as other community representatives is a prerequisite for success.

Contacts

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BUSINESS AND INDUSTRY

PRODUCT LIFE CYCLE REVIEW

Bristol-Meyers Squibb

Introduction

BMS is a diversified company that develops innovative products for treating cardiovascular, metabolic and infectious diseases, central nervous system and dermatological disorders, and cancer. It also manufactures consumer medicines, orthopedic devices, ostomy care, nutritional supplements, infant formulas and hair and skin products, which are sold worldwide. BMS maintains a high level of environmental performance, in light of the potential impacts of all its products. BMS had made a company-wide commitment to be a leader in environmental, health and safety management. A goal was declared to reduce the number of occupational injuries and illnesses to levels comparable to companies whose safety records are in the top 25% of businesses in the industry. Initially, BMS had an objective to meet or exceed regulatory requirements. This shifted to providing products that: have minimal environmental impacts; are safe in their intended use; are efficient in their consumption of energy and natural resources; and which are recyclable, reusable, or can be safely disposed of. This shift was part of the overall objective to improve the company's environmental performance throughout the life cycle of their products.

Project Activities

In 1992, BMS commenced efforts to develop a new environmental, health and safety programme. Environmental health and safety (EHS) programs, focussing mainly on compliance, begun in the early 1970s with the advent of internal EHS auditing programs. As part of the new programme in 1992, BMS commenced a Product Life Cycle (PLC) review of its existing product lines. Product life cycle analyses marked the cornerstone of the BMS pollution prevention strategy with all PLC reviews for all product lines to be completed by 1997.

Moreover, EHS evaluations were conducted of the facilities and operating practices of contract manufacturers and selected suppliers. Purchasing Guidelines were created, mandating BMS professionals to minimize any adverse environmental impact directly associated with goods and services purchased by the company. At a minimum, purchasing decisions were to consider: source reduction; availability of recycled materials; recyclability/reusability; renewable resources; hazard reduction; process waste reduction; handling and disposal; environmental technology; energy efficiency; and BMS suppliers' environmental commitment. BMS also endeavored to evaluate the performance of its waste handling and disposal contractors.

The evaluations were conducted by external consultants on a division by division basis. PLC reviews were carried out for each product from the initial point when the raw materials first arrived at the site until the final product was completely consumed. In some cases, an evaluation of the shipment of raw materials was completed including the proposal of recommendations. All existing products were evaluated, with the information used for product development and time reduction programs or other concurrent business initiatives.

The need to incorporate pollution prevention throughout the production process was catalyzed by the recognition that removing pollutants from wastewater merely shifted the pollutant to other areas such as sewers or landfills. The benefits of a PLC approach included more environmentally sound and safe product development as well as the minimization of energy waste and raw materials. By implementing pollution prevention throughout the product life cycle, BMS succeeded in enhancing its reputation, reducing the environmental impact of its operations, decreasing its costs, expanding its market share and creating new competitive advantages.

In addition to scrutinizing its existing products, BMS requires an all Capital Appropriation Requests (CARs) for new processes, products, and facilities that may affect the environment or employee health and safety be reviewed by the facility EHS coordinator. The CAR must address several issues including: permitted environmental releases; sudden environmental releases (such as spills and explosions); hazardous and non-hazardous waste generation, storage, and disposal; disposal of raw materials, intermediates, and final products; health and safety risks to employees; and energy consumption. In addition, CARs for projects involving new products or packaging must include an evaluation of total Product Life Cycle impacts on the environment.

Results

After completing PLC reviews for over 70 percent of its major product lines, BMS concluded that it could potentially save $ 7 million in product and process improvement opportunities. This could be accomplished partly by reducing the use of packaging, and decreasing its waste generation. The Environmental Guidelines for Package Development were drafted to direct BMS businesses to minimize the environmental impact of packaging by considering source reduction, recyclability, refillability and reusability, and safe disposal. Packaging was reduced in some of BMS product lines. Energy use in the manufacturing facilities was also reduced. Furthermore, recycling activity intensified, especially with regards to the production of process waste. PLC reviews that were completed resulted in an average savings of $ 340,000 per review. By the end of 1997, PLC criteria had been incorporated into the product development processes

Improvements were made in several product lines. For example, BMS was the first to introduce an alcohol-free hairspray. BMS responded specifically to consumer preferences and the need to eliminate solvent use. The product that incorporated eco-efficient improvements now exceeds stringent California VOC (volatile organic compounds) requirements. Another product was the flushable ostomy bag. Users of such bags can now flush away the used product. In turn, consumers are greatly convenienced and the environmental impact from disposable bags is minimized.

For Excedrin tablets, the printing of caplets was eliminated with debossing used instead. This was done to avoid the use of solvent-based ink, which when exposed to, proved harmful to employees. Moreover, debossing was shown to generate less waste.

In addition, the conversion to recycled and recyclable materials in Ovcon oral contraceptives was completed. Changes were also made in product transportation. One BMS facility began to use

reusable, collapsible, plywood pallet boxes for bottle/cap suppliers, which eliminated the need for a cardboard shipper. More than 175 tons of cardboard and $185,000 were saved by 1995.

In the production process, a hot room was replaced with drum heat jackets. The hotroom, which was kept at a high temperature, contributing to high-energy costs, was severely underutilized. Annual net savings of between approximately $5,000 to $12,000 resulted from the replacement. Moreover, the Black Euro Mum Glass for medicine bottles was required to be separated during recycling. This was substituted with black coated glass, which could be recycled with white flint glass. Consequently, waste was decreased while recycling potential increased. Moreover, the by-product in the production of hydrolyzed whey, which was previously disposed of, has now been used as part of a new product formula.

Pollution prevention has continued to be a priority for BMS. For example, the Pharmaceutical Group has decreased its releases of 10 high-priority solvents by 48 percent since 1988, and expects to reduce these emissions by 94 percent by the year 2000. The annual recorded case rate of occupational illnesses per 100 employees dropped from 4.5 in 1993 to 3.0 in 1997. The targeted goal is 2.5.

EHS employee awareness has extended to all BMS facilities worldwide. BMS provides training guidelines for both new and experienced employees and requires facility environmental coordinators and other full-time EHS professionals to complete, at company expense, at least 40 hours of annual EHS training related to their job assignments. BMS has also created a technology transfer database, called “EHS Best Practices”, which was developed to identify, summarize and share EHS operating solutions. This database tracks company-wide EHS activities and their compatibility with the BMS 16 EHS Codes of Practice (based on the principles of the ICC Business Charter for Sustainable Development) as well as provides financial costs and benefits data. The Codes of Practice must be adopted by all business functions and facilities at BMS. Every division completes an annual self-assessment, which provides a comprehensive framework for continuous improvement by identifying strengths and weaknesses in the company's management system. There are now 240 Best Practices available that address 18 business functional areas. The Best Practices database has generated a considerable flow of information that is accessible to all BMS facilities. Consequently, environmental solutions or eco-efficiency measures are easily obtained through the database.

Current cost savings of over $ 2.9 million have been realized due to the implementation of Best Practices. One example of a Best Practice Management Project is the reduction of toxic chemical use in laboratories. The initiative identified and eliminated 40% of the toxic substances that were previously used, diminishing employee exposure to the chemicals and reducing the hazardous chemical inventory. This led to a reduction of toxic waste generation of 80% as well as a decrease of laboratory cooling water use of 175m3 per year. Laboratory chemical costs have been reduced by $5,000 annually.

Another initiative under the Best Practice Management Project was the introduction of reusable label bins. All facilities adhere to waste minimization programs and are actively seeking ways to implement this target. Collapsible, returnable bins were developed to replace corrugated cases that were used for high-volume infant formula paper labels. This change has eliminated the use of 20,000 corrugated

shippers as well as 2,000 rings that were attached to the product container.

