The Landcare experience in the Philippines: technical and institutional innovations for conservation farming

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Contour hedgerow systems using nitrogen-fixing trees have been widely promoted as important components of soil conservation in South-East Asia in order to minimise soil erosion, restore soil fertility, and subsequently improve crop productivity. Although positive results have been observed and reported in a number of experimental and demonstration sites, farmers have been slow to adopt the systems. A number of factors are believed to cause this slow adoption: the high amount of labour needed to establish and manage the hedgerows; the poor adaptation of leguminous trees to acid upland soils; the lack of ready sources of planting materials; and the fact that hedgerows may reduce crop yields through their strong above- and below-ground competition with the crop.

ICRAF has been conducting research on contour hedgerow technologies in Claveria, northern Mindanao, Philippines, for the past decade. Intensive examination of many facets of contour hedgerow systems has led to the conclusion that hedgerow systems of leguminous trees consistently increase maize yield by 20–30 per cent, although reasonable yields cannot be maintained without external nutrient supply (particularly of phosphorus [P]) in addition to the tree prunings. However, the yield increase realised does not sufficiently compensate for the extra labour needed to establish and manage the tree hedgerows. Thus, net returns to the practice are usually low. The result is that tree hedgerow systems are usually abandoned after several years of trial.

This does not imply that farmers are not concerned about soil erosion. Erosion was, in fact, one of the top concerns among farmers in our surveys. What it does imply is that any technology, to be adopted, must have minimal cost to farmers, as well as to the public institutions supporting the programme.

Agroforestry or soil conservation technologies must fit within the context of marginal farmers, and be based in their socio-economic and biophysical environments. The socio-economic environment includes land, labour, and capital. The biophysical environment includes soil, climate, and vegetation. Any agroforestry or soil conservation technology must promote plant species that can adapt to the soils of the upland farmers, which are often poor and vary from site to site. Therefore, there is a strong need to develop technology options that consider such complexities.

This paper focuses on two issues: (1) the elements of a low-labour and low-cost system of buffer strips as an approach to conservation farming in the uplands, which may evolve into more complex agroforestry systems; and (2) institutional innovations based on farmer-led organisations that empower the community and the local government to disseminate conservation farming and agroforestry practices effectively and inexpensively.

The farming systems in the uplands of Claveria, as is typical in many parts of Mindanao, are based predominantly on two crops of maize per year. Farm size averages 3 ha. Tillage is done with animal power. Most farmers are clearly aware of the reasons for declining crop yields and possible strategies to combat soil degradation. Sloping fields in Claveria, which receive 2200 mm of rainfall a year, may lose up to 200 tonnes of soil per hectare. About 59 per cent of the cropping (mostly maize and some vegetable farming) is done on lands of more than 15 per cent slope (Garrity and Agustin 1994; Fujisaka *et al.* 1994). As is typical for the majority of cultivated upland areas in South-East Asia, soils in Claveria are degraded and acidic (pH 4.5–5.2) with low available phosphorus.

Contour hedgerows of pruned leguminous trees, known locally as sloping agricultural land technology (SALT), had been promoted in Claveria since the early 1980s by the Philippine Department of Agriculture as a solution to the problems of unsustainable crop production in the uplands. This farming system aimed to provide effective soil erosion control, organic fertiliser for the companion annual food crops, fodder for the ruminants, and fuelwood, and to restore water quality and quantity in the watershed. In spite of these benefits, adoption by farmers was not widespread. After years of ICRAF's on-farm research, working closely with farmers, we identified the key problems with their use:

- There were high labour requirements in order to establish and maintain the hedgerows.
- Farmers experienced only limited improvement of farm income.
- Unanticipated problems occurred in soil fertility because the hedgerows competed with the annual crops for nutrients particularly in phosphorus-deficient acid upland soils.
- The irregular width of the alleys makes inter-row tillage difficult, because this is done using animal traction.
- There was a reduction in the area available for cultivation because hedgerows were spaced too closely together on moderately to steeply sloping farms, also there was poor species adaptation and a lack of suitable planting materials.
- Farmers often have insecure land tenure.

