INTERNATIONAL NETWORK FOR BAMBOO AND RATTAN
(INBAR)

TRANSFER OF TECHNOLOGY MODEL
(TOTEM)

COMMUNITY RATTAN NURSERY

by
Dr. Celso P. Diaz

**Department of Environment and Natural Resources,
Ecosystems Research and Development Bureau,
College, Laguna,**

Philippines

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TRANSFER OF TECHNOLOGY MODELS (TOTEMS)

Transfer of Technology Models (TOTEMs) are focussed educational tools providing relevant information and distance training on one specific area of bamboo/rattan management, processing or utilization. They are a means of technology transfer between similar regions throughout the world, with the emphasis on South-South transfer for livelihood development. They enable those involved in the management and use of bamboo and rattan resources to more efficiently and effectively develop and use skills relating to these resources.

TOTEMs are primarily intended as practical information resources and teaching aids for those at the local extension level in their communities, who can utilize them to assist local community development. Each TOTEM consists of a detailed written report of the technology, a PowerPoint presentation, a film, and, where relevant, a set of technical photographs. They also include information on target users, financial analyses of sample set-ups from the partner country preparing the report and information on where to source particular technologies (such as equipment). The TOTEM thus provides all the information required for establishing similar technologies within interested countries and regions.

- The **report** contains all the technical details of the particular processes involved, as well as other relevant information for establishing the technology such as costs of business establishment, running costs and cash flows.

- The **PowerPoint** presentation contains details of the relevant technologies and their applications, and is intended to provide an overview of the potential of the technology for development.

- The **film** provides a visual guide to the processes involved and helps to bring them alive in the minds of the learners.

The different parts of the TOTEM are targeted at slightly different audiences, via the local extension workers. The report and film are intended to be the main means of extension to the individuals and communities who will implement the technology and who will directly benefit from it. The PowerPoint presentation is primarily intended as a tool for the extension worker to sell the technology and its role in development to those who provide the infrastructural, policy and financial support for its implementation, such as government departments, donors and NGOs. There is considerable flexibility, however. Local extension workers will be able to incorporate the TOTEMs in their own work as they wish and adapt and develop the TOTEM to suit their particular requirements and conditions.

This TOTEM on the **community rattan nursery** has been produced by Dr. Celso P. Diaz at the Department of Environment and Natural Resources, Ecosystems Research and Development Bureau, Laguna, Philippines. The report part of this TOTEM describes the technology for producing and establishing community rattan nurseries for rural development in regions where bamboo is available as a raw material. It is intended to be used in conjunction with the illustrative film included in this TOTEM package

The format of this TOTEM differs from most of the other TOTEMs in this set. The information in this TOTEM is presented as a series of examples of successful community rattan nurseries in the Philippines. Information on the horticultural practices involved are included and background information on climate and other relevant variables is supplied. The management of the nurseries, their successes and failures and the communities' perceptions of them are detailed. It is hoped that by sharing these experiences in this way that the true value of these nurseries in social and community development will become apparent.

This TOTEM is one of the first to be produced by INBAR/ DENR and your feedback is most welcome - kindly contact INBAR or DENR with your comments or suggestions.

Note: This TOTEM has been edited at INBAR and differs slightly from the form in which it was received from the author

COMMUNITY RATTAN NURSERY AT-A-GLANCE

What are Community Rattan Nurseries?

A community rattan nursery is a cooperative venture between community members who all play a part in running it and all benefit from it. As a larger unit than would be feasible at the individual level, the unit has more leverage in accessing inputs and selling its outputs. Collective facilities can be established for the benefit of all, such as central propagation facilities, advisers and machinery.

What is the market for the rattans they produce?

The market for rattan plants varies considerably with location. Rattan cultivation is being promoted throughout the rattan growing regions of the world and is ever-increasing. Locally, an investigation into the potential market would be beneficial and continuous feedback necessary to ensure a successful venture.

What is the role of a community rattan nursery in rural development?

The community rattan nursery fulfills two important roles. Firstly it enhances the livelihoods of poor, rural farmers and does so by drawing upon their own inherent plant cultivation skills. The community nature of the unit will empower each worker with a voice and a role in its running. Secondly it promotes environmental protection, especially if established on degraded lands.

How do I establish a community rattan nursery?

As can be seen from the examples in this TOTEM, there are many ways of establishing a community rattan nursery. Fundamentally all that is required is land, rattan seedlings, some horticultural experience on the part of at least one member of the community and access to buyers of the seedlings. Ideally a community cooperative would be established in which all members have a share, and all would be able to benefit.

PART ONE

INTRODUCTION TO

COMMUNITY RATTAN NURSERIES

IN

THE PHILIPPINES

Introduction

The Philippines is endowed with the rich natural resources inherent in many tropical countries. The plant species are so diverse that many plant forms have become integral components in the way of life of many Filipinos. Aside from the woody trees that are the major and dominant components of forest ecosystems, rattans are considered as highly important non-wood forest resources. Over time the rattans became very important sources of livelihood and the mainstays of the global cane industry common to most ASEAN countries. In a recent report, the Philippines was regarded as the centre of the rattan furniture industry and highly acclaimed with the best and most elegant designs known in the world. Rattan poles and finished products have been the top exports.

