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Community-Based Resource Assessment and Management Planning for the Rice Terraces of Hungduan, Ifugao, Philippines

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ABSTRACT

This study describes how the use of community-based participatory approaches and the Ifugaos' indigenous knowledge system (IKS) were harnessed in the conduct of resource and damage assessment, mapping, and the preparation of management plans for four clusters corresponding to four subwatersheds in Hungduan, Ifugao, Philippines.

The Ifugaos' indigenous knowledge was evident in the identification of the ownership and location of terraces and woodlots, and the use of natural landmarks and boundaries in locating properties, sitios and barangays on maps. Their IKS was complemented with trainings to build capacities on resource assessment such as the use of satellite-based navigation and positioning system, survey instruments, and grid-based assessment and in developing management plans.

The community-based resource assessment estimated the total areas of rice terraces in Clusters 1, 2, 3 and 4 to be 623 ha, 631 ha, 1,171 ha and 637 ha, respectively, while the damaged terraces ranged from 13% to a maximum of 20%. Abandoned terraces were found to be minimal. Outputs in the form of management plans were the product of the interaction of the different farmer groups and the available resources, strategies and achievable recommendations for the sustainability and protection of their rice terraces.

Complementing indigenous knowledge with science and recent research techniques is effective in generating reliable information needed in the development of management plans for the conservation and protection of natural resources.

Key words: *community-based management planning, indigenous knowledge systems, resource assessment, damage assessment*

INTRODUCTION

The Ifugao Rice Terraces of the Philippines (IRT) attract many local and foreign tourists every year, being the most famous among the rice terraces found in the Asia-Pacific region. There are rice terraces in nine out of eleven municipalities of Ifugao, and some have been inscribed in the UNESCO World Heritage List under the category of organically evolved landscapes. These are the municipalities of Kiangan, Hungduan and Mayoyao, and the barangays of Batad and Bangaan in the municipality of Banaue. On the other hand, the rice terraces in five other municipalities (Asipulo, Aguinaldo, Hingyon, Lagawe, and Tinoc) are not inscribed in the List. However, there are moves to have more terraces included in the List. Concerns have been raised that conservation efforts have focused only on the heritage municipalities, even as the same problems have been observed in the non-heritage municipalities.

As with other heritage areas, the terraces were originally carved out of the mountains by the Ifugao people more than 2,000 years ago for them to have land to plant rice on, and not to intentionally create a heritage site. The Ifugaos' indigenous knowledge allowed them to carve terraces on mountain slopes that both conserved soil and water for the sustainable production of rice. Through time, the terraces have gained recognition throughout the world, and the use of traditional skills in the engineering and hydraulic works in constructing the terraces has been marveled.

Concepcion et al. (*2005*) identified the multi-functional roles that the terraces perform, which include food (rice) production, soil and water conservation, especially in supplying clean water to Magat Dam, environmental enhancement, reduction of natural hazards (flooding, drought, and landslides) and the creation of beautiful touristic landscapes. These uses have economic and social values not only to the rural and urban communities, but to the global community as well. Under the *Millennium Ecosystem Assessment* (*2005*), ecosystem services are defined as benefits which people obtain from ecosystems and including provisioning, regulating, cultural and supporting services. The suite of benefits offered by the IRT can be categorized under the provisioning and cultural groups of ecosystem services, and conserving the terraces will ensure the sustainable production of rice and at the same time the

maintenance of their cultural heritage values.

However, the condition of the terraces has deteriorated over the years, owing to problems that include low rice productivity, outmigration, overcutting of woodlots, erosion and landslides, problematic irrigation system, and the presence of pests like golden snails and giant earthworms. These problems have resulted in the abandonment of many terraces that, if allowed to continue, can compromise their very existence.

The study of *Calderon et al.* (*2008*) reveals that the Ifugao farmers need financial support to rehabilitate the irrigation system and terrace walls, and other livelihood activities to augment farm incomes. Furthermore, there is a strong demand for the cultural and environmental services that the terraces provide and if captured, can be a significant source of funds to support the farmers.