We were probably very fortunate when we started working in Claveria in 1985 to have had no experiment station upon which we might have conducted our trials on tree legume hedgerows. If we had, we might still be a couple of cycles behind where we are now in our learning experience. Working with farmers on experiments that were superimposed on contour hedgerows that they had installed themselves made it clear that pruned tree hedgerows were too labour intensive, and productive forage grass hedgerows were too competitive with the associated crops. Neither technology was being adopted. However, we saw that the concept of contour hedgerows was popular. We observed that some farmers experimented with the concept by placing their crop residues in lines on the contour to form 'trash bunds'. These rapidly revegetated with native grasses and weeds and soon formed stable hedgerows with natural front-facing terraces. Other farmers tried laying out contour lines but did not plant anything in them. These lines evolved into natural vegetative strips (NVS), which we later observed were superb in controlling soil erosion, and required little maintenance (Garrity 1996; Agus 1993).

These latter innovations caught the imagination of many more farmers. By about 1994, over 150 farmers had adopted contour hedgerow systems, while the number of pruned-tree hedgerow fields was by that time decreasing. Meanwhile, the number of farmers with natural vegetative strips continued to increase spontaneously, with adoption spreading from farm to farm. We also observed a broad-based change in tillage systems. When research had first begun in Claveria in 1985, virtually all farmers ploughed up and down the slopes. Contour ploughing was unheard of. By 1995 it was evident that nearly all farmers had converted to the idea of contour ploughing, or were at least attempting to do so.

Evolving components of a successful conservation farming system

Interest in NVS continued to increase. Since it is quite uncommon for large numbers of farmers to adopt an effective soil conservation structure spontaneously, and without public subsidy, we realised that perhaps we were witnessing the kind of low-labour, zero-cash-cost alternative that would be widely applicable. We began to examine each component of the process of establishing and maintaining low-labour hedgerow practices. Establishing NVS requires only a fraction of the labour needed to establish the conventional contour hedgerow of tree legumes. Laying out contour lines, about two person-days per hectare, is all that is required. The total time needed for ploughing is reduced in proportion to the area of unploughed strips. This reduction offsets the labour spent for laying out the contour strips. The amount of labour required to prune or maintain the NVS is proportionate to the spacing of hedgerows. Mercado *et al.* (1997) found that NVS spaced 6 m apart, and dominated by *Chromolaena odorata*, required 15 person-days per cropping per hectare or 30 person-days per year to maintain. This was less than a quarter of the time required for conventional contour hedgerow systems based on tree legumes (ICRAF 1996). Low-statured NVS like *Paspalum* spp. or *Digitaria* spp., require even fewer days (three to ten per cropping season) (Mercado *et al.* 1997; Stark 1999).

Our surveys of farmers who had not yet installed contour hedgerow systems but wanted to do so indicated that their overriding reason for not contouring was that they lacked the technical know-how. We had recently uncovered an extremely simple and practical means of laying out contours without equipment such as an A-frame – namely, the 'cow's back' method (ICRAF 1996). This method involves ploughing across the slope and maintaining the angle of the cow's back on the level. When the animal is heading upslope, its head is higher than its back; when it is off-course downslope, the rear part of the animal is elevated above the front. Stark *et al.* (2000) found that farmers using the cow's back method deviated on average less than 2 per cent from the real contour, compared with either the A-frame method or the hose level method. This deviation is quite acceptable for practical purposes, particularly in light of the fact that most farmers do not bother with A-frames at all, but simply judge the contours visually (which is much less accurate).

Feedback from farmers also elucidated another factor that causes many smallholders to hesitate in installing contour hedgerow systems. Conventional recommendations indicate that hedgerows be separated by a drop of only 1–1.5 m in elevation. On steep slopes, the crop area lost to the strips might thus be 15–20 per cent or more. Crop yields cannot be expected to increase enough to counterbalance this quantity of area lost. Labour also increases in establishing and maintaining many strips in each field. We therefore conducted trials to determine how reducing the density of buffer strips would affect the loss of soil. We found that strips spaced at a vertical drop of 4 m are still effective in reducing soil loss (Mercado *et al.* 1997). Even a single NVS strip placed on the contour half-way down a slope 60 m long reduces soil loss to 40 per cent of that on the open slope. We conclude that farmers could space their strips at much wider intervals than the conventional rule-of-thumb recommendation suggests, even up to 8–12 m apart on such slopes. Erosion control will not be quite as good, but the practice is very much more likely to be adopted. More strips can always be added in between the original ones after the farmer has gained confidence in the effectiveness of the practice.