Like any forest product derived from the wild in high demand, rattans in natural stands suffered from heavy extraction. Such pressure was felt in the 1970s, prompting the government to impose a ban on the export of raw materials. This situation was however, partly addressed by replenishing the raw materials by artificial means through plantation establishment.

Interest was sustained in rattan nursery improvement because of the governments' policy of using rattans as reforestation species to rehabilitate watershed areas with added productive value, along with other commercial species. The integration of rattans in forest plantation development opened avenues for livelihood development options for upland dwellers on one hand and for future augmentation of supply of resources on the other. Government projects and tenurial agreements that include rattan are the Upland Development Projects (UDP), Community Forestry Projects (CFP), the Community Based Forest Management (CBFM), the Socialized Integrated Forest Management Agreement (SIFMA) and the Integrated Forest Management Agreement (IFMA). In the private sector the National Development Corporation in collaboration with the Paper Industries Corporation and what was then Provident Farms, Inc. engaged in massive plantation development on a commercial scale. This developed opportunities to explore practical methods of rattan nursery protocols, including seed germination.

One step towards the establishment of a plantation is the propagation of planting stock in the nursery. Initially, the government spearheaded the trial planting of this relatively new plantation crop. The dearth of technology on rattan nurseries compelled the government to develop appropriate methods in order to be able to establish plantations. Research work was conducted to explore the technology for rattan seed germination, nursery establishment and silviculture. Thus, the protocols for raising planting stock were developed and were disseminated by various means such as print medium (How to Series, Research Digest), pilot demonstrations and training.

Identification and Sources of Technology

There are several sources of information and technologies on rattan germination and nursery techniques. Generalao (1981) described the different methods whereby rattans can be propagated. Agmata (1984) improved the germination by mechanically removing the hilar cover, which was considered a breakthrough in increasing the germination percentage and initiating early germination. Baja-Lapis, delos Reyes and Cali (1991) described the taxonomy, morphological and silvicultural characteristics of rattan species with emphasis on palasan. Decipulo and Decipulo (1996) developed a technique of germinating seeds using wet gunnysacks, which prolonged seed germinative capacity. The work of Bruzon (1992) described the different techniques of propagating rattan from seeds. The PCARRD How-to-Series (1992) published a package of information on the techniques required by rattan growers to produce planting stocks, set up nurseries and maintain the planting materials.

This TOTEM report gives an account of the adoption of the different sets of technologies in people's organizations, cooperatives and some sectors of the communities. It also includes revelations from some farmers of their own crude methods of germinating rattan seed, which has proved to be a handy method in remote areas. The report captures the insights and perspective of the respondents on the technologies they learned and adopted as partners of the State in developing rattan plantations.

PART TWO

THE COMMUNITY RATTAN NURSERY

1. Introduction

The selection of project sites for investigation depended on the presence of an active rattan nursery and/or a community engaged in the same. Before fieldwork, survey and arrangements were done for possible existing project sites in collaboration with the Ecosystems Research and Development Service (ERDS) of the DENR in Regions 2, 10 and 11 of the country.

Field visits, interviews and documentation were conducted from October 1- 30, 1999 in the selected areas of rattan nursery activity.

Data and information was gathered from the following sites:

Region 2 - Cagayan Valley ----------		Rattan seedling growers
Region 10 - San Fernando, Bukidnon -		People's Organizations ERDS research Staff
Region 11 - Marilog, Davao City ---		Peoples organization CENRO personnel
	Taguibo, Mati Davao	Oriental People's Organization cooperative, ERDS Rattan Focal Person, DENR CENRO Rattan grower

2. Establishment and management of the community rattan nursery - the Philippines experience

Site 1

Two sites were visited in Cagayan Valley, about 300 km north of Manila. One is located in Abbakeruan, Pamplona in the province of Cagayan and the other is in Diadi, province in Nueva Vizcaya. For both sites, there was no formal organization of nursery operators and no communal or central rattan nursery. Business decisions however, are at times taken in consideration with other individual operators, and information on management and markets are shared.

Site 1-A

The municipality of Pamplona is situated along the northwestern part of the province of Cagayan and is approximately 156 km from the provincial capital of Tuguegarao. It is

bounded on the north by the Babuyan Channel; on the south by the municipality of Luna; on the west by the municipality of Sanchez Mira, and on the east by the municipality of Abulug. The area falls under the Type 3 climatic classification which is usually dry from March to August and wet from September to February.

The major livelihoods of the people are farming, fishing, nipa wine making, and weaving nipa shingles. There are no prominent industrial facilities in the area but there are considerable sources of timber, nipa, rattan, bamboo, gravel and sand. All of the barangays (villages) are accessible by motor vehicles. Trade on the other hand, is somewhat hampered by the distance from major centers resulting in high costs of transport.

Abbankeruan has a total land area of 352 hectares and has forested mountains on its southern border. This is where local residents gather forest products like rattan. In 1997, the barangay had about 150 households with about 775 inhabitants (Pamplona Municipal Planning and Development Office).

The population is a mixture of Ibanags and Ilocanos. There was no available comprehensive report on the literary rate and the income level of inhabitants. From the interview however, it was learned that farmers' earnings ranged from subsistence to about P75,000 per year from farming and related activities. These are spent for basic daily needs, their children's education and other needs.

