GRASSROOTS EMPOWERMENT AND SUSTAINABILITY IN THE MANAGEMENT OF CRITICAL NATURAL RESOURCES: A CASE OF THE AGROFORESTRY TREE SEED ASSOCIATION OF LANTAPAN

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ABSTRACT

There has been a tremendous upsurge of interest among smallholders in Lantapan and other parts of the Philippines to plant trees on their farms. This interest has not been matched by a credible and sustained supply of quality seed. The lack of quality seed has not only been identified as an impediment to the adoption and expansion of agroforestry systems and component technologies that are needed to address the twin problems of poverty and environmental degradation, it also has been a potent force against the quest to rehabilitate and utilize degraded and idle lands and to protect natural ecosystems for biodiversity conservation and management.

This paper outlines a client-oriented research and development approach to a system of self-seed production and management by a grassroots seed collection/production group in Lantapan, the Agroforestry Tree Seed Association of Lantapan (ATSAL). The approach in point identifies,

strengthens and seeks to build upon existing smallholder-driven seed collection/production, processing, development and marketing initiatives. It places emphasis on harnessing local knowledge and related resources in an attempt to develop, foster and sustain a process that will nurture interactive participation and integrate development and conservation. This client-oriented research and development approach demonstrates, particularly in the case of ATSAL, that "external" assistance can and will achieve so much with too little if it prioritizes working with "internal" initiatives in the search for a credible and lasting solution to a given problem.

Two broad issues are signaled for determined attention in ATSAL's future. The first is to strengthen the Association's entrepreneurial and managerial skills in the production of timber and non-timber forest-based products, collection and utilization of market and marketing information, livestock production, and the operation and maintenance of equipment for small-scale wood processing and related industries. The second issue is the need and capacity for ATSAL to scale-up its activities in Lantapan and beyond. Scaling-up is indeed a necessary step in ATSAL's development, and this process has begun through trainings that the Association has provided to other farmer groups in Lantapan and other municipalities. However, a

moratorium on further scaling-up activities at this time in ATSAL's history is suggested. There is also an urgent call to systematize partnerships between ATSAL and intermediaries, such as NGOs and their interface with public sector agencies, as an approach to scaling-up.

INTRODUCTION

Quality germplasm, in this case seed, is the most significant input in farming systems, including agroforestry systems. The seed determines the upper limit of yield, the ultimate productivity of other inputs, transference of genetic information from one generation of crops to another, the basis of economic yield of the majority of crops and makes substantial contribution to productivity independent of other inputs (Sperling et al 1996, Simons 1996, Cromwell et at l993, Cromwell 1990, Thomas 1990) .It is, therefore, an important source of innovation and intervention, particularly for farmers with small holdings of marginal lands, who have low capacity to absorb high losses and less resources for alternative inputs (Simons et al 1994, #Cromwell et al 1993).

The lack of quality seed has not only been identified as an impediment to the adoption of agroforestry technologies (Koffa and Garrity 1996) which

International Centre for Research in Agroforestry (ICRAF) is successfully disseminating through the Landcare Approach (Garrity and Mercado 1998, Campbell 1994) and participatory tree domestication initiatives (Weber et al 2000) in Claveria and Lantapan. It is also a major problem in the national quest to reforest millions of hectares of idle lands and problem soils in the Philippines to manage and protect critical ecosystems such as nature reserves and watersheds. For instance, costs just as much to establish tree plantations from poor (genetically inferior) seed as it does from seed of the highest genetic potential, but the difference in material and economic returns can be quite substantial. Poor quality seed has: (a) reduced storage capacity; (b) poor and non-uniform emergence when sown; (c) high incidence of abnormal planting stock, with high susceptibility to pest and disease attacks; and (d) often develop, into plant of poor quality in terms of yield, form and the rate of growth.