This wider spacing is also particularly appropriate when the farmer intends to convert the NVS strips into fruit or timber trees, in which there is now great interest in Claveria. To do this, farmers establish contours, then raise their tree seedlings. They introduce the trees during the second or third year after the NVS are established. Tree canopies start to close three to four years later, when the NVS are narrow (<8 m). By this time it is no longer feasible to plant annual crops because the alley is too shady. Some farmers bring in ruminants to graze under the trees.

Farmers with wider alleyways (8–12 m) can still plant annual food crops between the rows of the trees and grow fodder grass between trees along the row. A wider spacing of NVS is useful for farms that want to continue growing food crops while the fruit and timber trees mature. However, farmers with larger farm sizes tend to opt for somewhat closer buffer strip spacing, and cultivate their food crops on other land parcels once the tree canopy shades the annual crops. The fast-growing timber tree systems have a six- to eight-year cycle.

Farmers who establish cash perennial hedgerows such as coffee tend to space hedgerows more closely in order to have more rows of these crops. The cash crops from the buffer strip component often earn more than the maize or other annuals planted in the alleys – NVS can evolve into many forms of agroforestry systems. Farmers in Claveria are planting fodder grasses and legumes, 31 species of timber and fruit trees, and other cash perennials on their NVS fields. The fodder grasses used include *Setaria* spp., *Pennisetum purpureum*, and *Panicum maximum*. The forage legumes include *Flamingia congesta* and *Desmodium rensonii*. Timber species cultivated include *Gmelina arborea, Eucalyptus* spp., *Sweitienia* spp., and *Ptericarpus indicus*. The fruit species include mango, rambutan, durian, pineapple, and banana. The wide diversity of species helps the farmers to stabilise their income.

The groundswell of enthusiasm among thousands of Claveria farmers, and the rich store of farmer experiences with a wide range of prospective buffer strip management options, provided a stimulus. Public-sector research and extension institutions needed to consider how they might evolve more effective techniques to diffuse NVS technology rapidly to much larger numbers of interested farmers. The adoption and technology modification process was well documented by IRRI staff (Fujisaka 1989; Cenas and Pandey 1995), but this was not followed by any quantity of extension work.

Extension methods can be basically classified as belonging either to an individual (or household) approach or to a group approach. The former is most effective for activities to be undertaken within the full control of the individual farmer or household (such as establishing contour buffer strips). Working with groups or the community at large is more suitable for matters related to the whole community (such as post-harvest public grazing practices) or for activities that would be undertaken more cheaply by a group (such as tree nurseries). The latter approach is particularly suitable where group work is common. This is practised in the Philippines through the *bayanihan* system, which involves farmer work groups based on voluntary work contribution for a common benefit.

Towards effective technology dissemination: the evolution of an innovative extension strategy

In addition to conducting applied research, ICRAF recently initiated a technology dissemination programme to ensure that derived innovations will reach the user group. ICRAF is helping to strengthen existing government programmes and to help technology dissemination develop into a self-perpetuating farmer initiative. The key institutional innovation in these effects is the Landcare approach: a process that is led by farmers and community groups, with support by the local government and technical backup from ICRAF, from government line agencies such as the Department of Environment and Natural Resources, the Department of Agrarian Reform, and the Municipal Agriculture Office, and from NGOs.

What is Landcare?

Landcare is a method for diffusing agroforestry practices rapidly and inexpensively among upland farmers, based on farmers' innate interest in learning and sharing knowledge about new technologies that enable them to earn more money and to conserve natural resources (Garrity and Mercado 1998). Landcare groups bring together people who are concerned about land degradation problems and interested in working together to do something positive for the long-term health of the land. It evolved as a participatory community-based approach designed to bring about change in complex and diverse situations (Swete-Kelly 1997).