Rattan nursery technology

The technology involves the production of rattan germinants from collected seeds of palasan *(Calamus merrillii)*. The operators obtained the technology from fellow farmers who had previous experience in rattan plantation development and nursery operations from the Philippine Forestry Development Project in Ilocos Norte (PFDFIN). The process of transferring this technology from one farmer to another involves frequent interactions and actual observation of the activities performed by the ones who had the experience.

Rattan nursery operation

Arrangements

During the period of the interview, there was a lull in nursery operation among the farmers in Abbankeruan. According to Mr. Edwin Lucas, 38, and the project's lead person, their main buyer of rattan germinants had stopped buying from them. Rattan germinants, or undeveloped seedlings, were sold in the locality. A representative of the Greener's North, Inc. (GNI), the main buyer of the seedlings noted that reforestation contractors had also stopped buying from them. The Greener's North, Inc. served as a conduit for the marketing of rattan germinants from the nursery operators to reforestation contractors. The agent believed that the contractors were either through with their projects or were blacklisted by the government.

The height of the nursery operations was in 1996 and 1997. Before this farmers did not raise rattan seedlings regularly due to the limited market outlet. They only produced germinants when GNI placed "orders" from them. The GNI on the other hand, would not place their orders unless prior orders came from reforestation contractors. The GNI transacted business with the farmers (about 30 of them) through Mr. Lucas only.

Apparently, the latter did not receive any commission or any remuneration for this for the simple reason of belongingness or *"pakikisama"* in Tagalog terms.

There were two types of arrangements between the GNI and the farmers. The first arrangement involved paying farmers P300 per day for gathering rattan seeds from the forest. The seeds were given to another set of farmers who raised them into germinants. Farmers usually opted for this arrangement when in dire need of money. The second arrangement on the other hand involved farmers gathering the rattan seeds themselves, raising them in seedling beds and then sell them to the GNI.

Gathering of Rattan Seeds

Rattan seeds are gathered in September and October. Only one species, *Calamus merrillii,* was identified. The farmers/gatherers devoted two to three days per month to collecting the seeds. The gathering area was approximately 10-15 kms and the farmers/operators ply the area in batches of 10 or more persons at a time. The gathering area was along the riverbanks where rattan grew with nipa and other vegetation. A gatherer can collect about half to one 19-liter can of seeds a day or about 10 to 20 thousand seeds.

Rattan seeds were more preferable when they had started to fall naturally. They are usually gathered by climbing the tree itself or by using long poles to pulling them down. Seeds that have fallen naturally a long time ago were not collected as the farmers deemed it difficult to pick them up one by one under the litter. Farmers were not sure of the seed viability as they had already been exposed to elements such as water, insects and rodents.

Sowing in seed beds

The collected seeds were spread in about 1 x 10 meter seedbeds that were usually found at the farmers' backyards. The number of seedbeds depended on the amount of seeds gathered. Farmers usually had two to four seeds each. The seeds were then covered with a thin layer of garden soil. Coconut fronds spread on bamboo slats were placed about 1 foot above the beds to protect the latter from the direct impact of rain and intense sunlight. The beds were watered occasionally and other maintenance activities such as weeding were done.

Collection and Marketing of Germinants

About two months after sowing, the seeds have already sprouted into germinants with hypocotyl just emerging. In this case, farmers cannot determine seed mortality just set because some seeds germinate long after most of the others did. The farmers/operators would then contact the representatives from the GNI so that the germinants could be collected and transported. The germinants were carefully picked by hand, cleansed of soil and then placed in plastic bags of 100 or 1000 pieces each plus 10% allowance for mortality. Women and children were actively involved in this activity. The GNI paid the farmers P1.25 to P1.50 per germinant. The bags of germinants were secured in ice chests for transport directly to the contractor where the

latter paid the GNI an undisclosed amount. The contractors further raised the germinants into full seedlings in their own nurseries until they were plantable which is usually from June to September or the until the planting season of the next year.

Economics and other considerations

Inputs on the part of the farmers were: Unpaid family labor, a small space in the backyard and some local materials. Within about four to five months of gathering, sowing, and collection of germinants, there was no significant cash outflow rendered. There were no provisions for fertilizers, pesticides, materials and other supplies. Hence, given a viable demand, farmers can easily start with the business.

The income generated by a farmer can be estimated. Roughly around 40 to 80 thousand seeds can be collected within the four days of seed gathering. Assuming 50% mortality after sowing, about 20,000 to 40,000 germinants can be produced. Deducting 10% allowance for mortality during transport, there would be about 18,000 to 36,000 germinants sold at P1.25 each. This would amount to P22,500 to P45,000 of gross income realized. Considering that the farmers did not work in the seedbeds on a full time basis, considerable earnings can be derived even if family labor were valued.

Socio-cultural and institutional factors

Mr. Lucas could not recall any form of indigenous beliefs, rituals, customs or traditions related to or affecting their nursery operation. He was also unaware of any government policy or regulation that would affect his business. However he had previous experience in rattan nursery operations while employed in a forestry project in a nearby province several years back. He relied more on his sole outlet, the Greeners North, Inc. in terms of rattan-based livelihood.