In high rainfall areas with steep slopes and nutrient poor soils, as is variably true for the Manupali watershed and the buffer-zone of the Kitanglad Nature Park (KNP), tree crops and tree-dominated agroforestry systems are the most stable forms of landuse other than natural forests (Sayer 1991). The introduction of such agroforestry systems and component technologies in

buffer-zones around protected areas has therefore been suggested as a credible technology option which may not only reduce pressure on forest resources, but may also improve the living standards of the rural population whose lives are almost exclusively dependent on such protected landscapes (Sayer 1991, van Orsdol 1987). This paper discusses a strategy that attempts to capacitate farmers to collect/produce, process and develop seeds of a variety of agroforestry tree species as a viable enterprise and for biodiversity conservation through the development of agroforestry systems and component technologies to manage the buffer-zone of the KNP. Around the world, farmers currently depend upon more than 2500 tree species for construction materials, fence posts, firewood, charcoal, fibers, resins, waxes, fruits, medicines, fodder, poles and service functions such as soil conservation, boundary delineation and shade (Salim et al 1999,Simons 1996). With these benefits the collection/production, development and marketing of quality tree seeds are potential alternative ways to promote local development so as to encourage improved natural resource management practices outside protected areas.

THE STRATEGY

Two broad categories of activities constitute the strategy for grassroots empowerment:

1.0. Characterization of farmer-managed germplasm collection and handling practices. In about a year of research and extension work with farmers in nurseries and on farms to improve the management of tree-based production systems, we learned that seed was collected by and exchanged among few farmers while others sold seed for cash in Lantapan and nearby municipalities. However, nothing was known about the appropriateness of the seed collection and the processing (extraction, cleaning, drying, storing, packaging) methods used, the quality of the seed exchanged or sold and the attendant constraints these farmers were faced with. A five-month case material (Koffa and Roshetko 1996) was undertaken to address these and related issues and concerns.

The case study mainly focused on assessing the seed collection, processing and diffusion practices and systems of smallholders, so as to understand these systems and to improve and use them to serve as channels and avenues for disseminating and producing quality tree seed. The study indicated,

among other findings, that, while farmers showed commitment and had an entrepreneurial spirit in seed collection and processing, serious knowledge gaps existed as to the adherence to standardized methods for seed collection to capture a broad genetic base. Most farmers, for example, collected seeds from only 1-5 trees. Collecting seeds from such a limited number of trees often result into the production of seeds of limited genetic base. Seed with a limited genetic base develop into trees that are highly likely to suffer from inbreeding depression. Inbred trees grow very slowly, develop poor form (i.e., branchy, shrubby and crooked stem) and are susceptible to pest/ disease attacks.

In a workshop arranged to share these findings with farmers in 1997, the 15 seed collectors who attended said they were not aware their methods were inappropriate and welcomed the findings. At the end of the workshop, this group of farmers decided to organize themselves into a seed collector/producer association0 that is now known as the Agroforestry Tree Seed Association of Lantapan (ATSAL), with ICRAF's facilitation (Figure 1). Farmers, by and large, cultivate and hence was quite familiar with cereal cropswhich are generally self-pollinating and therefore breed true. These differ greatly from tree crops, which are preferentially outcrossing (Dawson

and Were 1997, Simons et al 1994). Tree seeds must be collected to maintain a broad genetic base, and this is accomplished by collecting seeds from the minimum of 30 trees, which are about 50/m apart. The seeds are then bulked and mixed properly (FAO 1995). The requirement to maintain a broad genetic base is especially important if inbreeding depression in future populations of trees (in this case, on-farm) is to be prevented, and if an adaptive capacity in this genetic resource is to be provided to meet the ever changing and increasing needs of smallholders and the diverse micro-environmental and socio-economic conditions under which they must operate. Assessing and understanding farmers' seed collection/production and diffusion practices and systems was a pre-requisite to improving them.

2.0.Institutionalization of farmer-managed seed production systems.

The two main germplasm supply systems, which often co-exist, are the formal and non-formal (Simons 1996). In sharp contrast to the formal seed system that has recognized or licensed seed programmes, the non-formal system is the major source of seeds in the tropical developing world, and is composed of unaccredited seed collectors or unlicensed seed traders who, generally, are not concerned about the quality of their products and services. The formal system sustains its overall activities and assures the quality of its

products and services. It, however, delivers an insignificant proportion of the seed requirement of small, scattered, diverse and risky markets such as those found under smallholder conditions in developing countries (Cromwell et al 1996, Cromwell 1990, Garay 1990). Smallholders in Lantapan and particular in the Philippines as a whole, as our working experience with them indicates, largely depend on the non-formal system for agroforestry tree seed.