The Landcare model has a threefold emphasis: appropriate technologies, effective local community groups, and partnership with government (Campbell and Siepen 1994). This grassroots approach is generally recognised as a key to success in all community development activities. Groups respond to the issues that they consider locally important, solving problems in their own way. Landcare depends on self-motivated communities responding to community issues, rather than to issues an external agency imposes. Such bottom-up approaches are more likely to bring about permanent and positive change. Landcare groups have government support, and they use networks to ensure that ideas and initiatives are shared and disseminated.

In 1996, ICRAF supported dissemination activities in Claveria as a direct response to the farmers' request for technical assistance in conservation farming. The technical and institutional innovations led to the formation of the Claveria Landcare Association. Today, there are 250 Landcare groups in the municipalities of Claveria, Malitbog, and Lantapan in northern and central Mindanao. Most of these Landcare groups are based in the *sitio* (subvillages) where farmers can interact with each other more frequently. More than 3000 farming families are now involved in these three municipalities alone.

The Landcare groups in Claveria have successfully extended conservation farming based on NVS to an additional 1500 farmers. They have established more than 300 communal and individual nurseries, which produce hundreds of thousands of fruit and timber tree seedlings that are planted on the NVS or along farm boundaries. They have also been able to link to other service providers to get funding for livelihood projects.

Steps involved in the Landcare approach

Based on the evolution of Landcare during the past several years in Claveria, we have identified the major principles and steps in developing this approach (Garrity and Mercado 1998):

1. *Select appropriate sites to bring conservation farming technologies to where they are needed most – on sloping lands where soils are subject to erosion and degradation*. This initial step also involves meeting with key leaders in the local government units (municipal or province), interested farmers, and other stakeholders. Their understanding of the issues that need to be addressed, as well as their willingness to support and complement the programme, are crucial to the success or failure of Landcare at a given site.
2. *Expose key farmers to successful technologies and organisational methods*. This helps to develop strong awareness among prospective core actors – especially innovative farmers and farmer leaders – of the opportunities to address production and resource conservation objectives effectively through the new technologies. The success of the activities can be measured by how much enthusiasm develops within the community to adopt the technologies. Exposure activities include:
   - organising cross-visits to the fields of farmers who have already adopted and adapted the technology successfully into their farming systems;
   - providing training for farmers in the target communities to learn about the practices through seminars in their *barangays* (villages); and
   - providing opportunities for farmers to try out a technology on their land through unsubsidised trials, to convince themselves that it works as expected. These farmers can then become the core of a 'conservation team' to diffuse the technology in the municipality.

The characteristics and roles of farmers, the community, the local government unit, and the technical facilitator in implementing the Landcare approach are listed below:

Farmers:

- are usually resource poor;
- want to improve their livelihood;
- want to employ new farming techniques;
- would like to acquire and share knowledge and experience with other farmers;
- are committed to resource conservation;
- can create work groups for establishing nurseries, conservation farms, etc..

Local government units:

- provide policy support (e.g. institutionalisation of conservation farming and agroforestry, creation of municipal and *barangay* ordinances);
- play a leadership role (e.g. facilitate formation of Landcare groups and activities);
- build capacity (e.g. initiate various training activities);
- facilitate financial support: a Human Ecological Security fund is available from the municipality and from the *barangay*.

Technical facilitators (ICRAF and line agencies):

- develop technology: soil and water conservation, agroforestry, nurseries;
- facilitate formation of Landcare groups and Landcare-related activities;
- provide germplasm;
- initiate information and education campaigns.

3. *Organise local conservation teams.* Once it is clear that there is a critical threshold of local interest in adopting the technologies and a spirit of self-help to share the knowledge within and among the *barangays* of a municipality, the conditions are in place to implement a municipal conservation team. The team is composed of an extension technician from the Department of Agriculture or from the Department of Environment and Natural Resources, an articulate

farmer experienced in the application of the technology, and an outside technical facilitator.