Perceptions and recommendations

Mr. Lucas believes that this kind of business was easy to start given the minimal need for capital, labor and space. He believes that the activities involved in this business are fair to women and children and can easily be adapted by others and that it is ecologically sound. He commented that so far, no heavy conflicts have risen between the farmers. However, he hinted that competition for the source in the future could be a potential problem.

As a recommendation, he noted that the government should identify and develop rattan reforestation areas to sustain the market and that technologies in terms of seed storage and nursery operation should be extended to them.

Site I-B

The second site in Region 1 was Diadi, Nueva Vizcaya. Diadi is found on the northeastern part of the province. Nueva Vizcaya is situated at the central part of Northern Luzon, bounded on the north by the provinces of Isabela and Ifugao, on the east by Quirino and Aurora, on the south by Nueva Ecija and on the west by Benguest and Pangasinan. Its total land area is 390,387 hectares.

The terrain is marked by numerous mountains and forests, rolling hills and valleys and lush forests in the east. The province has a short dry season with no pronounced rainy months.

The population is a mixture of Tagalog, Ilocano and Ibanag speaking people. The primary industries include furniture making, food processing, ceramics and metal works.

The site investigated is adjacent to an old mahogany (*Swietenia macrophylla*) and teak (*Tectona grandis*) reforestation area. The farmers' source of planting materials included rattan gathered from within the reforestation area and from the natural forests. The former was planted sometime between 1989 to 1993. The area is accessible by common forms of land transportation or by a 30 minute hike from the highway.

Rattan nursery technology

The technology adapted by the nursery operators involved the gathering of germinants from the forest and rearing them in nurseries in their backyards. The farmers learned how to tend rattan seedlings from fellow farmers who had prior experience from being employed in early reforestation project. Other information was obtained from the DENR "How To Series" and other publications of the former Forest Research Institute (predecessor of the ERDB). The mode of technology transfer was direct observation and interactions.

Nursery operation

From the two rattan nursery operators interviewed in Diadi, it was gathered that they learned the process of rattan production in nurseries through their previous experience in the reforestation area. Four of them were either active or retired personnel of the reforestation project. As nursery operators, rattan was not their top priority species. They mainly grew mahogany (*Swietenia macrophylla)*, yemane (*Gmelina arborea)* and other tree species.

Unlike in site 1-A, the nursery operators produced seedlings even without orders from middlemen or reforestation contractors. Planting materials were usually from germinants gathered on the forest floor starting from November. Seeds of littuko *(Calamus manillensis*) were used as planting materials but were less preferred. The operators can save time in collection as the fruits were sold in the market places as a delicacy. Fresh fruits cost about P40-50 per kilogram or P0.10 per fruit. Preparing the seeds for germination however, was more laborious. Each seed had to be scarified in emery or on a coarse surface and potted in plastic bags. These were maintained and took a month or more for the seeds to germinate. About 90% survival rate was estimated by the nursery operators.

Gathering of germinants

Towards the end of the rainy season, the nursery operators occasionally visited the rattan plantation areas and gathered germinants from the forest floor. It was estimated that about 10,000 or more germinants can be gathered by a person per season (year) depending on the availability. The quantity gathered was also affected by the presence of poachers in the area that cut the rattan shoots for food. When the operators cannot attend to the gathering of germinants themselves, interested individuals were paid to gather for them at P0.25 to P0.50/pc. The germinants were extracted manually with the aid of pointed objects to loosen the soil in order not to damage the roots. The germinants were promptly brought home for potting.

Potting

The germinants would then be carefully potted in plastic bags containing a combination of garden soil and humus in a 1:1 ratio. They should be potted on the same day or the day after otherwise mortality would be high. Carefully potted germinants had survival rates ranging from 75 to 80%. If the operator or other members of his family cannot afford this activity, labor was hired at P0.10 per bagged/potted germinants. The potted germinants were lined up in make-shift beds in the backyard and then covered with plastic sheets on bamboo slats about one foot (30 cms) above the top of the bags.

Care and Maintenance

Potted germinants were not watered directly within three days after they were lined up in beds. Moisture was maintained by misting. According to the farmers, very wet or very dry media would cause higher mortality rates. Watering intensity was increased gradually as the shoots grow, and full watering was done when the seedlings were established. The plastic sheets were gradually removed and replaced with coconut fronds. Roots protruding from the plastic bags were prevented from penetrating the ground to avoid disturbance while handling them during marketing and transport. This was done by occasionally lifting the plastic bags containing the seedlings.

Seedlings were reared in the nursery for about a year. Occasionally, fertilizer and pesticides were applied. The 10,000 seedling capacity nursery requires about ½ bag of complete fertilizer, one small bottle of fungicide, and another small bottle of insecticide per year. The perimeters were cleaned though hand weeding.

Marketing

After about a year in the nursery, the rattan seedlings were ready to be sold. These were picked-up by reforestation contractors and other interested individuals. Price was highly variable depending on who was in dire need of what. If the buyer urgently needed seedlings due to commitments and reforestation targets, seedlings were sold from P8 to P12 each. However, if the operators badly needed money or if they needed to dispose of the seedlings to get rid of overmature ones, then prices can drop down to

P3.00 or P4.00/seedling. (Overmature seedlings are cumbersome to handle due to their thorns).