A new system of an intermediate nature between the formal and non-formal systems is critical if farmers' needs for seed are to be met cost-effectively and sustainably. A better means to address this concern is to directly involve farmers as more than mere recipients of seed but as active participants in the entire spectrum of activities, ranging from seed collection or production to seed processing and marketing. This means focusing on building the capacity of smallholders to collect/produce their own seed on-farm, adhering to standardized methods and exercising some degree of control over their production systems. A credible institutional structure is central towards achieving this objective. ATSAL's was created in 1998 to meet this objective. A grassroots institution like ATSAL is essential for success because these farmers have limited access, either directly or through

extension services, to information and technologies generated to improve their lot. Their limited capacity to tolerate risks reduces their desire and to experiment, thus, these quickly adopt technologies to their own circumstances. Perhaps, most importantly, they are rarely well organized or powerful enough to pressure research systems to understand and meet their demands. If relevant technology is to be developed and adopted indices, quality seed, farmers must be given the voice in the research process. ATSAL has provided that voice because it enables farmers to pool their talents and limited resources together in a working relationship with researchers to serve their interests considerably. As a strategy of empowerment, the process of institutionalization consists of the following elements:

2.1.Training needs assessment and training. In workshops and village-wide assemblies organized to identify training needs, farmers were advised to signal their interest by listing their names, addresses and the themes/areas each would wish to learn more about as far as seed collection, processing and development in nurseries and management in farms. Those who provided this information attended a workshop to indicate their availability for training and to discuss training mechanics and schedules. In the series of hands-on training exercises that followed the training needs assessment

process, participating farmers collected and processed seeds of varying sizes (small, medium, large) from a variety of agroforestry tree species, administered treatments to enhance germination of seeds of selected species in nurseries and undertook tree planting and management work on their farms.

These training's lasted for six months, which spread over two years, as interested farmers could afford to put in only two days per month. This time was required as farmers needed to learn about and participate in every aspect of the activities involved in the management of tree crops, ranging from seed collection and processing to nursery and plantation establishment and management. Ten carefully selected members of ATSAL attended these trainings. Hundreds of other farmers participated in the training but did not put in as much time as the selected 10. The 10 farmers were chosen on the basis of their demonstrated interest to learn more, their ability to teach others and their willingness to put in more time in practical work with researchers. Some training sessions were rotated among villages as per trainees' request. This was particularly done for seed collection and processing exercises, as well as for tree planting and plantation maintenance (fertilizing, pruning, replanting, thinning, weeding) in farmers' fields.

The goal/role of training in this work was to strengthen capability of members of ATSAL and to create the environment for changing the state-driven approach to forest management away from its narrow focus that sees and treats farmers as passive adopters (beneficiaries in government parlance) of imposed forest management schemes and practices, to a broad focus that accepts, respects, and works with farmers as partners in the management of forests and other critical natural resources.

The specific objectives of the training, therefore, were to: (a) initiate or foster self-reliance and self-determination in resident smallholders within the bufffer-zone to make informed and practical tree-planting and management plans and decisions; and (b) help scientists to develop, nurture and expand strategic alliance with smallholders in an attempt to strengthen private initiative in the management of forest and other critical natural resources within the buffer-zone and beyond, thus protecting the KNP and similar landscapes throughout the Philippines. Through training we have developed and are working with a pool of talented farmers. On several occasions, this team has been requested to train other farmers in various municipalities in Bukidnon on nursery management and tree planting activities. The Association has broadened its markets during the various trainings it has

provided for other farmers and has sold seeds and seedlings to managers of various reforestation and community forestry projects in some provinces in Mindanao and the Visayas.