The team initially helps individual farmers implement their desired conservation farming practices. Later, they give seminars and training sessions in the *barangay* if sufficient interest arises. During these events they respond if there is interest in organising more formally to accelerate the spread of agroforestry and conservation practices.

4 *Facilitate a Landcare farmers' organisation*. When the preconditions are in place to form a Landcare farmers' organisation, the facilitator may help the community to develop a more formal structure. A key ingredient of success is identifying and nurturing leadership skills among prospective farmers in vision and organisation. This may involve arranging for special training in leadership and management for the farmer leaders and exposing them to other successful Landcare organisations. Each *barangay* may decide to set up its own Landcare Association chapter and *barangay* conservation team. A *barangay* may organise Landcare Association subchapters in their *sitios* (sub-*barangays*). A *sitio* conservation team usually includes a local farmer-technologist, the *sitio* leaders, and the district *kagawads* (councillors). The *sitio* teams are the frontliners in conservation efforts, providing direct technical assistance, training, and demonstrating to farmer households. They are backed up by the *barangay* and municipal conservation teams.

In the municipality, the Landcare Association is a federation of all of the *barangay* Landcare chapters. The municipal conservation team is part of the support structure, which also includes other organisations that can assist the chapters (for example, the Department of Agriculture, the Department of the Environment and Natural Resources, and NGOs). Figure 1 presents the organisational set-up of the Claveria Landcare Association (CLCA). It is a people's organisation, registered as an association with the Philippine Securities and Exchange Commission (SEC) in 1996.

5. *Attract local government support.* Local government can provide crucial political and sustained financial support to the Landcare Association. The municipality has its own funds earmarked for environmental conservation that can be targeted to Landcare activities. The municipality can be encouraged to develop a formal natural resource management plan – which may help to guide the

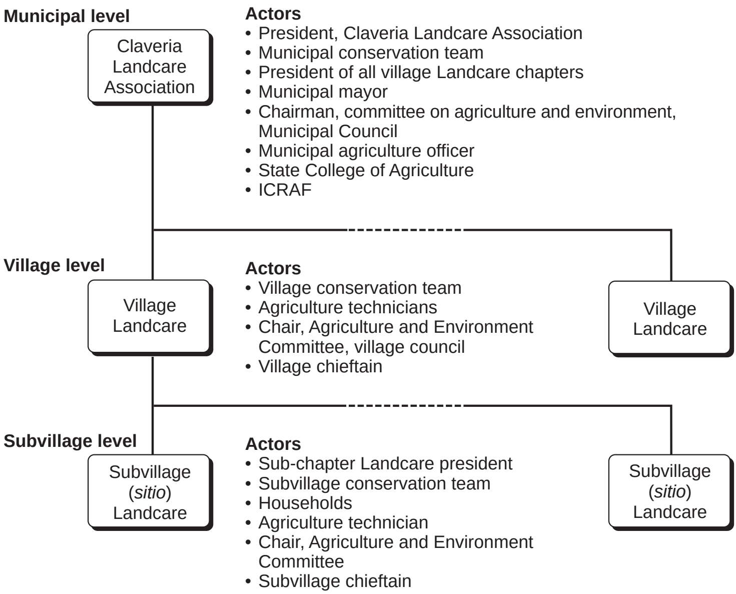
allocation of conservation funds. The *barangays* can allocate financial resources from their regular internal revenue allotment through the Human Ecological Security (HES) programme, which represents one-fifth of the total development funds of the *barangay*. These funds can be used to organise the conservation teams and Landcare Association activities in the *barangays* and the *sitios*, and support training activities and honoraria for resource persons if the time required for these activities is more than volunteer time can cover. The municipality can also allocate HES funds to complement the *barangay* budget. For 1998, the Claveria municipal government committed 50,000 pesos (about US$1250) to each *barangay* to support Landcare activities.

External donor agencies can best support Landcare development by allocating resources for leadership and human resources development, communications equipment (such as handheld radio sets), and transportation (e.g. motorcycles) to enable the Landcare leaders to make maximum use of their time.