The Heating Ventilation Air Conditioning (HVAC) system was also improved. HVAC requires the continuous removal of boiler water in order to control the buildup of dissolved solids, thereby preventing scaling and water carryover. This process, known as “blowdown,” discharges high-solids water to the sewer to control the dissolved solids level. The process was altered where condensate material was recovered from the boiler water. As a result, blowdown is decreased since the water has a significantly lower dissolved solids level.

BMS has received recognition for its environmental activities. The Council of Economic Priorities (CEP), a US based independent research organization, awarded it the top environmental performance rating among pharmaceutical companies. CEP measured the performance of over 100 corporations on the basis of multiple environmental criteria and the company’s commitments in areas such as pollution prevention, employee accountability and energy use. In addition, four BMS manufacturing sites have received ISO 14001 standard certification.

Lessons Learned

Bristol-Myers Squibb has directed considerable efforts to minimize the environmental impact of its production process. The PLC initiative was an important tool used by BMS businesses to identify and reduce the EHS footprint of its products. By minimizing packaging, using recycled and recyclable materials, and reducing the toxicity of its raw materials, the overall impact of BMS products, including use and consumption by consumers, has been greatly decreased. PLC concepts have been successfully incorporated into new product and process development. By undertaking a more holistic approach, BMS has acquired valuable environmental impact information, which has enabled the company to improve its overall eco-efficiency.

Incorporation of PLC in new product development is still ongoing and BMS is faced with a continual challenge to develop new products, new methods of production, and new management practices that meet customer demands for product quality, cost and environmental protection. Moreover, BMS has taken the initiative of sharing their experiences with the medical profession. They prepared a report: *Innovations in Health Care Environmental Management: A Compendium of Effective Practices for Health Care Facilities,* which was a compendium based on presentations and discussions from the BMS conference "Innovations in Health Care Environmental Health and Safety," in June 1998 at Tufts University in Boston, Massachusetts. The conference provided health care professionals in administration, housekeeping, purchasing, facilities, and EHS with hands-on tools for reducing, recycling, and managing health care waste.

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WASTE RECYCLING AND BY-PRODUCT SYNERGY SCHEME
STMicroelectronics , France

Introduction

STMicroelectronics is a global independent semiconductor company that designs, develops, manufactures and markets a broad range of semiconductor integrated circuits and discrete devices, which are used in a variety of microelectronic applications. These include telecommunications systems, computer systems, consumer products, automotive products and industrial automation and control systems.

ST was the first semi-conductor company to receive EMAS (European Union Eco Management and Audit Scheme) verification for its site in Malta. They also became the first company in the world to apply EMAS outside of Europe. The ST operation in San Diego was the first company to achieve ISO 14001 certification in the world. All of ST's manufacturing sites worldwide are certified ISO 14001 and use validated EMASs.

ST has a corporate environmental policy which includes an environmental mission to eliminate or minimize the impact of its processes and products on the environment, maximizing the use of recyclable or reusable materials and adopting, as much as possible, renewable sources of energy, striving for sustainable development. The policy calls for a proactive approach in their environmental activities, which is based on the TZM principles, and guided by the 16 principles of the ICC (International Chamber of Commerce, *Business Charter for Sustainable Development*.) In addition, the company has published the *10 Environmental Commandments of ST*, which demonstrates their vision for environmental responsibility and sustainable development.

ST has a facility located in Rousset, France that manufacturers various semi-conductor microelectronic components. During the production process, acids are used thereby necessitating the cleaning of the components. The cleaning process creates sludge waste composed of calcium that requires landfilling. In France, landfill space is at a premium especially since the amount of available landfill space is decreasing. New French regulations aim to eliminate all class II landfilling by the year 2002. Consequently, the cost for class I landfilling will increase.

Project Activities

ST has developed a technique to process waste sludge into raw material that is useable by the cement industry. ST discovered that there were no process changes possible that could eliminate altogether the need for large quantities of water to clean the components. Chemical effluents diluted with large quantities of water would always be necessary in the semi-conductor industry. As a result, the company examined the possibility of using the waste by-product as a resource.

Supplying sludge to a cement plant is a complex process since the sludge must be carefully monitored to ensure that the sludge is of optimal quality for recycling at the cement plant. Additionally, the sludge must contain the absolute minimal amount of water possible, otherwise transportation costs

will increase. Successful by-product synergies depended on a close cooperation between the Rousset facility, the cement facility, and a third party for performing sludge quality analysis.

Results

By using the waste byproduct, ever-increasing landfill expenses were reduced or eliminated altogether. In 1997, 210 tons of sludge was recycled at the Rousett facility. This amounted to 11% of the total waste generated by the facility. One hundred percent of the sludge sent for recycling to be used by the cement industry was accepted.

Other facilities have supplied the managers of other facilities with the necessary information to assist them in managing their sludge for recycling.

Lessons Learned

This is a good example of a corporate initiative that was successful in developing a productive use for its waste by-product. This in turn had a highly positive impact in affecting the patterns of consumption within another industry. The main motivation may have been the need to reduce the cost of the disposing of sludge. Nevertheless, by-product synergy created a productive use for wastes that would otherwise have been disposed of into the environment. The additional benefit has been the use of that waste by another facility as a raw material, thereby obviating the need to extract raw materials from the environment.

The success of the project has stimulated further similar initiatives. There are plans to build a wastewater treatment facility that will serve all of the semiconductor manufacturers within the local industrial park. The facility will process sludge that would become suitable for by-product synergy with cement manufacturers.

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ZERO EMISSIONS PROJECT
Golden Hope Plantations, Malaysia

Introduction

Golden Hope Plantation has been in existence for over 100 years. The company's core business is focused in the plantation sector with more than 172,000 hectares of oil palm, rubber, cocoa, coconut and fruit plantations under its ownership and management. The estate produces and processes palm and palm kernel oil, rubber, cocoa, and fruits. It also owns and operates a palm oil refinery, and installations for palm oil and latex bulking.

Introduced from Africa, oil palm is the most important widely grown agricultural crop in Malaysia. Its cultivated area is more than 2.51 million hectares, which produced 7.81 million tons of palm oil in 1995. Oil palm is the highest contributor to the Malaysian agriculture sector income and Malaysia is the world's largest producer of palm oil accounting for more than 50% of the world's output.

Oil palm typically has an economic life cycle of about 25 years. Harvesting usually commences about 30 months after planting. Each palm can produce 12.18 fresh fruit bunches per year. One hectare of oil palm can produce about 23-25 tons of fresh fruit bunches per year which can be processed into 4 to 5 tons palm oil per year. Oil palm is known for its efficiency in terms of its low energy utilization and high productivity. It is ten times more productive than soya beans and has six times the yield of rapeseed.

Project Activities

Golden Hope developed a number of initiatives to recycle various by-products or wastes generated from the growing and processing of oil palm. The by-products are used as a valuable biomass source. Oil palm trunks and fronds and the fresh fruit bunches are mixed in with the biomass. Fresh fruit bunches and their subtending fronds are removed regularly during harvesting. The fruit bunches are sent to the mill for processing while the fronds are stacked in the avenues and inter rows. From this, the fronds return organic matter and plant nutrients, and protect the soil from erosion.

Although Golden Hope makes a concerted effort to reuse the waste and by-products at the oil palm plantation, some of their activities continue to generate environmental consequences. At the end of its economic life, old oil palms are turned into biomass and burned. This technique destroys organic matter and causes air pollution. Instead, the Golden Hope Plantation introduced the zero burning technique, which presents fewer ecological consequences. This method, contributes to a cleaner environment, replenishes soil organic matter, improves the physical properties of the soil and enhances soil fertility. Large quantities of plant nutrients are recycled into the soil throughout the decomposition of the palm residues, lessening the need for inorganic fertilizers. The technique involves leaving the old stand, where it was felled and shredded, to decompose *in situ*.