In 1998, for example, ATSAL supplied seeds to the European Union-Agrarian Reform Support Programme's farm forestry projects in the Philippines, the Community-based Forest Management Programme of the Philippine Department of Environment and Natural Resources and exported seeds to Kenya. ATSAL's current membership is smallholders (as households and individuals). Members are residents of 10 out of the 14 villages of Lantapan, located across the landscape of the watershed at upper (Alanib, Cawayan, Songco, Victory) and relatively lower (Baclayon, Balila, Bantuanon, Bugcaon, Kulasihan, Poblacion) elevations.

ATSAL now serves as a unifying body that brings to bear farmers' collective will, skills, talents and efforts in meeting six key objectives. These are to sustainably: (a) collect and process quality tree seed to meet household tree planting needs and for the markets; (b) establish, develop and manage tree nurseries and tree planting activities efficiently and cost-effectively; (c) harvest, process and market trees and tree products and to produce wood for home consumption; (d) train other farmers in the

collection and processing of tree seeds, and the establishment and management of nurseries and plantations; (e) serve as a channel for disseminating and diffusing quality germplasm of promising agroforestry tree species from other countries; and (f) conserve steeply-sloped areas of farmlands by undertaking low cost , efficient soil erosion control measures, employing the independent or combined effects of grasses, shrubs and trees on contours to stabilize soils and check erosion. ATSAL is a chapter of the Landcare movement in Lantapan, active in the collection, processing, diffusing and marketing of tree seeds, a very important agroforestry technology (Figure 2).

2.2.Developing management efficiency

Quality seed production development and management compelled income earned from these activities are significant achievements. However, these are only an integral part of the whole picture of tree resources management. Unless quality seed is developed in nurseries and introduced and managed on-farm, it cannot become a component of an agroforestry system or an agroforestry technology from a practical standpoint. Working with ATSAL, efforts are made to get farmers to engage not only in the establishment and

management of nurseries and plantations, but to perform these tasks efficiently.

Nurseries are managed to raise uniform and healthy planting materials for the highest plantation output(s) at the least possible cost in terms of cash, labor, space and time. Our participatory research and development efforts are contributing to learning from and with farmers, particularly in our work in decentralized nurseries (those managed by individuals or group of individuals). Management of decentralized nurseries, a continuing effort, implies a situation in which rural people themselves, as individuals, households or group of households, are raising seedlings of species they prefer, primarily for their own needs and the local market. The various plant materials involved in ATSAL's work in nurseries include landraces, exotics and indigenous tree species.

Decentralized nurseries are more appropriate than centralized types (those run by corporations, cooperatives, etc) for our purpose on cardinal counts:

(a)Distribution and management efficiency. Because smallholders live in villages isolated by distance and rugged terrain, production and transport of seedlings is convenient, safe and made easier only by establishing and

managing small-scale nurseries in or close to these scattered and mountainous villages which our work cover;

(b) User sensitivity. Better provision of seedlings for a range of farmer-preferred tree species is made possible in decentralized nurseries, where farmers can and do engage in production for and by themselves at any time convenient to them;

©Equity. Decentralized nurseries provide a wider distribution of the economic and related benefits, which may be derived from raising seedlings. Because these types of nurseries require relatively low inputs and can be established on small plots of land around homesteads, etc. they are an enterprise in which socially isolated and economically disadvantaged people can participate to improve their lot;

(d)Sustainability. The management of decentralized nurseries is a credible approach to sustainability in developing forest resources, as this means transferring the means of production to end-users. When this happens, sustainability is highly likely to be a reality.

There are now 28 farmer-managed nurseries of ATSAL members across Lantapan. This number of nurseries include one central nursery where farmers work together to produce seedlings of various species (including native and exotic timber and fruit trees) to meet their on-farm tree planting

and marketing needs. About 56 small-scale woodlots (0.15-0.5 hectares) (planted in blocks, in boundaries, etc) have been established on-farm with seedlings propagated by smallholders themselves in these nurseries, with technical backstopping from ICRAF.