Cost and Returns

Costs and returns for a 10,000-seedling nursery can be determined from the foregoing section and can be summarized as follows:

COSTS		
Seed collection at P0.25 per pc.	-	P2,500
10 sacks garden soil at P50 per sack	-	500
10,000 pcs. plastic bags at P0.10/pc.	-	1,000
Local materials for shed	-	200
Paid labor for bagging P0.10/bag	-	1,000
½ bag fertilizer at P350.00 per bag	-	175
1 bottle fungicide	-	500
1 bottle pesticide	-	500
Labor for maintenance	-	7,000
TOTAL COST*		P 15,375
*Excludes unpaid family labor		
RETURNS		
Initial stocks	10,000 seedlings	
Mortality (25%)	2,500 seedlings	
Balance	7,500 seedlings	
Average seedling price	P6.00/seedlings	
GROSS INCOME		45,000
NET RETURN		P 29,625

Socio-cultural and institutional factors

There were no prominent indigenous beliefs, rituals, customs and traditions observed by the nursery operators. However, they were aware that rattan was encouraged as a reforestation species in community-based forest management areas. They recognized the role of private institutions as outlets and conduits for the seedlings they produced. They also recognized the need for cooperatives among nursery operators to cater to their needs and to explore wider markets.

Perception and recommendations

As in Site I-A, the respondents believed that rattan nursery operation was easy to start and would require minimal initial capital. Labor and materials were considered available throughout the year. Women and children can be involved and the activities

followed sound ecological principles. It should be the role of both the government and the private sector to set a good business atmosphere and to facilitate IEC and technology transfer. Rattan nursery technologies were accordingly easy to adapt by other would-be operators.

It was recommended that rattans should be required within regular government reforestation projects where possible. The government should have an active role in the production and distribution of planting materials to other potential areas if the private sector cannot provide such services.

Site 2 (Northeastern Mindanao)

In Mindanao, one of the selected sites was in San Fernando, Bukidnon in Region 10. There are two people's organizations engaged in rattan nursery management. Representatives of the two organizations were interviewed. They included rattan species in raising planting stocks as a response to the governments program to rehabilitate the Pulangi Watershed Area. This is also an area with a small-scale rattan furniture manufacturing industry.

Site 2-A

The first site visited in Bukidnon was in Halapitan, San Fernando. The peoples' organization (PO) was the Sail Halapitan Tree Farmers' Association, Inc. with 248 members and was holding a Community-Based Forest Management Agreement (CBFMA) with the government. The PO's total contracted area was 7,768.43 ha including 271 hectares for rattan plantation. Among the PO's objectives were the restoration and rehabilitation of denuded areas and the protection and conservation of forest areas from any destructive activities. Hence, among their many activities was the development of a rattan nursery to meet the demand.

The area had a total population of 2591 people with 588 households, 330 of which were migrants. The average household size was 5 members. There were 46.85% males and 53.15% in the community. The people were a mixture of Cebuanos, (41.18%), Manobos (10.18%), Boholanos (5.44%) and Ilongos (3.20%). Among the common livelihood activities were handicraft making, farming, and off-farm employment.

Technology in nursery operation

The process involves collecting wildings (about 70% palasan (*C. merrillii),* 30% tumalim (*C. mindorensis*)) and raising them into plantlets of plantable size or plantlets with 5 leaves.

Economics

The following are the costs and returns incurred by the PO.

COSTS	
Initial Outlay	50,000
Maintenance and Operating Expenses	
Seeds (50,000/yr)	50,000
Plastic bags (P350/1000)	17,500
Fertilizers (90 per bag)	450
Chemicals	300
Labor (Permanent)*	2,100
(Occasional) 7 cents/bag	1,225
TOTAL	121,775

*Computed as proportion of total permanent labor for all seedlings (50,000 out of 800,000)

RETURNS (For own use)		
Seedling Produced	50,000 seedlings	
Mortality (30%)	15,000 seedlings	
Balance/Survival	35,000 seedlings	
TOTAL RETURN		149,000
NET RETURN		P 18,225

Socio-cultural and institutional factors

There were no observed customs and traditions that would hamper the rattan nursery operations. Every provision of the Community-Based Forest Management Agreement was strictly followed. The PO receives technical assistance from other NGOs such as the Visayas Association for Livelihood Upliftment and from the local DENR Office.

Comments, perceptions and recommendations

The PO members had generally positive perceptions of the rattan nursery and the whole CBFMA operations. The activities were believed to be ecologically sound and gender friendly. The roles of both the government and private sectors were recognized although they admitted that information availability and other activities should be enhanced.

Site 2-B

The second site visited was in Little Baguio, San Fernando, Bukidnon. This is the site of the Community-Based Forest Management Agreement Project operated by the

Pagpalibud Tu Kakayuhan Association (Pagtukas), Inc. The PO has 227 members while the tenurial instrument was awarded by the government through the DENR covering a total of 1,102 hectares.