6. *Monitor and evaluate*. Monitoring is needed to assess progress and make the programme more dynamic and relevant to the needs of the target community. For monitoring purposes, ICRAF has been keeping records of all those who have attended a training session or have been assisted with establishing NVS on their farms, as well as of farmers who have requested assistance. Details on farming and conservation practices, training activities, and follow-up needs are recorded on a diagnostic card, which is updated on regular follow-up visits by ICRAF staff. The leaders of the CLCA chapters or subchapters have been supporting this activity by facilitating the distribution and collection of the diagnostic cards to and from the villages and new CLCA members.

   A survey on adoption and dissemination progress is now being conducted, with an emphasis on how farmers modify technologies, and the reasons behind their decision making. A participatory monitoring and evaluation system is being developed that enables Landcare groups to self-evaluate their performance against their objectives. The Landcare facilitators will assist the groups to conduct these exercises, to reflect group accomplishments, and to help groups achieve future goals.

Figure 1: The organisational structure of Landcare in Claveria



Conservation farming technologies adopted by Landcare members

The specific activities of Landcare Association members will vary according to their needs and interest, as well as their biophysical and socio-economic situation. Some of the many activities that have been or are being developed as focal areas for Landcare Association work include:

- establishing NVS along the contour to reduce soil erosion in the field and on the farm – the initial farmer-generated technology that launched the organisation of Landcare in Claveria;
- planting perennial crops on or just above the NVS to increase the farmers' cash income and enhance soil and water conservation;
- planting trees to increase family income by producing timber, fuelwood, and other tree products in farm forests, boundary planting, or other arrangements;
- planting high-quality fruit trees to provide income and better nutrition for the household while enhancing the environment;

- adopting minimum-tillage or ridge-tillage farming systems; ridge tillage has been successfully adopted with the existing draught-animal cultivation practices and is being further tested on farms;
- establishing nurseries for fruit and timber trees;
- promoting and adopting backyard gardening, thus helping to address the problem of malnutrition, which is widespread among children;
- planting herbal medicines;
- managing solid wastes by segregating the biodegradable wastes and making them into compost;
- setting up local competitions such as composing Landcare songs and slogans to promote awareness and adoption of various resource-conservation measures;
- exchanging labour;
- helping one another in times of sickness, death, and other community problems.

The evolution from simple soil conservation practices to more complex agroforestry systems occurs over time as farmers continually experiment and innovate technologies that are suitable to their conditions. Generally, farmers start by establishing natural vegetative strips. Next, they establish communal or individual nurseries and plant perennials on or above the NVS. Farmers may cultivate annual cereal crops up to the fourth year, particularly if the strips are not too close to each other. When tree canopies shade out the crops and it is no longer profitable to grow annuals, farmers graze livestock beneath the trees. The trees (mostly *Gmelina arborea*) can be harvested 8–12 years after planting, when farmers resume annual cropping and begin the next cycle. This system earns more than the traditional practice of mono-cultural cropping (Magcale-Macandog *et al.* 1997).

Impacts and scaling up

The greatest success of Landcare is in changing the attitude of farmers, policy makers, local government units, and landowners about how to use the land and protect the environment. It is not simply about the total length of NVS laid out, the number of nurseries established, or the number of Landcare members. The Landcare movement is renovating the attitudes and practices of the farmers, policy makers, and local government officials towards using the land to meet their current needs while conserving it for future generations. Now many farmers voluntarily share their time and efforts, while policy makers also urge farmers to adopt conservation farming practices, and support these efforts by allocating local government funds and enacting local ordinances. These are the important success indicators of the Landcare approach that enable local people to conceive, initiate, and implement plans and programmes that will lead to their adopting profitable and resource-conserving technologies. The Landcare approach provides:

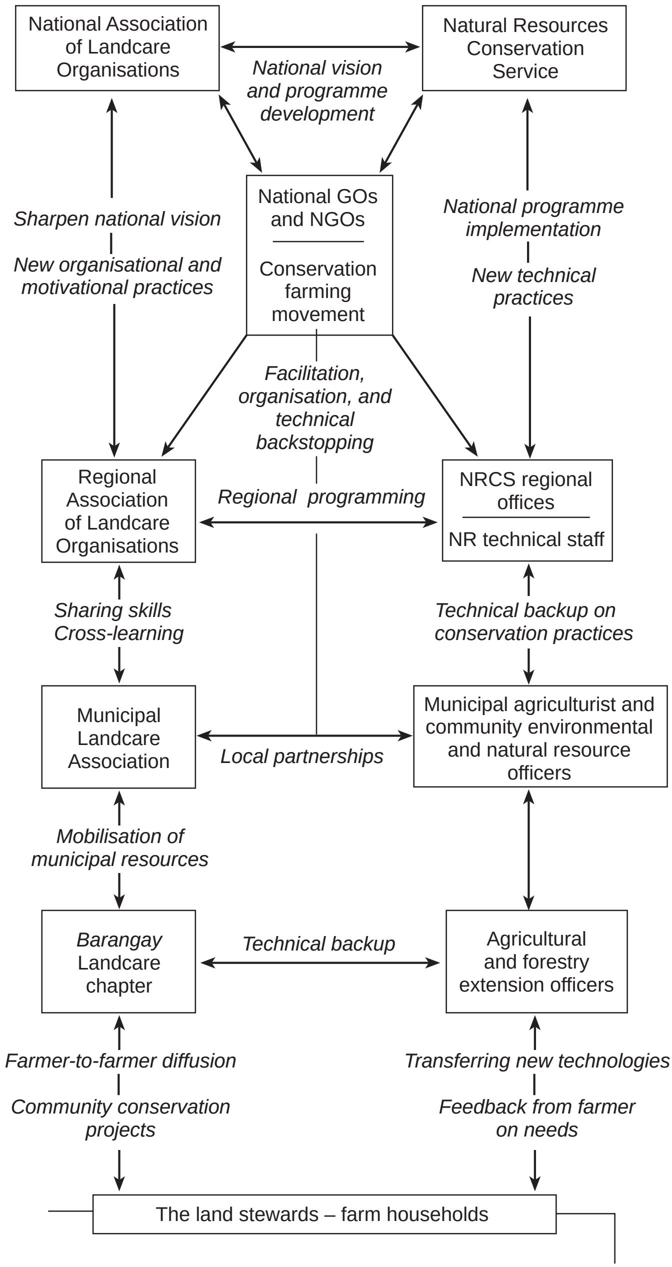
- a way for interested farmers to learn, adopt, and share knowledge about new technologies that can earn more money and conserve natural resources;
- a forum in which the community can respond to issues that it sees as important;
- a mechanism for local government to support;
- a network for ensuring that ideas and initiatives are shared and disseminated.

Landcare is emerging as a method for empowering local government and communities to disseminate conservation farming and agro-forestry practices effectively and inexpensively. The experiences and lessons learned in Claveria provide a strong basis for scaling up to regional and national levels, and for scaling out to other municipalities. A vision for the development of national Landcare movements is set out in Figure 2.

Currently, we are employing different models for scaling up the Landcare approach and comparing them. These are integrating the Landcare approach through:

- the regular extension programme of the municipal agriculture offices and line agencies, such as the Department of Agrarian Reform and the Department of Environment and Natural Resources;
- government special projects;
- NGO development programmes;
- special bodies, such as the Cagayan-Iligan Corridor Watershed Management Council;
- watershed management and development planning of the municipality and province.

Figure 2: Conceptual framework for the vertical scaling up of the Landcare approach



The adjacent municipality of Malitbog in Bukidnon Province approached the Claveria team to assist it in developing Landcare activities. Farmer cross-site visits and training activities were arranged. An ICRAF field extension staff member was posted to Malitbog, and the local government formed a conservation team to help start Landcare activities in four pilot *barangays* (Saguinhon 1998). Municipal funds were provided to assist Landcare chapters to establish nurseries, to fund training and cross-site visits, and to provide transport and allowance for the participants who attend monthly meetings. Based on specific requests, various study tours and training activities were organised for farmers, NGOs, and local government units interested in the Landcare approach. The ICRAF–Lantapan team has also applied the Landcare principles and approach to its work on decentralised planning and implementation of natural resource management. It helped develop a farmer agroforestry tree seed association. The movement grew to over 60 farmer groups in Lantapan and has spread to several other municipalities in central and southern Mindanao and in the Visasyan islands of Bohol and Leyte.