At the palm oil mill, the main by-product/wastes that are produced consist of empty fruit bunches, palm oil mill effluent, fiber, shell and boiler ash/clinker. Empty fruit bunches are obtained after the

fresh fruit bunches have been sterilized and stripped of the oil bearing fruitlets. Previous disposal of the empty fruit bunches involved incineration at the mill, which produced a high alkaline bunch ash. Incineration caused air pollution, motivating the discontinuance of this practice. Alternatively, the empty fruit bunches are used as mulch and organic fertilizer for oil palm and other crops.

The effluents from the palm oil milling process have a high biochemical oxygen demand. For every ton of oil produced, five times the amount of effluent is produced. Malaysian law requires that the biochemical oxygen content be severely reduced before it can be discharged into waterways. In response, effluent is treated by a biological process involving both anaerobic and aerobic digestion. Once treated, it becomes rich in plant nutrients and can be used as a fertilizer substitute. Generally, at the end of the effluent treatment process, the treated waste water from the aerobic pond is discharged into waterways.

Golden Hope has attempted to develop a closed loop system, with the possibility of creating zero discharge effluent treatment systems. In an effort to institute a zero discharge effluent treatment system, success was achieved in its treatment of effluent produced from the processing of rubber latex concentrates. The partially treated effluent at the aerobic stages is subjected to further treatment and recycled as clean water for process or other uses. The new system made use of both physiochemical and biochemical processes to reduce the solids content, as well as the chemical oxygen and biochemical oxygen demand of the effluent (reduced by 90-95%). The success of this has been the use of an innovative technology and practical application of sound principles of hydraulics and biochemical reactions. This system has been installed in three production centers.

Other by-products from the effluent treatment plant include sludge cake and biogas from the anaerobic digestion. Sludge cake is a good feed supplement for cattle and other animals. Biogas is recovered from the anaerobic closed tank digester. A 60-ton fresh fruit bunch per hour oil mill is capable of producing about 20,000 cubic meters of biogas per day, generating about 1000 kW of continuous electricity. Another by-product is mesocarp fiber and kernel shells, which are currently the main sources of energy in the palm oil mills. Their combustion in boilers produces more than sufficient energy to meet the oil mill's energy demand. Excess energy is supplied for domestic consumption in the plantation while surplus shell is normally used for road surfacing. The burning of fiber and shell produces small quantities of boiler ash, which can be used as fertilizer, and clinker, which still must be landfilled.

Results

The zero emissions initiatives by Golden Hope have been duplicated by other plantations and companies throughout Malaysia. Zero-burn replanting is now widely used and the application of biological processes to treat effluents has become an accepted commercial practice in Malaysia. Some of the byproducts have not been used as much as intended. For example, the use of sludge cake has not been significant. Biogas, despite its energy use potential, is still limited to only a few mills.

Lessons Learned

Palm and palm kernel oils are the primary products from the oil palm. However, oil palm biomass and byproducts from oil palm cultivation and oil palm processing are utilized or recycled to a large extent. Moreover, they can be valuable sources for new products. However, Golden Hope has realized that they have not fully reached the goals of zero wastes and zero emissions.

Two approaches are now being considered. Golden Hope will first attempt to improve the efficiency of oil palm cultivation and processing so as to optimize the use of inputs and energy and reduce the generation of wastes and effluents. One breakthrough has been in oil milling technology where the Golden Hope-Pieralisi process has greatly reduced the total effluent load by a factor of eight.

The second consideration is focused on increasing the value and extent of utilization of the biomass and by-products. Presently, bio-mass and by-products are used mainly as organic fertilizers in the plantations and sources of energy for the oil mill. However, the industry has identified a wide range of value-added products that could be produced from the palm bio-mass. Such products include: wood products; pulp & paper; ligno-cellulose products: furfural; biogas; biofuel; oleochemicals; and food chemicals. The downstream production of wood based and lignocellulose products has immediate prospects of commercialization. Work is already underway at the Palm Oil Research Institute of Malaysia and the Forest Research Institute of Malaysia, which has demonstrated the feasibility of producing products such as medium density fiber board, particle board, oriented string board, gypsum boards all from bio-mass.

In order to achieve zero emission through full use of biomass, Golden Hope is considering an integrated and coordinated approach. The overall objective is to use the plantation industry as a source of valuable renewable raw materials for clusters of industries. This approach has been adopted in the development of its rubber-based industries. Rubber wood has become a preferred material for the furniture and wood-based industries. In lieu of the global shift towards sustainable production, Golden Plantation developed a fully integrated rubberwood-based manufacturing complex to make full use of the rubber biomass. By applying the integrated approach, the biomass of the rubber tree will be fully utilized. Since rubber wood has become a valuable co-product, Golden Hope has refocused its objectives for breeding and selection of rubber cultivars and have developed a number of clones that are capable of producing high latex and rubber-wood yields.

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ECO-EFFICIENT PRINTING PROCESS
Beacon Press, UK

Introduction

The Beacon Press has tried over the years to be an active environmental leader in the printing industry. The company has a substantial environmental programme. It includes three main components: on-site working practices that actively favor the environment: an environmental education project aimed at company personnel, customers and the community: and assuming a leading role in the printing industry's internal debate on the industry's environmental impact and ways to prevent and/or mitigate the impacts. The Beacon Press environmental management system (EMS) meets both ISO 14001 and EMAS criteria. Beacon has won numerous awards including; the UK Environment Printing Company of the Year: the Royal Society of Arts Environment Management Award: and the AP&PB Award for Pureprint.

Project Activities

Beacon developed a new waterless printing process in response to the environmental impacts involved in conventional lithographic processes, which involved trapping ink between a mixture of water and the volatile organic compound (VOC) isopropanol (IPA). The use of IPA is a major concern for the printing industry, since it is a pollutant that presents a significant health and safety risk. The printing industry is accountable for as much as 10 per cent of the VOC emissions due to the use of IPA. IPA is an ingredient of the fountain solution employed in conventional presses to control the whereabouts of ink on the printing plates. All of the substances that are used in the printing process ultimately evaporate into the atmosphere. To reduce IPA usage, the conventional process was initially redesigned to consume lower concentrations of IPA. This led to the gradual transition to the waterless process. Under the new operational procedures, lower concentrations of IPA are tolerated. Subsequently, presses were re-engineered to work with plates that do not require any fountain solution whatsoever.

As part of its eco-efficiency efforts, Beacon also aimed to reduce its paper waste and to improve its water and energy use efficiency. It developed an approach to eco-efficiency that treated its plant as a closed system. This was in conformity with current thinking regarding life-cycle analysis. The measures that were used to monitor performance were related to the consumption of certain environmentally sensitive resources (inputs) and product flow (outputs). Measurements of expenditure, consumption and emission provide the company with meaningful indicators of environmental performance.

Another initiative was the progressive introduction of silver-free photography. The ultimate objective was to reduce consumption of silver and photographic chemicals to zero. All of the initiatives were to be promoted by managers who were mandated to ensure that environmental concerns were considered carefully when making decisions concerning new product developments or in presiding over the company's operations.

In 1997, Beacon developed the "pureprint" (TM) branding printing system. This is an advanced printing system that combines alcohol and water free technology with a comprehensive environmental management system. A "pureprint" label guarantees that the product meets the most rigorous environmental standards in the industry. It combines a waterless process together with many other elements such as waste reduction, the use of safer chemicals, the use of vegetable inks, and the recycling of silver from photographic plates.

Results

Since the introduction of the waterless process, IPA consumption has decreased from 0.14 to 0.03 liters per thousand impressions. The use of IPA has been reduced by over 79% (on a liters per thousand impressions basis). The waterless process began to replace the conventional process in July 1995. By August 1998, the waterless process accounted for approximately 75% of the production. It saves a total of 30,000 liters per year. The use of IPA was reduced by 79% from 1994/1995 to 1997.