Rattan is just one component of the whole nursery operations. The rattan nursery has a capacity of 6,000 seedlings per season. Palasan was the only species raised and all the seedlings were used in their reforestation area.

Rattan seedling production involves the gathering of seeds from the forests by the farmers themselves. The seeds were sown directly on the seedbeds, covered with a layer of sawdust and then occasionally watered. After about two weeks to a month, the seeds were collected for bagging. Farmers observed a 50% survival rate. The seedlings were kept in nurseries for about 5-6 months more. After this, the seedlings were readied for planting. At the time of planting, about 25% more were accounted as mortality. Farmers also gathered wildings from the forest and these were directly bagged at the nurseries. Only 50% survival was observed using wildings.

Farmers were able to learn about rattan propagation techniques from fellow farmers and through experimenting. The local DENR office also offered technical assistance to them.

Site 3 (Southern Mindanao)

Site 3A

The first site covered in Davao Province was in Sitio Quimasong, Barangay Marilog, Davao City, which is about 54 km from the City proper. The people's organization is registered as the Swamp Upland Development Association. It has 30 families as members. The interview respondent, Mr. Orlando de los Reyes, is the Vice president of the said organization. He is married, with 7 children, and is a farmer who owns a three ha rattan plantation. He used to be a logging superintendent and acted as the area forester. He had been raising rattan seedlings even before joining the association,. He was informed about the use of rattans in planting through the Regional Office of the DENR

The nursery is located behind his house in a sloping area under planted *Gmelina arborea* and native tree species. The nursery can carry 100-150 thousand seedlings. At the time of the investigation, they had 54 thousand seedlings in various stages of growth. About 25 percent of the seedlings wee ready for planting. The species raised are palasan (*Calamus merrillii),* limuran *(Calamus ornatus* var. *philippinensis)* and bogtungan (*Calamus cummingianus*). The seeds were collected from Mt. Sinaka which is a 10 km walk from the nursery. The seeds were bought from the gatherers at P100 per kilo.

Seed technology

For seed germination the hilar removal method, which Mr. Delos Reyes learned from the PICOP nursery, was not adopted because it requires more labor and time. He mentioned, though, that it is an effective means of ensuring early germination. The technique he adopted for his rattan seeds was to burn the fruits under a layer of soil. He disclosed that he experimented on it by using different thicknesses of dried cogon (*Imperata*

cylindrica) layers on top of a thin layer of soil above the fruits in seed beds. He observed that those fruits exposed to burning under a medium thick layer of dried cogon had 80 percent germination in 20-30 days. He emphasized that the fruits should be those already fallen on the ground with the mesocarp almost purple in color.

Nursery activities

Soil bagging

This activity commenced with soil gathering by contracted men. They are hired for 70 pesos per day and the entire need for potting may cost about 3000 pesos. Plastic bags 3 x 5 inches are filled with soil by his family members led by his wife, Casilda. When Mr. Delos Reyes' immediate family can not cope with the work (since his daughters, age 12 – 18, are still studying), he contracts labor at 10 centavos per filled bag.

Germinant dibbling

The germinated seeds are extracted from the seed beds and transferred to the prepared bags. This is done by Mr. de los Reyes himself and occasionally by his wife. He ensures that the roots are intact and well covered with soil. Otherwise, according to his experience, loose soil in the bag causes mortality.

Watering

During the dry season, the potted germinants needed watering. The water is hauled from a nearby creek, about 2 km downslope. This is done by hired labor at 3 pesos per container (about 10 gallons). However, during the rainy season, he has a water tank where rainwater is deposited. Watering is done when there is no rain for 10 days.

Duration in the nursery

Seedlings were maintained in the nursery for 6 months. The recorded mortality rate is 10 percent, which was attributed to handling and seedling suppression in the beds.

Marketing and disposal

The raised seedlings are primarily intended for government projects such as Community Forestry Projects and as additional planting materials for the rehabilitation of watershed areas of the DENR with whom the PO entered into contracts. However, some private entities do purchase Mr. Delos Reyes' seedlings and are sold for P 3.00 (buyer collects) and P 3.50 (delivered). Small holders and farmers also buy from him. He plants unsold stock on his 7 ha farm.

Site 3-B

The second site was in Davao Oriental. Before proceeding to the site, the team of researchers paid a visit to the CENRO. We were briefed by Forester Salamoding A. Dicampong about the rattan plantation development project of the Region where the Peoples Organization was contracted to undertake the nursery phase and the supply of planting materials. He disclosed that the scheme to be applied in rattan planting is based on the contract reforestation scheme, which is a part of the Comprehensive Site Development. The goal is to develop 50 –100 ha. The financing for the project came from the trust funds intended to replenish the natural stocks that were collected from rattan permittees.

The people's organization is the Kawilihan Rattan Plantation Association located in Taguibo, Mati, Davao Oriental about 20 km from Mati. The respondent was Mr. Alfonso Cordata, the PO President, 60 years old, married with 7 children. He hailed from the Visayas region (Leyte) but lived in Davao for 38 years. He owns a farm and plants corn, coffee and coconut. He earns an income of about P18,000 per annum of which he spends 80% on food and the rest on clothing and his children's' and grandchildren's' education. He had training in tree planting in the early 1990s and in 1997 was trained in rattan growing by the ERDS in Region 11. Another rattan grower in the area is Mrs. Arsenia Dagusing, 56 years old, mother of 5 children. She grows rattan when there is a demand for seedlings and when asked to do so to earn additional income.