While there are standard procedures for tree propagation that can be applied with minor adjustments at different levels of production, creating a management system that could be conducive to sustainable production on the smallholder level is more problematic and remains a challenge. Such a system answers a host of methodological questions and hence contributes to fostering wide-scale adoption of agroforestry technologies and sustainability in production. Our work with farmers in decentralized nurseries is a step towards building such a management system, because this approach enables researchers to identify management weaknesses among farmers which can not be diagnosed by conventional methods such as interviews and surveys (Figure 3).

2.3.Encouraging product diversification. Because of the multiple needs of farmers and the vagaries of markets and the physical environment, product diversification to avert risks is very important. ATSAL members are not only collecting seeds of timber trees to meet their tree planting requirements

and for cash, they have also been trained to produce seedlings of fruit trees for their own use and for the market. The association is also in the process to begin establishing silvipastoral systems in their backyards in which fodder trees and animals (rabbits and goats in particular) are to be integrated and managed. This, of course, will require cash for each household to buy at least a pair of these animals.

Agreement had been reached with few ATSAL members who have these animals to share a pair with members who do not have or can not afford to buy them. The plan is to rotate a pair of these animals with each household, beginning first with five farmers. Each household will raise the pair upon reproduction, keep the offspring and pass the pair on to another household. Others are planning to begin saving some of the cash income from seed and seedling sales to buy either a pair of rabbit or goat or both. They say they prefer these animals because of the ease with which they can be raised. Restaurants in nearby towns and villages are potential markets for rabbit and goat meat.

In the past, research focused on producing technologies, which were widely applicable across a range of conditions that were broadly uniform. The Green Revolution is a concrete example. With resource-poor farming systems,

research must produce multiple products tailored to the identified needs of diverse client groups and production systems such as those of resource-limited, small-scale farmers (Merrill-Sands et al 1991). Thus, when research addresses the needs of resource-limited farmers, it must generate a number of different technologies, enhance their adoption in a wide range of conditions and evaluate them according to the broader range of criteria that farmers use Product diversification contributes substantially to the generation of different technological options. It also contributes significantly to the necessity to respond credibly to changing farmers' needs.

2.4 Linking farmers to markets

There is evidence worldwide that agroforestry system and component technologies have raised productivity of smallholders, whose production has largely been subsistence. Chief among the problems farmers face in Lantapan in this regard is the lack of adequate market and marketing information to sell their products or to profitably dispose of any excess that must have been produced as a result of improved agroforestry systems and technologies. A study was conducted to assess the market and marketing channels for smallholder-produced trees and tree products in Lantapan (Koffa and Garrity 1999). Information on markets for ATSAL's seeds and

seedlings. ATSAL's representation in national tree farmers' congresses and workshops had been facilitated. This has helped the association identify more markets for its seed.

Tree seeds generate income and employment faster and probably greater than wood, particularly for timber production which holds true for smallholders in Lantapan. Tree seed production affects soil stabilization within the buffer zone, on steeply sloped lands where intensive farming of cereal crops and vegetables is on going. This also means more wood can be produced hence more income generated, since more wood is expected to be harvested with longer rotation age made possible by seed harvesting and marketing. What the latter statement assumes is that as farmers earn from seed sale, they are highly likely to afford to wait a little longer before harvesting their trees for cash.

As of February 2000, ATSAL earned total of **$18,987.34** from the sale of tree seeds (**$13,493.67**) and seedlings (**$5493.67**). The processing and marketing of these forms of germplasm is managed by the germplasm collection, handling, development and marketing committee of ATSAL.

Figure 4 shows a group of ATSAL members visiting one of the lumberyards and sawmills where lumber is sold.

DISCUSSION

1.0.Advantages of self-seed production systems

There have been a large number of seed projects and programmes in many third world countries; the actual successes of these, as they affect the smallholder, appear relatively limited and the processes by which the seed reaches the farming community is not documented (Garay 1990). In working directly with farmers we realize that opportunities exist to increase the impact of tree domestication efforts hence improves agroforestry systems and component technologies, by elucidating effective diffusion mechanisms at the farmer level through the capacitating of self-seed production systems.