Many local governments, and the NGOs that are supporting rural development and environment programmes, have approached the Landcare programme to learn how to encourage it in their areas. The Department of Agrarian Reform and the Department of Environment and Natural Resources are keen to infuse the Landcare approach into their work throughout the Philippines. This has prompted ICRAF to develop a training-of-trainers strategy and methodology to accelerate the training of Landcare facilitators in government agencies and NGOs.

The new Philippines National Strategy for Improved Watershed Resources Management (DENR 1998) has incorporated the Landcare approach into its key institutional elements and operational framework. As the strategy moves into the implementation phase, it provides a good opportunity to scale up useful Landcare principles and experiences in other parts of the Philippines. However, this scaling-up process must respect and adhere to the critical, underlying elements, such as farmer voluntary action and local government partnership, that have made Landcare successful.

The term 'Landcare' originated in Australia, where a Landcare movement that has evolved since the late 1980s now encompasses over 4500 groups nationwide (Campbell and Siepen 1994). The Philippine Landcare movement adopted the same name, although it evolved independently. There is now strong interaction and exchange between the Landcare movements in Australia and those in the Philippines.

We see the prospect for research and development to be carried out through Landcare groups and to be managed by them. This would multiply the amount of work and the diversity of trials that can be accomplished, and ensure a robust understanding of the performance and recommendation domain of technical innovations. Currently, we are conducting surveys through the Landcare groups to get grassroots feedback on the priorities for research, from the farmers' perspective. In Australia, public-sector research institutions such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO) are adjusting to the new reality that, through Landcare, farmers sit on the boards that decide on research project funding, and may even dominate them. This is having a galvanising effect in focusing researchers on problems that are of concern to farmers.

We may summarise by listing four functions of farmer-led, knowledge-sharing Landcare organisations:

- enhanced efficiency of extension and diffusion of improved practices (more cost effective than conventional extension functions);
- community-scale searching process for new solutions or adaptations, suited to the diverse and complex environments of smallholder farming;
- enhanced research through engagement by large numbers of smallholders in formal and informal tests of new practices;
- mobilisation in the community to understand and address landscape-level environmental problems related to water quality, forest and biodiversity protection, soil conservation, and others.

There are three significant concerns about the sustainability of the Landcare movement. Firstly, the Landcare concept is sufficiently popular that there is a definite risk of attracting support projects that do not understand the concept and that provide funds in a top-down, target-driven mode that defeats the whole basis of a farmer-led movement. The second concern is the question of how such movements can sustain themselves in the long run. Networking, and stimulation from outside contacts, is widely considered to be crucial in the long-term success of such institutions. This can be provided through Landcare Federations, which have evolved locally in Claveria, and through provincial and national federations, currently being explored in the Philippines. Thirdly, group leadership is a timeconsuming and exhausting task, particularly when it is undertaken on a voluntary basis. Landcare is still very young in both the Philippines and Australia, but increasingly leadership burn-out is discussed as a concern.

Our analysis indicates that the following actions need to be taken in order to release the power of the Landcare concept further. The public sector and the non-governmental sector can help to form groups and networks, enabling them to grow, developing their managerial capabilities, and enhancing their ability to capture new information from the outside world. They can also provide leadership training to farmer leaders, helping ensure the sustainability of the organisations. Cost-sharing external assistance can also be provided. For this, the use of trust funds should be emphasised, where farmer groups can compete for small grants to implement their own local Landcare projects. This has been remarkably successful in the Australian Landcare movement. We envisage that the Landcare approach may be suited to other locations in the Philippines and elsewhere, providing a national focus for farmers to sustain the management of their resources with minimal local government support.

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