In the same area the Community Forestry Project Camar Multi-purpose Cooperative is also involved in rattan nursery operations. Rattans are integrated with agroforestry crops and forest tree species. The respondents were Romeo Agapay and Jose Valena in charge of the nursery in Carantic and a subsidiary nursery in Calapagan / Marayag, respectively. Both are members of the board.

The rattan nurseries are located 4-12 km away from their houses. They have three species of rattans, namely palasan, kalapi and bugtongan. Palasan is the preferred species by the DENR thus it accounts for 70 percent of their seedlings. Initially, the PO invested P35,000 for the land and P38,000 for a bank house. The collection of palasan is done by the members of the organization for free. They collect from the mountains of Taguibo, which is approximately 36 km from the town and is accessible by foot. The gatherers are provided with provisions for the 2-3 days fruit collection during the months of November and December. Other means of procurement is by buying seeds or fruits for 6 centavos each.

The cooperative bought seeds from a native individual belonging to the Mandaya Tribe named Alfonso Sumarigay of the nearby town of Don Mariano. He has a seed production area composed of 20 fruiting rattan plants and sells rattan for P 1.50 each.

Seed germination technology

There are two methods used to germinate the rattans. The first method is by burning weeds, e.g. cogon, over a layer of soil above the bed of fruits. This technique gave 40 percent germination as early as one week after treatment. According to Mang Alfonso, he discovered this technique after he observed a heap of germinating rattans in his slash and burn farming during the preparation of the planting site. This gave him the insight that the heat generated by the fire probably triggered germination. He cautioned that this can be done only with rattan fruits with grayish mesocarp.

The second technique that they adopted was patterned after the ERDS Techno-Transfer Series Bulletin No. 13 (1992), whereby freshly collected rattan seeds were first cleaned of its mesocarp by squeezing the fruits inside a net bag. The pulp must all be removed. Extracted seeds were then cleaned by soaping with detergent/bar soap after which should be thoroughly rinsed. The seeds were then rubbed in a sharpening stone (carbarundum) at least eight times. Hilar removal was combined with scarification using the carbarundum and resulted in 70 % germination. Mang Alfonso disclosed that the latter method is preferred because the germination is higher although it is more laborious and incurs slightly higher costs.

For the cooperative however, they followed the How to Series (1992) of ERDS. After the pre treatments, the seeds were placed in boxes with wet gunny sacks and covered with clear plastic sheets. After one month, the germinants were ready for transplanting in the plastic bags.

Nursery activities

The nursery activities employed by the group of Mang Alfonso and that of Mr. Romeo and Valena are very similar to those discussed earlier. For each of the activities, the members of the association and cooperative worked in the nursery, especially in the germination stage. The male dominated but at least 30 percent of the labor needs were met by the women, particularly the wives, and children.

The seedlings were raised in the nursery for 7-8 months, after which the members of the organization/cooperative planted them in the field.

In some instance, Mang Alfonso sold 600 seedlings to a private person for P3.50 each. The price of seedlings was computed by the ERDS and approved by the DENR-CENRO. The proceeds formed part of the associations' income.

Perceptions

The exposure of Mr. Orlando de los Reyes to forest activities, particularly logging, gave him the experience that rattan can grow inside the forest. In the past, he supervised the cleaning of forested area from entangling rattans and other vines prior to road construction and timber extraction. His interest in planting rattans developed further when a rattan furniture maker in a nearby town mentioned the increasing price of rattan poles and the long intervals for pole delivery. He was also guided by a Filipino adage "Kung may itinanim may aanihin" (Translation- If you plant you can harvest). He also has a passion for planting any seed he can get and while doing so, encourages local people around him to plant trees as well.

His wife (Casilda) noted that there are a number of students from Cotabato, the next province, who visited their nursery giving them the opportunity to spread knowledge on rattan nurseries. Even the local officials became interested in planting rattan when they gave them free seedlings. Furthermore, a non-government organization, Bahandi sa Kaumahan, benefited from informal dissemination of nursery techniques led by Mr. delos Reyes.

As Mang Alfonso and Aling Arsenia disclosed at the start raising rattans seemed to be a difficult project due to their lack of knowledge. However, after learning the different germination techniques they soon realized that it was not difficult after all. However, the

long wait for the rattan seedlings to grow dampened their enthusiasm. It took 7-8 months maintenance before the rattan seedlings are planted compared to growing forest trees that would only take about 2 months in the nursery. They were able to access information by training, word of mouth and by observation.

Acquiring the source of planting materials, such as seeds for example, was not a problem because there are still natural stands from which to gather seeds in the area. Plus there were the ethnic groups that can bring down ripe fruits for them.

The positive adoption of relevant technologies of the end user highly depends on the government forest development policy. The rattan nursery technology, for that matter, would not have received any attention had it not been included as a species in the government forest planting. On the part of the private sector, the interest in rattan technology is tied up with government funding support.