The smallholder-managed scheme has several positive features: farmers do the work themselves, the seed is available where the investment required is minimal, farmers have good knowledge of the potential of the seed and the seed can be tested by farmers themselves, under the diverse micro-environmental conditions under which they operate. This user-driven

approach to seed supply and diffusion is efficient and cost-effective as farmers become extensionists and researchers at the same time. ATSAL collects seed mostly from exotic plantations established about two decades ago and patches of natural forests that are not necessarily owned by the association. As such, these are not sustainable sources. On-farm trials of indigenous and mostly exotic tree species, established three years ago to select the best species mix on varying elevations, are being transformed into seed production areas to satisfy farmers' demand sustainably. Seed have already been collected from three of these trials (Figure 5).

1.2.Buffer-zone agroforestry and biodiversity conservation

Buffer-zone agroforestry has been ICRAF's principal approach to conserving biodiversity of the KNP. Genetic diversity is a critical component of biodiversity. The sources of genetic diversity in a genepool of a given crop, including trees, are: (a) wild relatives (natural processes unaided by humans); (b) landraces (crop evolution, selection and adaptation in farming systems of highly heterogeneous and often marginal environments); and (c) formal breeding (to create new genetic combinations on the basis of predetermined criteria) (Eyzaguirre and Iwanaga, 1995).

While new technologies employed in mutation breeding programmes and some engineered genes (of those with enhanced herbicidal resistance) may introduce new variations, isozyme and molecular data on diversity in wild relatives, landraces and modern cultivars indicate that wild relatives and landraces remain the major sources of genetic diversity in crop genepools (Miller and Tanksley 1990). The approaches to maintaining these principal sources of diversity in farming systems, while providing development options that support the continuity of populations of wild relatives and landraces, are to: (a) work directly with genetic resources which smallholders value and conserve; (b) create and conserve protected areas; and (c) provide smallholders with genetic diversity in the form of landrace germplasm from a range of sources (Ezaguirre and Iwanaga 1995, Maurya et al 1988, Altieri and Merrick 1987).

1.3.ATSAL and biodiversity conservation

The work with ATSAL and the rest of the farming community in Lantapan is addressing the key elements for maintaining the three major sources of diversity, as discussed above, while paying determined attention to meeting the socio-economic and related needs of buffer-zone residents. Complex agroforestry systems are being developed and are contributing to diversified

and sedentized farming practices within the buffer-zone. This will not only curb further encroachment on the remaining forest of the park, but will also increase productivity and generate income and employment for marginalized buffer-zone farmers. These activities clearly link conservation with development.

Linking conservation to development, as a growing body of literature indicates (Colchester 1996, Wells & Brandon 1992, Maurya et al 1988), is creating a situation in which local communities are beginning to see themselves as genuine stakeholders in resource management and park protection. For example, the cash benefit from the marketing of seeds and seedlings by farmers themselves, in addition to farmers being enabled to establish their own woodlots to meet their needs, create a social contract that link the welfare of these local resource users to the protection of the KNP. This, in essence, gives birth to a viable enterprise that links development to conservation as well as sustained, decentralized management of Lantapan's critical natural resource base.

1.4. ATSAL and grassroots participation

Despite the recognized and established significance of grassroots participation in attempts to manage the critical natural resource base (see Gakou and Force 1996, Fisher 1994, Clarke 1991, Raintree 1991,Cernea 1989, Postel and Heise 1988, Rao 1985), there has been limited improvement in the contribution of natural resource management projects and programmes to local development in practice. The essential argument is that participation has largely been seen in terms of merely seeking involvement of local people in projects exclusively conceived and largely designed by outsiders, rather than creating an enabling environment for local control of resource management through the participatory development of the required skills on the grassroots level.

Principally the entirely outsider-driven approach to resource management has clearly manifested itself, particularly in the case of the Philippines, into the establishment of new organizations instigated by outsiders in a given rural community or beyond, or hastily organized by insiders, rather than carefully identifying and supporting local grassroots institutions. The underlying problem is that outsiders often ignore the existence of local

institutions, either because they do not believe in their effectiveness or simply because they do not recognize them as institutions (Fisher 1994). Identification and recognition of grassroots organizations are key requisites to genuine participation. Interactive participation of farmers has been the central tenet of our work with them, including those who are not members of ATSAL.