Some critics have expressed concerns that waterless printing machines require closer controls and a greater use of electricity than conventional machines. These concerns proved to be incorrect as energy consumption remained constant at about 11kWh per thousand impressions. Gas is used only for space and water heating. This has led to a number of eco-efficiency measures such as the installation of a power factor correction device, a maximum demand monitor, low energy lighting, and thermostatic controls in the office.

Water consumption at Beacon is used mainly for hygiene, catering and cleaning. Waterless printing did not effect the water efficiency of the plant. However, Beacon has improved its water consumption leading to a drop in consumption from 25 to 13 liters per thousand impressions. Electricity consumption decreased by ten per cent while gas consumption dropped by 20 per cent.
There has also been a reduction in waste generation due to the application of the waterless process. The waterless process produced only 12.3% of waste compared to the conventional process that produced 17.5%. Other operating procedures within the plant have led to a total waste reduction of 30% compared with the levels in 1995. Other waste reduction efforts involve the collection of used photographic fix and waste film, which contains silver, a potential pollutant. Silver recovery units for film processors have been installed and are able to recycle the metal. Silver recovery units for film processors have also been installed, extracting the silver to be collected and recycled by a specialist company. Proceeds from the recovered silver contribute to a tree-planting scheme for the factory grounds. Since 1994, there has been a recovery of over 38,000 grams of silver.

The new pureprint process has also improved the quality of the paper produced. The ink is recessed within a layer of silicon with less "dot gain" or ink smearing of the ink. This allows for sharper resolution, increased ink densities, and brighter colors that are clearer and have greater consistency than conventional lithographic printing. Inks, ink strippers, plate cleaners, hand cleaners and other chemicals based on vegetable derivatives have been introduced into the production process. The plate cleaner is derived from vegetable oils, gum arabic and biodegradable surfactants while the hand cleaner contains citrus rinds, pumice, lanolin and jojoba oil. The newly installed dry film setting

facility completely eliminates chemical processing and requires no water consumption, storage of toxic waste, or disposal of chemical substances or waste water. There is no longer any need to use silver or other heavy metals.

Production at Beacon has increased from 58 to 77 million impressions from 1995 to 1997. Concurrently, operating costs per thousand impressions have declined by 13%. Profits have increased by 10% (11% decrease in price per unit). Despite an industry with traditional fluctuations in demand, monthly production has increased by 75%.

Beacon has been awarded the Business Commitment to the Environment Award for 1994-95, the Royal Society of Arts Environmental Management Award for 1995 and the UK Environment Printing Company of the Year.

Lessons Learned

The long-term objective of Beacon has been to completely replace all production with the waterless process. Another waterless press machine is expected to soon come on line, and this will ensure that Beacon's processes are 100% waterless. The greatest lesson learned is that an environmentally favorable production process combined with superior management activities can help to build a thriving, growing printing company. It is hoped that the unique and innovative nature of Beacon's environmental management approach will serve as a model for environmental best practice in the printing industry as a whole. It is also now standard company policy to inform all of its major suppliers and subcontractors of its own environmental policy and to express Beacon's expectation that the same standards will be likewise adhered to. Although Beacon cannot control the selection of paper by its clients, it actively tries to influence the decision-making process by promoting the use of recycled materials and sustainably resources or requesting that the products are manufactured in a way that results in minimal adverse environmental impact on the environment.

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BY-PRODUCT SYNERGY
Chaparral Steel Company , USA

Introduction

Chaparral Steel company produces bar and structural steel products by recycling scrap steel from old cars. It has remained committed to using new technologies to provide the best quality products at internationally competitive prices. Steel production at Chaparral uses the most stringent environmental controls and is constantly incorporating the newest environmental technology. The company has two electric arc furnaces that are sophisticated enough to produce a broader array of steel products than traditional mini mills. Most of Chaparral's products are sold to the construction industry and to the railroad, defense, automotive, mobile home and energy industries.

The primary source of scrap steel at Chaparral is old automobiles. An automobile shredder facility, which is the largest and most productive in the world, is located next to the mill. The volume of old cars used in the steel production represents about 40% of Chaparral's total scrap needs, giving them a competitive advantage in the acquisition of raw material. Wastes and by-products from the steel making process include three significant ferruginous streams: EAF slag, mill scale, and baghouse dust. In addition, auto shredder residue, non-ferrous particulate, and spent refractories are produced in the process. Mill scale can be sold as a source of iron oxide to Portland cement producers.

Project Activities

Chaparral recognized that other by-products were equally good candidates for by-product synergy and other pollution prevention measures. As a result, it developed the STAR (Systems and Technology for Advanced Recycling) project. The project's aims were to reduce process wastes, conserve natural resources and prevent pollution throughout the environmentally and economically sound recycling of waste materials generated by steel and cement manufacturing. By-product synergy between steel, cement, and auto shredding was the objective, which ultimately lead to the achievement of zero waste.

The STAR project focuses on three aspects of by-product synergy: baghouse dust, electric arc furnace (EAF) slag, and automobile shredder residue. Baghouse dust is a by-product requiring management by the U.S. Environmental Protection Agency due to its heavy metals content. Prior to Chaparral's intervention, the material was simply sent to lead smelters. Chaparral now uses the baghouse dust to make it a useful by-product. Heavy metals, mainly lead and zinc, are removed and sold. The remaining dust is then supplied to the cement industry who add it to their cement mixtures.

EAF slag by-product is produced by Chaparral as a resource for TXI's (Texas Industries Inc.) cement operations. A long series of theoretical studies, practical tests, and economic evaluations, led to the creation of the "ChemStar" ™ process. Slag is added to the cement raw material mix, thereby yielding larger batches of high quality Type 1 Portland cement. Prior to this innovation, slag was cooled, crushed, and sold generally to the road construction industry. The upgraded slag magnetic separation process allows lower grade metallics to be recovered and recycled back to the furnace. The lower-

grade iron slag is fed into the cement plant kilns, reducing the need for limestone.

The supplementary question to recycling automobiles is finding a use for the residue. About 700,000 obsolete cars are shredded every year, generating over 180,000 tons of residue. The residue is composed of a random mixture of aluminum, magnesium, glass, polyvinyl chloride, and rubber, as well as non-chlorinated plastics and other non-ferrous metals. These materials were traditionally dumped in landfills, since it was extremely difficult to separate the residue's contents. Chaparral installed a sophisticated ASR cleaning system, based on eddy current technology, to reduce the amount of residue that must be landfilled. Years later, the company purchased exclusive rights to an innovative floatation separation technology after pilot tests indicated that Chaparral's residue could be economically separated into essentially pure components. The technology allows for high throughputs while using very inexpensive flotation media.

Results

As a result of the ChemStar process, natural resources have been conserved while energy requirements have been reduced by 10-15%. Moreover, CO2 emissions during the cement-making process are lowered. Moreover, the value of slag is increased 20 times, due to its demand by the road construction industry. The process is now licensed by TXI to other domestic and international cement producers for a royalty, while Chaparral provides the equipment, technical assistance and the raw material.

In relation to automobile shredder residue, Chaparral has brought industry one step closer to total recycling of automobiles. The recycling operation is currently online although the project is still in its research and development stage. Nevertheless, numerous by-products have been developed. For example metals can be easily produced and glass can be re-melted, used as roadbed material, or used as an abrasive for sanding devices. The next step will be to find a way to separate the chlorinated and non-chlorinated plastics and to ensure that the technology in the recycling operation can be applied to a variety of waste streams. The Texas Natural Resource Conservation Commission has offered to streamline the process for these operations and to help identify potential applications for this technology.