As a step towards the development of a payment for ecosystem services (PES) system that will engage the people of the municipality of Hungduan in the province of Ifugao, Philippines, this study was conducted to develop the capacity of the farmers of Hungduan to conduct resource and damage assessment as a preliminary activity for PES. The activities on capacity building took advantage of the community-based approach that involves the community at all stages starting from resource assessment, mapping and management planning. Community-based participatory approaches have been found to be an important and effective tool in resource assessment and management planning.

Over the past decades, there had been a gradual change in the philosophy and practice of environmental management at the regional, national and international scales. This change involves a shift away from top-down strategies, in which planning, policy formulation, and regulation are conducted primarily by centralized government agencies, towards a bottom-up approach, which involves all relevant parties, especially local communities, in the process of environmental management and decision making (*Merkhofer et al.1997*; *Moote et al. 1997*; *Vasseur et al. 1997*; *Smith et al. 1997* as cited in *Rhoads et al. 1999*).

The community-based approach to resources management acknowledges that local communities are better able to understand and intervene in environmental problems because they are 'closer' to both the problem and the solution (*Lane and McDonald 2005*). It is generally recognized that IKS plays an important role in the sustainable management of natural resources and can also have an impact on issues of global concern (*Tripathi and Bhattarya 2004*). IKS is also acknowledged as essential in maintaining global cultural diversity and the biological diversity with which it is associated (*Maffi 2001*, *Maffi and Woodley 2010* as cited in *Bohensky and Maru 2011*).

Today, community-based approaches are not only limited to planning design and implementation, but have also been integrated into various forms of geographic information systems and communication technologies (*Chambers 2006*). The collaborative and participatory approaches to spatial planning and decision-making recognize the local people's autonomous intelligence and knowledge. In practice, this means translating people's spatial concepts and their knowledge of boundaries and locations, into mappable outputs (*McCall and Dunn 2011*).

This study discusses how community-based participatory approaches and the Ifugaos' indigenous knowledge system were employed in the conduct of resource and damage assessment, mapping, and the preparation of management plans for four subwatersheds in Hungduan, Ifugao.

METHODOLOGY

In the study, the watershed and not political boundaries was used as the unit of management. For this purpose, four subwatersheds were selected (**Figure 1**). Each subwatershed represented a cluster, from which the farmer-participants were also drawn. These are Cluster 1- Nungulunan and Hapao; Cluster 2 - Baang and Nungulunan; Cluster 3- Baang and Hapao; and Cluster 4- Hapao and Poblacion.

To build the capacity of farmers, a series of training workshops on resource and damage assessment methods, community mapping and management plan preparation were conducted. The farmers then estimated the woodlot and terrace resources in their clusters in a process that involved the following steps: community 3D mapping of land use and rice terraces; GIS-based mapping; and validation workshop.

Community 3D maps help to maximize the learning experience of farmers by enhancing the visual familiarity of the landscape in which the community lives, and enabling them to indicate more accurately the different land uses onto the map. In this approach, the community members themselves constructed the 3D models. The land uses of interest include the extent and coverage of terraces, woodlots, and the households. The participants also indicated the conditions of the terraces, i.e. whether these are damaged or abandoned.

The data from the 3D models were then transformed into GIS maps. These maps were used to provide estimates of coverage (i.e. location) and extent (in ha). After this exercise (step 2), a validation workshop (step 3) was undertaken to enable the participants to refine the results of land use and terrace-woodlots, especially the extent of damaged terraces.