Nevertheless, for some upland dwellers, as revealed by this account, they believed that what they are doing is good for future generations. They also serve as effective messengers of information because they can demonstrate the technology directly in their nursery.

Ultimately, they believe that by engaging in rattan seedling production they participate in the restoration of the natural forest and hope to encourage other people to do the same.

3. Conclusions

Economic viability

Despite some limitations, technology transfer in community based rattan nurseries has lead to the realization of economic potentials. The technologies are manageable and do not need sophisticated gadgets. Labor is available all year round and capital requirements maybe considered insignificant compared to most small scale business endeavors. Minimal space is needed for the nurseries.

Although somewhat affected by the seasonality of fruiting, seeds and germinants are available wherever nursery operators need them. Indigenous materials such as bamboo and coconut fronds are readily available in the communities.

The farmers derive positive net benefits despite the fluctuations in prices and limited market outlets. In addition to the direct benefit that can be drawn by the nursery operators, the employment of occasional labor services offers indirect benefits to society.

The vast economic potential of rattan nursery operation can be better realized if proper business and policy environment are facilitated. Considering that the supply of rattan canes dwindles with time, the need to shift to plantations grows even stronger. This will raise the demand for seedlings in the very near future.

Role of market

From the cases presented, it is apparent that the market plays the major role in production. The market on the other hand is highly influenced by the availability of reforestation areas in the vicinities of rattan nurseries. This is very much exemplified by the

case in Cagayan Valley (Study site 1). In the case of the other sites, there are no formal markets and the seedlings produced substitute for the demand of the seedlings that otherwise will be bought.

The respondents are cognizant of the need to expand the market for rattan seedlings. And because rattan seedlings are raised in areas where there are considerable amounts of existing rattan stands, market expansion is somewhat limited. The role of information here is very important and responsibility lies in the hands of the private and public sector..

Environmental aspects

Rattan nursery operations and the application of pertinent technologies follow sound environmental principles. These do not require materials and substances that will damage the environment considerably. Of course, pesticides and chemical fertilizers are applied. However, these are administered in minimal amounts and can readily be assimilated in the field. Other processes require indigenous materials and needs no sophistication. Furthermore, energy and water requirements are minimal.

More than the minimal disturbance, these are long term impacts of rattan nursery development. Development of plantations mean microclimatic amelioration, carbon sequestration, minimization of soil loss, soil quality improvement, improvement of biodiversity and many other environmental benefits.

Social aspects

Rattan nursery technologies are not very sensitive to cultural norms nor are they governed by any traditions and beliefs that would hinder their development and adoption by other farmers and would-be operators. They show no particular potential to generate conflicts between interested groups. There is little need for specialization of labor that would concentrate authority or power with a selected few while marginalizing others.

Rattan nursery and seedling production technologies offer significant participation in terms of gender concerns. The roles of women and children are evidently seen and these result into closer working relationships within the family and the community. Consequently, everybody enjoys the access to benefits and resources.

Transferability of technology

Needing no sophistication and costly gadgets, rattan nursery technologies can easily be transferred into communities. The advantage with these kind of technologies is that the products are tangible and can easily be compared to those produced by traditional means.

It can be surmised that the presence of organized communities can hasten the transfer of technologies. Information is readily shared and the spirit of self-help reinforces the desire and ability to learn. And since organized communities command some bargaining power, they can deal with reputable entities with more influence.

Weaknesses and threats

Situations are not usually perfect. There are factors that threaten the sustainability of rattan nursery operation despite technology transfer efforts. Biophysically sustainability is adversely affected by the distance of the communities from the centers of services. Production is governed by the seasonality of the supply of seeds and adverse climatic conditions are forces to reckon with. It is sad to note that most if not all seed gatherers find their materials from stands that may not be genetically superior. This is one aspect that proper authorities may have to explore. Economically the market for rattan seedlings has not yet been fully developed and is marked by restrictions such as limited information and the presence of sole buyers and sellers in some areas. The economics of rattan seedling production is highly influenced by the proximity of the nursery to potential reforestation areas.

Among the major gaps affecting the sustainability of community rattan nursery technologies are on the policy side. There have been few incentive systems to encourage nursery operators to produce more effectively and efficiently. Policies instituting mechanisms to use stocks only from genetically superior and proven sources are also lacking.

Research needs

It can be surmised from the responses of the interviewees that they need more access to information. Without bringing them a package of technologies, they would rely on informal communication and by occasional participation in the training programs of particular government projects. There is a need for an active dissemination of rattan technologies through extension strategies that would meet the specific need of the local people. The present technologies require refinement and improvement with integration of indigenous knowledge that should be verified.

Parallel to the gaps in the policy and technology transfer is the need to conduct relevant research on rattan production. This will enable decision-makers to draft their courses of action more accurately rather than iteratively. The following may be considered as research areas both in the short and long terms:

a) Inventory of growth and yield studies of rattan stands both in natural forests and plantations
b) Potentials for the development of rattan plantation
c) Supply and demand studies
d) Site-species compatibility studies
e) Performance trials for rattan grown from seedlings
f) Socio-economics of community nursery operations; market research; market based instruments for rattan seedling production and incentive system
g) Technology transfer schemes among nursery operators and developers
h) Policy research

APPENDIX

Appendix

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