Lessons Learned

The efforts by Chaparral and TXI demonstrate that by-product synergy can lead to considerable environmental improvements. It is no longer necessary to landfill waste since many by-products from the process can be used in other production processes. Moreover, both market opportunities and revenues have increased. Chaparral and TXI now have a larger array of customers and have sold their processes, in the form of licenses, to the rest of the industry.

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ENVIRONMENTAL TARGET SETTING
SC Johnson Wax Company

Introduction

SC Johnson Wax has a long history of responsible environmental management. In 1975, the company was the first to, voluntarily and unilaterally, eliminate CFC propellants from its aerosols. Since then, the company has institutionalized an environmental program and has set long-terms goals to ensure continuous action to improve the environmental performance of its products and processes.

Project Activities

As part of the its environmental campaign, SC Johnson set several targets to be reached by 1995. This included: a promise to cut virgin packaging material use as a share of the total by 20% by 1995; a reduction of air and water emissions and solid waste disposal by 50% by 1995; and a reduction of VOC use by 25% by 2000.

SC Johnson began its campaign for environmental excellence by setting several targets to be reached by 1995 or 2000. These included a 26% reduction of packaging material use, a close to 50% reduction in waste and a 16.5% VOC (volatile organic compounds) use reduction.

After its success in meeting these targets in 1995, the company attempted to improve their environmental performance by designating new targets as well as setting long range goals. The new objectives were to: reduce virgin packaging material by an additional 30% by 2000; cut combined air emissions, water effluent, and waste disposal by an additional and challenging 25% with respect to a 1995 base level; complete VOC use reduction of 25% from 1995; achieve a reduction of energy usage relative to production volume by 15% compared to 1995; expand the company's database on ingredient toxicity for improved product and process risk assessment; establish new financial and product eco-efficiency measurement systems; and maintain an open dialogue on local and global fronts with community neighbors, business partners, environmentalists, consumers and end-users in continual pursuit of new and enhanced partnerships for sustainable development. These commitments are expected to be met by the year 2000.

Results

The results of the first campaign were encouraging. SC Johnson cut virgin packaging as a share of the total by 26.8%, well above the desired target. The main contributions came from the increased use of recycled materials and progress with light-weighting containers. SC Johnson's worldwide manufacturing operations reduced combined air emissions, water effluents, and solid waste disposal relative to total production by 46.7%. This fell slightly below the 50% reduction target. The ratio of VOCs to finished formula weight was down 16.5% between 1990 and 1995.

In the second phase of the environmental performance targets, air emissions, water effluent and waste disposal has been cut by an additional 5% from 1995, despite an increase in production of 11% from 1995 to 1998. Surprisingly, energy use has remained the same, implying that there has been a substantial improvement in sustainable production when considering the company's increase in

output. VOC has been reduced by 24% of 1990 levels, almost reaching the 25% target set in 1990.

The toxicity database has expanded while much work has been done to develop new eco-efficiency measurement systems. SC Johnston has developed a unique computerized STEO (Success Through Environmental Progress) tool to help it further integrate eco-efficiency decision-making into product concept and product design processes and systems.

In total, SC Johnson has eliminated over 420 million pounds of waste from its products and processes. This has resulted in savings of over $125 million. Customers may have benefited as well from having light-weighting packaging, waste minimization and toxic reduction. Examples of light-weighting include Glade, which has a 7% light-weighting of its container, a 6% reduction of the candle weight and a drop of material use by 1,536 tons. In Europe, isomodularity for primary and refill packs has reduced cardboard usage by 25%, eliminated 180 tons of corrugated cardboard and reduced transport need. The Solutions Center technology applied to concentrated professional products, has reduced product waste by the end-user by up to 50% with less packaging, freight handling, storage and solid waste disposal costs for SC Johnson.

The company has also applied the Design for Eco-Efficiency principle in the construction of new facilities. There is a new NA Professional manufacturing facility that has been designed to meet corporate energy efficiency guidelines and to reduce scrap and obsolescence, as well as cut product making and transfer losses. This has led to massive annual cost savings as well as greater energy efficiency. The Netherlands Cogeneration Energy Center saves 669,000 m3 of natural gas annually as compared with conventional utilities. As a result, CO_2 emissions have been reduced by 1,200 tons. This facility also recovers and reuses 95% of its wastewater and reduces its fugitive emissions from piping by 85% over traditional methods. At the corporate headquarters building, campus energy systems have been re-engineered to reduce energy consumption by 45,000 btu/sq.ft.

The sustainable production methods at SC Johnson have received more than three dozen environmental awards around the world, recently being honored as Wal Mart's Environmental Vendor of the Year for 1998.

Lessons Learned

SC Johnson has achieved a great deal of success in meeting its internal targets and guidelines. This has been attributed to broad-based internal support of eco-efficiency objectives, sound business management and support and promotion of employee awareness. Eco-efficiency has been merged into the product development process by translating waste prevention and energy reduction efforts into cost-savings objectives. Product improvement has been designed to meet business and environmental objectives. This has spread to all components of the company’s production process, from product design conception through to the actual marketing of the product. Target setting has also been a great motivator for the company, and has galvanized increased efforts to continually strive for greater achievements.

Contacts

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PRODUCT INNOVATION
Azurel SA

Introduction

The most important environmental concerns in the construction industry are the energy intensity of heating systems and end-of-life waste disposal. Heating accounts for about 92% of the energy consumption over the entire life cycle of a house. In 1997, DOW Europe established a spin-off company Azurel SA to concentrate on the development of building products. Azurel produces, among other things, Styrofoam ™, a basic insulation product. The new company realized that the material not only had great insulating characteristics but also potentially considerable strength as a building material. When Styrofoam ™ was made more dense and reinforced with wooden panels, it could actually substitute for masonry or timber walls.

Project Activities

Azurel's new insulation product, (code named "Blue House" because of the insulation's color), began with years of development and product testing to ensure that the new product would meet safety and building codes. From there, efforts were made to convince builders and consumers of the merits of the new building material. In 1987, the first prototype house was built in eastern France. A few years later, eight houses were built with the new building material in order to test air tightness and energy consumption. The results were positive, making Azurel a viable building project.

In 1997, Azurel SA was established to focus on the new business realm of building products. They developed Azurel as a construction system. The basic element is composed of a composite panel made from high-density Styrofoam™ and wood panels. Azurel serves as a superb insulation material and a load-bearing frame. It can be used for walls, roof, and flooring. The system involves building a house as an integrated, made-to-measure system.

Results

Azurel components of the house are designed in the engineering office and assembled in the factory, rather than at the actual building site. Styrofoam ™ is blown with CO2 and not with CFCs or HCFCs. This not only minimizes ecological impacts, but it also reduces unnecessary transportation time, extra labor and the use of other externalities such as energy. There is reduced use of quarry materials resulting in less damage to landscapes, less noise, dust and risks. Building sites are safer, cleaner and quieter. When installed, a lower amount of cement is required for its foundation because of the light weight of Azurel. Construction time for a 100 m2 Azurel house is roughly 200 hours as compared with the 300 hours required for a similarly sized timber house, or 400 hours for a masonry house.

Dow conducted a detailed Life Cycle Analysis of Azurel along with conventional timber-framed and masonry houses. When comparing the three types of homes, Azurel homes were found to be superior with regards to non-renewable resource consumption, energy consumption, greenhouse gas emissions, eutrophication and solid waste disposal. It was noted as the essential equivalent to the

timber house with respect to acid substances.

Azurel was also considerably superior in terms of its energy efficiency. The total primary energy requirements for heating an Azurel house are 6% lower than a timber house and 12% lower than a masonry house. In economic terms, this represents a saving of three years of heating relative to the timber house and seven years of heating relative to the masonry house. Additionally, the Azurel house produces six times less disposal waste than a timber house and ten times less than a masonry house. At the end of the life cycle, Azurel panels can be burned to retrieve the inherent energy content.