1.5. The future

ATSAL is barely 2 years old. It is very young. The Association still needs more training in entrepreneurial skills, the management of small-scale wood processing and related industries, livestock husbandry and the propagation and husbandry of a host of indigenous tree species and non-timber forest products (abaca, bamboo, bee keeping, fodder, fuelwood, fruit trees). The Association, with time, needs to graduate into a tree farmer cooperative that spearheads collection and production of quality tree seeds as well as its distribution and diffusion. ATSAL may also serve as a channel through which quality germplasm from sources in other countries may introduced to a host of farmers and tested on-farm in the Philippines and other Southeast Asian countries. Training is also needed to develop skills for the collection

of market and marketing information and to operate and maintain harvesting and processing equipment.

The Association has got to scale-up its activities in Lantapan and other municipalities in the Philippines. This process has begun through the training, which it provides for other farmers in and outside Lantapan on the establishment and management of nurseries. However, emphasis at this point in ATSAL's history is on strengthening the association further in the various areas mentioned and many others. As it gains confidence that comes from experience, ATSAL will definitely do more in Lantapan and beyond. At its infancy, the association is doomed to failure if it begins to engage more in scaling-up activities than it has at the time. For example, as ATSAL expands so will the need for quality control. Quality seed is a biological technology requiring physical attributes such as viability, health, vigor, purity, etc., to be an effective carrier of biogenetic innovations from the research phase to farmers' fields (Garay 1990). Adherence to strict seed quality control is therefore a necessity and this will require monitoring of storage facilities of hundreds of farmers in isolated villages. There also is a concern about the prices of seeds. If ATSAL attempts to expand without the required experience that comes with time in most cases, hundreds of other farmers will associate and thousands of kilos of seeds of a variety of tree species will

be collected and marketed. Flooding tree seed in the markets may cut down prices if the seed is in demand or will pile up seeds in farmers' homes if they are not in demand. This disincentive will certainly be a recipe of total failure for a young association. Clearly, no one knows how much time is needed for the Association to engage in scaling-up activities in full, but as ATSAL gains experience through practice, it ultimately will develop its own strategy to expand and diversify. There, also, is an urgent need to systematize partnerships between ATSAL and intermediaries, such as NGOs, and their interface with public sector agencies, so that technologies developed in the work with ATSAL can be speedily and efficiently replicated. This is another approach to scaling-up.

1.5.Lessons learned

Biodiversity conservation and management has been one of the three main programme components of SANREM-CRSP. Its goal is to evolve community-based approaches/strategies to the conservation, management and utilization of existing biodiversity (fauna, flora) in selected regions in the tropics. In our bottom-line world, results tend to be equated with an immediate, tangible product, something that can be captured with a dollar sign or a snapshot. However, in a community-based approach to biodiversity conservation and management, today's successful product can become

tomorrow's white elephant (in the form of abandoned hedgerow systems or abandoned community-based nurseries) if it is not a fruit of a genuine and broader participatory process. This is not, in the least, to suggest that the emphasis on results is misplaced. It is particularly vital today in the world of growing demand and dwindling resources.

The challenge on our hands, therefore, is to identify a community-based development strategy that will take into account both success in the short run and sustainability over time, in attempts to conserve critical ecosystems upon which the lives of smallholders directly depend. Improved agroforestry systems and component technologies, if developed through a credible participatory process, offer a lasting solution in these respects. In about two decades, agroforestry has re-emerged as a means to produce traditionally important goods and services, listed earlier in the body of this paper. As such, agroforestry can be viewed as an intervention to break the downward spiral of land degradation and rural poverty.