The sales of Azurel are still low. However, these figures are not accurate reflections of the growing enthusiasm that the product has generated in the construction industry. Numerous construction firms and architects have acknowledged the potential of Azurel houses. Azurel has since signed a licensing contract with a construction firm in Poland. They are currently constructing one or two houses per month in France, with a rising market in the United Kingdom.

Lessons Learned

This is a novel case where production innovation is seen to be compatible with environmental improvements and still contribute to market expansion. New market opportunities are expected from the use of a superior product that is more environmentally sustainable. Moreover, the lower requirement for non-renewable consumption and relatively little waste generated by Azurel at the end of its lifetime will increase interest in this product, as the market demands more ecologically friendly and economically viable products.

Contacts

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SCIENTIFIC AND TECHNOLOGICAL COMMUNITIES

MATERIAL FLOWS ACCOUNTING

Wuppertal Institute, Germany

Introduction

The Wuppertal Institute has developed a material flow accounting system referred to as "Coordination of Regional and National Material Flow Accounting for Environmental Sustainability" (Con-Account). ConAccount serves as an international platform to discuss material flow accounting or material flow analysis (MFA).

Material Flow Analysis or Accounting is an accounting system that breaks down accounts into physical units (usually in tons). This can assist in understanding the link between economic cost information and ecological information. The physical units are comprised of the extraction, production, transformation, consumption, recycling, and disposal of materials (e.g. substances, raw materials, base materials, products, manufactures, wastes, emissions to air or water). MFA can include various approaches such as substance flow analysis, product flow accounts, material balancing, and bulk material flow accounts.

The ultimate objective of MFA research is to support policy, by identifying and resolving environmental problems and to support various institutions in their pursuit of sustainable development. It attempts to delve further into the complex backgrounds and causes of environmental problems and provide an overview of the underlying environmental pressures. For example, MFA can be used to monitor and support the increase in resource productivity through changes in technology, production and consumption patterns. It can be applied to analyze the relation between hazardous substances and bulk material flows to economic processes in a system-wide perspective, thus forming a basis for an effective materials management. The information obtained through MFA is expected to be used by statistical offices, governmental and NGOs as well as industry.

Material flow accounts assist in providing information that goes beyond singular indicators by monitoring the interlinkages of different flows and their interdependencies with human activities. The life cycle-wide inputs of primary materials can be used to indicate the general environmental impact potential of products and services. This will be valuable for environmental and economic accounting exercises. Integrating these accounts can then be used for the design and control of an effective material flow management in order to improve the environmental performance of economic activities.

Project Activities

MFA has been established in numerous places at the firm level although it is at the embryonic phase on the European, national, regional and community level. A task force was set up for a pilot study on "Eco Audit and Resource Management" in the wood products industry. The primary issues with which the study was concerned was the execution of an Eco-Audit according to the rules of the EMAS ordinance (No. 1836/93) as well as a life cycle analysis of solid core wood and particle board/formica kitchens. The EMAS ordinance provided an opportunity for developing a management

system, which attempts, through the use of preventative measures and strategies, to avoid cumulative protection expenses at the firm level. An analysis was performed for a small to medium sized company, Kambium Möbelwerkstätte GmbH, which produces solid-wood kitchens and other pieces of furniture.

The firm's input-output analysis was combined with a product line-based analysis of the company's resource demands as well as the firm's cost accounting procedures. The goal of the study was to assess ways for small and medium sized companies to minimize the costs of obtaining the desired certification while gaining the highest possible level of information about the environmental management system as well as the environmental stress intensity of their products. The Wuppertal Institute endeavored to specify a resource management strategy for the company that would permit them to determine specific methods for firm-specific material flow management and ecological design, incorporating alternative modes of product use, as well as of firm-specific environmental management.

A site analysis was undertaken, encompassing both a summary of the input-output material flows as well as a comprehensive inventory analysis. Existing resource management methods for energy and water as well as the transport and supplier-infrastructure were scrutinized. The facilities were reviewed as well and life cycle analysis of the environmental stress intensity of the company's products was undertaken.

Results

The life cycle analysis indicated that the company's products met the specific requirements for good management practices under the ordinance. The analysis of the kitchen furniture made of wood and the computation of the environmental stress intensity of the formica kitchen furniture were suitable as comprehensive informational instruments pursuant to the ordinance's requirements.

Lessons Learned

The focus of the Kambium project was to develop an efficient and easily implemented environmental management system that would be suited specifically for small to medium sized companies. A successful strategy allows the financial and personnel efforts incurred by these companies to be reduced to a level at which the majority of those companies can participate in the audit system. An integral component of the environmental management system was the firm-level quantification of the material flows analogous to the firm-level cost accounting procedures. Awareness of the synergistic effects of both the cost and material accounting meant that, efforts to obtain follow-up information in successive years could be reduced to a minimum. Moreover, a renewed firm-level environmental test could be accomplished with significantly reduced efforts.
The Wuppertal Institute is now developing a research and development agenda for MFA. Future plans for MFA research will cover methodological issues as well as the relevance of material flows for policy. Subsequently, the future task in relation to implementing MFA-based monitoring and information systems on various levels will be explored. Thirdly, the project will focus on essential tasks for MFA directly related to the management of the material flows. There is now a recognized

need to understand the real dependence of economic performance on material flows. Moreover, there is a need for improved information on the material flows that are directly or indirectly linked with different economic sectors. This will assist in assessing the environmental performance of the various sectors in order to foster an environmentally sound competition.

Although MFA does provide a comprehensive perspective, integrated solutions and precautionary actions, its widespread application for policy support is not accessible to most stakeholders. The intention is to improve relevance in the political process, which thus depends on the establishment of tangible material flow indicators. The indicators must be present in regular updated databases of material flow accounts.

The Wuppertal Institute plans on further developing MFA methodology. Input and output-oriented analyses are to be combined in order to develop a conceptually comprehensive and coherent approach to MFA. A code of conduct is needed for further MFA study, such as a refined terminology, a system definition in relation to the target question and conceptual background, scoping, detail and data quality demands. Moreover, there is a need to clarify the limitations of MFA. There is also a recognized need to combine the regional and national MFA and product and process-oriented MFA, that focus on the product. The results allow for harmonized local planning of processes and products with priorities for materials management on the (supra) national, regional and firm level.

Further development of the modeling of flows and stocks is another goal, as well as acquiring a better understanding of the environmental impacts of material flows. Another area of exploration will involve expanding the scope of MFA so that it can analyze the interrelation between economic gains and risks and material flow patterns as well as technological change and material flows. Future work will also concentrate on the interrelationships of materials flows, life styles and consumption activities. Consumption patterns will be analyzed with respect to time budgeting and material intensity.

Contacts

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WATER MILL IMPROVEMENT
Center for Rural Technology, Nepal

Introduction

The Center for Rural Technology was established in August 1989, to play a catalytic role in delivering technology packages to rural communities. The overall goal of the CRT has been to collaborate with people and institutions to formulate environmentally friendly technology projects and programs that respond to the issues, needs and problems faced by rural inhabitants. CRT also undertakes adaptive and action-oriented research on indigenous and improved technologies. Its staff include rural energy specialists, agricultural economists, agricultural engineers, mechanical engineers, agro-forestry specialists, gender specialists and technical experts. Their main fields of operation include development of projects relating to: micro-hydro; solar cooking technologies; improved latrines; biogas; watershed management; natural resource management; irrigation; and sustainable agriculture. CRT has also assisted the Nepalese Government and international donor agencies with the implementation of development projects.

Nepal is a mountainous country with rugged terrain, with several perennial streams, rivulets and rivers. Hydropower has been a traditional source of electricity in the middle and high hills of the country. Electricity had been traditionally harnessed through the use of a wooden blade/shaft water mill, however its low power output was geared only for grinding purposes. It has been estimated that there are between 25,000 and 40,000 traditional water mills, known as ghattas, operating in the hills of Nepal. The power output of these traditional water mills has ranged from 0.25 to 0.5 kW. Their use has been limited to grinding with low processing efficiency. Diesel-powered mills have been increasingly used since the ghattas have been unable to meet the increasing processing needs of local populations. However, these mills have tended to undermine the self-reliant set up of the villages and increase the dependency on imported machinery and diesel fuel. By contrast, the improved water mill proposed by the CRT has been able to generate up to 3 kW and can be used for end-uses. The CRT considered the use of this power for diversified activities such as efficient agro-processing, grain grinding, paddy hulling, oil expelling) and other useful applications.

Project Activities

In 1991, CRT developed an improved version of the century old traditional water mill that has been used for grinding and other uses. The mill uses the power inherent in flowing water for mechanically powering devices such as hullers, grinders and generators to produce electricity for lighting houses in rural areas.

The project had originally commenced in 1984, with financial support from the German Agency of Technical Co-operation (GTZ) to improve the performances of the mills by improving the hydraulic efficiency. During this initial four-year period, 80 mills had been improved. The Center started phase 2 of the project (implementing the project in two hilly districts) and continued, in collaboration with various development agencies, offering training support covering various potential hill districts.

The last phase of the project involved the GTZ, the Center and the Nepalese Ministry of Local Development, Women's Development Division. Efforts were directed towards training and demonstration activities. The participating entrepreneurs through personal credits/bank loans financed the installation of the improved water mills. The objective was to encourage and support the local mill owners to improve their traditional mills for efficient and diversified applications in order to enhance rural income and employment to the operator/owner and provide diversified end-use services to the village communities.

The water mills are mostly of the short-shaft type, which has increased the grinding capacity of the traditional water mill. The communities readily accepted this type since processing capacity was shown to increase. Its set up entailed only a simple modification, a low level of technology was required and less repair and maintenance was needed. In addition, there was a limited additional investment cost and risk.

Ownership of the mills has been on an individual or on a group/community partnership basis. A majority of mill owners have installed the improvements at full cost. Others have received loans from the bank, which are usually repaid in 6 months. The owner has been able to both operate the mill and do minor repairs, while local carpenters, blacksmiths and local technicians perform the major repairs.

The majority of the improved water mills have operated throughout the year, although some mills are seasonal, not operating in the winter due to the reduction of water discharge in the stream and its diversion for irrigation. If possible, such mills are shifted closer to streams, which are known to have sufficient water flow during the dry seasons.

Results

In total, 467 ghattas have been improved throughout Nepal since 1991. This has generated an additional volume of 712 kW of power to be used for various rural applications. About 40000 rural families (60 families per ghatta) have been served by the new installations. Since 1996, about 112 improved water mills were installed to facilitate rural communities. As a result, 480 water mills have been installed throughout the country. The improvement of these mills has catalyzed positive changes in the socio-economic conditions for mill owners as well as other community members and the village itself. Local self-sufficiency is increased while local blacksmiths, carpenters and technicians have greater job opportunities as their technical capabilities are enhanced.

Processing capacity of the improved water mills has more than doubled maize production. The processed grains from the new mills were shown to be of better quality than what has been provided even by the diesel mill. The revolutions per minute (rpm) of the grinding stone of the diesel mill has been higher than that of the grinding stone of the improved water mill, creating more heat, and thereby affecting the taste and storage quality of the flour. The greater capacity of the water mills has helped owners to process greater volumes by attracting more customers from distant villages with resultant income increases. The processing/waiting time of the village customers has been reduced drastically. The time saved is used for fodder/fuelwood collection, household sanitation, education, childcare etc.

There has also been an improvement in the meeting of basic human needs. The traditional water mills generated only 50 to 75% of the flour/grain that was consumed in the owner's family. Now, the charge collected is enough to feed their family with the surplus generating cash income.

Improved mills operate 6 to 12 hours a day. Its increased efficiency has substantially reduced the workload for the owner who previously had to operate their traditional mills day and night. Mill operation months have been extended during the dry season due to the mill improvements, particularly since the mills can now be operated with low water discharge.

Lessons Learned

Improvement of the traditional mill has represented the most promising option for those communities residing in the remote hills and mountains of Nepal. More communities are shifting away from diesel mills, therefore reducing the consumption of diesel oil, which had previously placed a financial burden on communities. Moreover, the water mill produces negligible environmental effects. Nevertheless, many villagers continue to prefer diesel mills because they enable faster processing despite the higher charges and lower quality output. This has in turn affirmed the need to systematically phase-out diesel mills.

There are still some modifications to the water mills that will be required. The end use application of the improved mill is mainly limited to grinding only. This has been due to the employment of the short-shaft types at the water mills. Few attempts have been made to use the power for paddy hulling. The deficient technical, managerial and risk bearing capacity of rural entrepreneurs have also inhibited technical expansion. Improved water mill owners have been shown to lack both technical and management aspects, especially when they are required to diversify the end uses for new applications.

Perhaps the greatest barrier to expansion of water mills has been the lack of support by the Nepalese government authorities. Since, the national power grid has not been extended to the hill communities, water mills have been generally used by the poorest sectors of society. Government subsidies have been provided to biogas plant, irrigation technology, solar energy technology and even diesel mills, but water mills continue to receive no government assistance whatsoever. Moreover, water mills have not been given due recognition and therefore priority in the national planning process. The lack of data and inventory on traditional water mills is scarce, thereby undermining effective long-term planning.

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FARMERS

SUSTAINABLE FISHERIES PROJECT

Yadfon Fishing Association, Thailand

Introduction

The Yadfon Association is based in Trang in southern Thailand. It has worked with local fishing villages, including Chao Mai, to promote community based coastal resource management and sustainable fisheries management. Fishing has been vital to the coastal village of Chao Mai. When fish catches began to decline, thus impeding the economic livelihood of the villagers, there was renewed concern about resource conservation, mangrove forest preservation and seagrass protection. Fish thrive on seagrass and mangrove swamps, which were increasingly threatened. Unsustainable fishing practices by larger fishing boats had depleted the resource from the seagrass and mangrove areas, forcing many local fishers to venture further away from the village. This required more fuel and therefore generating larger expenses. Many fisherfolk left the industry due to these increased costs.

The Yadfon and the fishers of Chao Mai decided that seagrass was an important resource that warranted further study. Yadfon facilitated the convening of government, academia and fisherfolk in an exercise to map and study/observe the organisms within the seagrass beds. This would commence the whole process of addressing the coastal resources, discussing community problems, awareness raising and eventually empowerment of the community to conserve/protect the natural resources.

Project Activities

In response to the decline, the Yadfon Association began to work with small scale fisherfolk to organize activities to supplement incomes, responsibly manage mangrove forests, reduce the use of destructive fishing equipment and develop sea grass conservation projects. The official project was carried out for three years with financial assistance from the Thailand Department of Environmental Quality Promotion supported by an ADB loan/grant. Activities continued after the three-year period, as a strong network of fishing villages were involved in participatory management of coastal resources.

Results

The project has resulted in considerable environmental improvement, which, in turn have generated positive impacts on the villager's livelihoods, income as well as more equitable distribution of income. Even after initial project funding had ceased, activities continued throughout a network of fishing villages who were involved in participatory management of coastal resources.

There has been an increased awareness about the importance of coastal resource conservation and protection and the link to fisheries production. Community leaders have felt empowered by the participatory nature of the project. Currently, there is an increased effort and coordination amongst fisherfolk, national park personnel, fisheries department, and the police to prevent pushnets and

trawlers from operating in the seagrass zone of the bay. The use of illegal & destructive fishing gear has also been reduced. Fish and crab catches have increased thereby increasing the villagers' income. Villagers now spend less time fishing and are not forced to travel so far from the village to fish and pay high prices for fuel. In turn, some of the fisherfolk who had initially left the industry, have now returned to pursue their original livelihoods.