The forest and non-wood forest-based products whose simultaneous production agroforestry systems provide, can be used by smallholders in Lantapan to either generate cash with which to buy fertilizers to improve the

yields of staple crops or as a profit-motivating incentive to promote the establishment of more trees on-farm. This, ultimately, will ameliorate soil depletion and land degradation across the landscape of the Manupali watershed and the forest margins of the KNP. Thus the vision now is of agroforestry as an integrated land use system that combines productivity and income generation with environmental rehabilitation and diversification of agroecosystems. Central to the development of improved and efficient agroforestry systems is quality seeds and the processes involved in their appropriate collection/production, processing, development, dissemination and marketing.

ATSAL is a product of a farmer (client)-oriented research and development process that encourages grassroots participation in conservation. This client-oriented participatory research and development process initially identified seed collection and marketing activities which farmers themselves undertake towards improved living standards. Working with farmers, these activities are being improved and formation of a grassroots institution facilitated. This process creates and strengthens links between farmers and researchers in three basic ways that also promote interactive participation. First, it emphasizes feedback, and this helps to ensure that research is driven more

by demand (responding to the needs of clients) than by supply (reflecting mostly the interest of scientists). Farmers will interactively participate in a process if they know that it genuinely takes their interest seriously. This attitude is highly likely to develop when "external" assistance identifies "internal" initiatives and interest with which to work and improve (if need be), rather than re-inventing the proverbial wheel. This approach is not only cost-effective; it also enhances interactive participation and ensures sustainability.

Second, the process performs three basic tasks that are critical to technology generation and adoption. These are diagnosis of real problems, design of relevant solutions and evaluation of technologies. Third, this client-oriented participatory research and development process enables researchers to monitor changing problems in farmers' situations, thus enabling research to take corrective action or respond more quickly to farmers' evolving needs. Evolving strategies for community-based resource management must be sensitive to farmers' evolving needs. About four years ago, the landscape of the Manupali watershed was dominated by a single tree species, Gmelina arborea, planted mostly along boundaries. To date, a variety of other tree species has been introduced through the numerous woodlots farmers have established on their farms. There is therefore a greater tree cover within the

watershed than it was four years ago. This increase of tree species in diversity and space is a living testament of increased experience and self-reliance of farmers, engendered by research and training this project provides. What must be remembered here, however, is that research and training efforts were directed to strengthening technologies which farmers themselves genuinely felt could improve their standards of living.

Our immediate clients, smallholders, are more concerned about the health and continuing productivity of their land than any salaried employee; their survival depends on this. Concerned farmers, if properly trained and organized, will therefore react positively to technologies, which would improve their management efficiency, produce economic benefits and are simultaneously conservation-effective. The collection/production of quality tree seed and its processing, development and marketing, integrate conservation with development. The ATSAL experience demonstrates that even in the most remote and apparently resource-scarce situations, it is possible to develop a viable production system that draws its strength from interactive participation.

ACKNOWLEDGEMENTS

We are indebted to the Sustainable Agriculture and Natural Resources Management Collaborative Research Support Programme, USAID, for financial support and partnership, and do gratefully acknowledge the useful suggestions on the first draft of this paper from Dr Gladys Buenavista and Dr Ian Coxhead. This work was also made possible through the leadership of ATSAL management. We particularly acknowledge with profuse thanks the dedication and commitment of Alberto E. Ceballos, ATSAL's chair Alfonso Sagayan and Ricardo Labor.

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Titles/Captions of cited Figures:

Figure 1. Registration of some of the farmers who attended the "feedback" workshop during which ATSAL's formation was decided

Figure 2. A seed processing session of the workshop that followed a series of seed collection activities (in the field). Note the arrangement of seeds of 4 tree species with respect to size (large, medium, small: L-R)

Figure 3. Transplantation of young plants from seedboxes to plastic bags. This is an extremely important activity in seedling production. Participants in this training exercise also include farmers who are not members of ATSAL

Figure 4. A group of ATSAL members visiting a lumberyard and a small-scale sawmill. There are 3 of these in Lantapan and dozens in the municipalities of Malaybalay and Valencia. These establishments are markets for smallholder-produced wood (sold here mainly as sawn timber)

Figure 5. A portion of one of the 15 on-farm trials involving 14 tree species, established on 10 sites of varying elevations. The trials (including this plot) are 3 years old