The seagrass zone of Sikao Bay was declared a conservation zone by the provincial government. As a result, the seagrass beds and the endangered dug have been protected. This has represented the largest protected seagrass bed conservation zone in Thailand. Three additional types of fishing gear were added to the regulations banning certain types of fishing gear. In order to uphold the new law, fishers, park officials, district officers, fisheries department personnel and the police cooperate with each other. This joint effort has led to a powerful and effective relationship that will be essential in solving future problems of coastal resource conservation and utilization.

The benefits of this project have been offset however, by the impact of tourism development, land speculation and inappropriate infrastructure projects. Some people have been forced to leave the village with subsequent loss of their land. Many are engaged in tourist related activities as opposed to traditional fishing efforts and this has contributed to the undermining of the natural beauty of the Chao Mai.

Lessons Learned

The importance of broad-based multi-stakeholder participation was recognized early in the project. Government and academic support were important to provide the necessary impetus and organization. Lack of government cooperation did impede the greater potential of the project. The media would also have been a good stakeholder, since they can play an important role in raising awareness, publicizing the project and disseminating ideas. There was some skepticism at first to the project since the visual benefits of recovering the coastal ecosystem had not been readily apparent.

Contacts

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FARMERS LAND LINK PROGRAMME
Center for Rural Affairs, USA

Introduction

The original goal of the Center for Rural Affairs was to stimulate dialogue about social, economic and environmental issues affecting rural America, especially the Midwest and Plains regions. The specific issues it addresses include: the loss of farms and residents; an aging population; the need for greater diversification of rural income; and greater access to information. A volunteer board of diverse constituencies representing agricultural, business, education and civic interests governs the Center. Another major concern for the agricultural sector has been the lack of entry into the farming professions by young people. This has in many cases forced retiring farmers to sell their farms to larger, already established farms.

Project Activities

One of the Center's activities has been the Land Link Programme. It addresses the need to create new opportunities to keep farmers on the land by matching young people who want to farm with older landowners who have the knowledge, management skills and resources. The programme has provided a range of farm management services, a licensed realty division and a computerized clearinghouse. Hundreds of listings exist on the database. The Center also has acted as a liaison between landowners and young farmers.

One of the specific services that Land Link has provided is assistance to young people in deciding whether to pursue a farming livelihood. It also provides youth with help on management practices and sustainable farming practices. A few years ago, they started a summer camp called "Entrepreneurs of the Future" to teach youth how to translate ideas into concrete business plans. The camps are organized in conjunction with the University of Nebraska and the Nebraska Business Development Center. Another school project involved the REAP Entrepreneurial Development for Youth, that promotes the idea that both schools and the local community can benefit through increased interaction. It has been adopted in eighteen schools in Nebraska and is referred to as the "Starting Out Right" Program, which promotes preference for local farm operations against the growing large agricultural ventures that rely on chemicals and other unnatural forms of pest management.

Another initiative is the Beginning Farmer Sustainable Agriculture Project. The aim of this project is to create a more sustainable future for agriculture by assisting beginning farmers to use sustainable agriculture strategies to start farming. Sustainable practices provide the most viable options for beginning farmers. Moreover, beginning farmers are generally more amenable to sustainable farming as opposed to established farmers who have already invested intellectual, and financial commitments in pursuing conventional methods.

The availability of loans under the Stewardship Investment Finance Fund is contingent on the practice of sustainable agriculture. The Center works with beginning farmers and their communities in local

initiatives to revitalize livestock production by establishing new family farms using sustainable agriculture. There is also an advocacy component, where state agencies are petitioned for beginning farmer support and university programs are adjusted to provide educational opportunities about alternative farming/ranching methods for beginning and established farmers.

In 1990, The Center developed the Rural Enterprise Assistance Project. This project was a Grameeen Bank type of micro-enterprise system, which was designed to increase and diversify rural income. The Center had previously completed studies that revealed a high number of self-employed persons in the rural areas, despite the fact that economic development strategies at that time were not specifically designed to help this sector.

REAP has provided individuals with business management training, technical assistance, lending capital, and networking opportunities for starting and developing a small business. Members of the local business associations are able to secure loans and receive assistance with strategic planning, loans to start a business and ongoing counseling to manage their business successfully. The program builds on a local entrepreneurial spirit to orient locally generated dollars towards local investment. REAP has required the establishment of small business associations comprised of microbusinesses and local residents, which, in turn, raise money within their communities. These associations undertook to raise from $ US 1,000 to $ US 3,000, which the Center matches up to ten times that amount from its endowment fund and members of the associations approve the loans. The purpose of this arrangement is to ensure that the associations are committed to sound community development, and that communities demonstrate a strong stake in the success of the projects.

REAP is also addressing the developing needs of its association members. They have created an individual lending program to complement its association lending program. This has supported individuals who are experiencing difficulty in obtaining capital. The Center has also provided annual training programs and has published a number of different newsletters and journals, given technical support for a hotline and created an electronic “conference” on the Internet.

Results

The main contribution to sustainable consumption and production included the reconnection within the community, which involved bridging the relationship between generations as well as increasing the numbers of examples of sustainable farming. Individuals have become reconnected to the community and relationships between the generations have been reformed. Moreover, the link has brought together conventional farmers with sustainable farming operations.. Sustainable agricultural practices have become the norm, especially among young farmers. An innovative environmental finance program was set up that resembles an environmental audit.

The project database has also been a success. By the end of 1997, the Center had successfully made 210 matches. The Center reported that more than 1,200 other farmers with an average age of 34 are interested in seeking matches. Moreover, there were numerous examples of prospective farmers who had obtained the program’s educational material, and therefore learned about sustainable agriculture, without formally participating in the program itself. The process of Land Link has encouraged the

growth of 19 similar programs in other states and has led to the development of a curriculum on sustainable practices for community colleges. In fact, the volume of requests became so large that the Center has since delegated its information outreach tasks to the National Farm Transition Network, which coordinates all of the projects.

Since the Rural Enterprise Assistance Project started, it has lent approximately $130,000 with a low default rate of below two per cent. Businesses that have benefited from the project included Bed and Breakfasts, crafts, guilds and accounting to desktop publishing, small mechanics and catering services. Other states have since replicated the program. REAP currently has 32 associations in four states with over 304 active members representing 102 communities and ten more associations are planned. Since 1992, the volume of loans has nearly doubled. The programme has provided 183 loans with an average loan amount of $1,606 and total lending of $294,000. Four consortia have been formed to procure Community Development Block Grants to cover operating costs of the project, enabling REAP to cover the entire state of Nebraska.

The Nebraska legislature has since drafted two bills that encourage micro-enterprise development by providing funding for regional collaborative rural development projects. *Initiative 300*, which prescribes that farms must be operated by the landowners, thereby discouraging large agribusiness enterprises, has been incorporated into the state constitution. Moreover, the Nebraska Government has expressed its commitment to making policy changes concerning natural resources and environmental conservation. The Federal Government has expressed interest in programs similar to the Land Link, in a report drafted by the US Commission on Small Farms. Recently, REAP assisted the establishment of the Nebraska Enterprise Opportunity Network (NEON) to provide a forum for discussion and cooperation between like-minded organizations.

Lessons Learned

The two programs have helped individuals and groups assume responsibility for their own communities by encouraging participation, inclusiveness, business diversification, local investment and capacity building over the long term. Sustainable farming practices are promoted and greater success has been achieved in preserving the family farm.

One of the difficulties has been engaging the interest of older farmers. Many who had been involved in agriculture for longer periods of time, seemed to express an interest in the future of their farm. Others have expressed reluctance to the mentoring aspect of the program. However, retirees are beginning to demonstrate enthusiasm in light of the numerous positive experiences from the Land Link matches.

Contacts

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