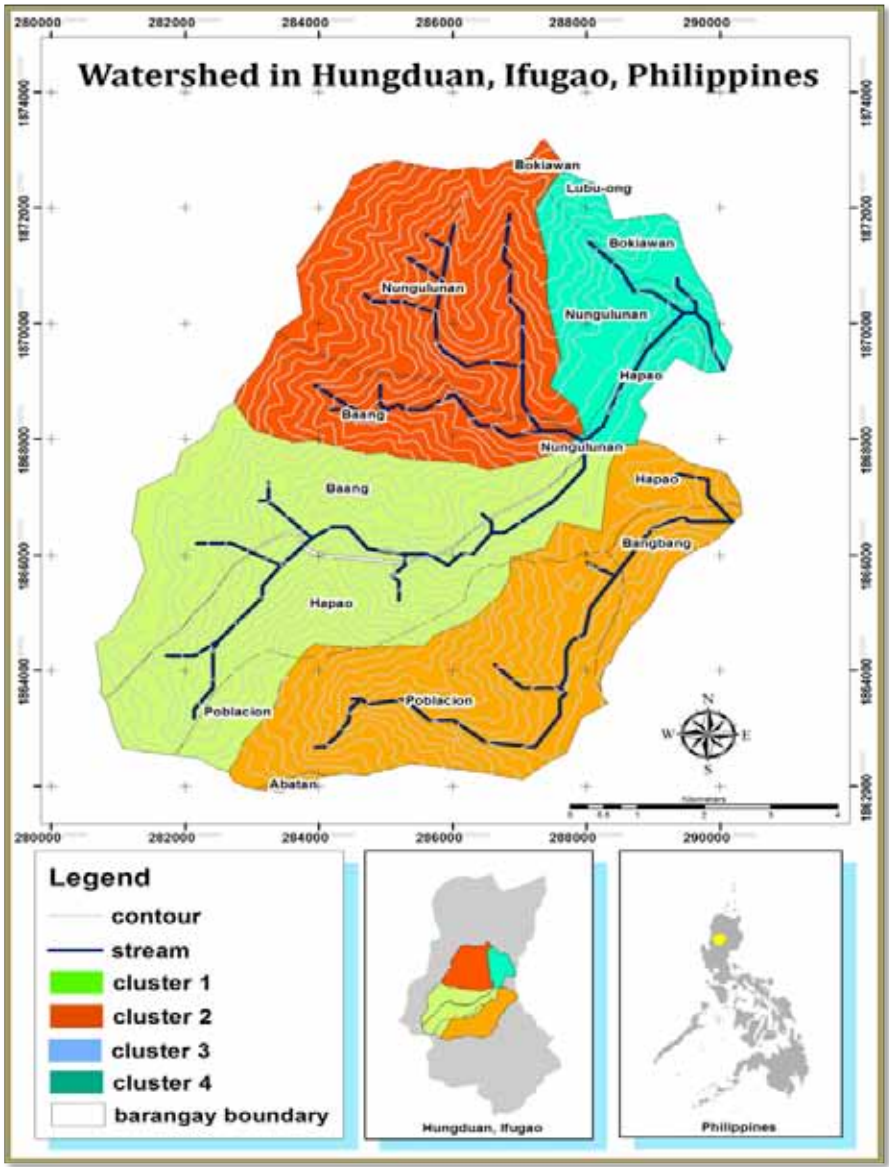

Figure 1. A map showing the selected subwatersheds in Hungduan, Ifugao.

Results from the resource assessment, 3D models and information from GIS maps were then used in the preparation of the management plans for the conservation and protection of the rice terraces in each cluster. Farmer participants went through the rigorous process of management planning that includes problem identification, goal and objective formulation, identification of strategies, financial evaluation and scheduling of strategies and preparation of management plan report. A simple management plan template was prepared to help the farmers complete their draft management plans. Management plans were complemented with maps that provided a visual image of the plan.

RESULTS AND DISCUSSION

The farmers contributed their indigenous knowledge in the identification of plant and animal species, identification of which terraces were considered damaged or abandoned and their extent, ownership and location of terraces and woodlots, boundaries of sitios and barangays on the ground,and the use of natural landmarks and boundaries in locating properties, sitios and barangays. This was complemented by their training on several resource assessment techniques, such as the use of satellite-based navigation and positioning system (i.e. GPS), survey tools (i.e. compass, meter tape), and grid-based assessment.

The farmers' familiarity with their areas was evident during the mapping activity, especially after they had prepared the 3D maps (**Figure 2**). Once a landmark had been located, it was easy for them to identify terraces, woodlots, houses, and other landmarks relative to the original. This finding conforms to the results of case studies presented in *Cheng and Daniels* (*2003*) that highlight various ways by which local people know and value places. The study concluded that in a small-scale setting, stakeholders have very particularistic ways of knowing specific physical features and social sentiments, relying mostly on personal experiences and knowledge. This proves that community-based mapping works well for farmers and is a cost-effective and reliable way of ground

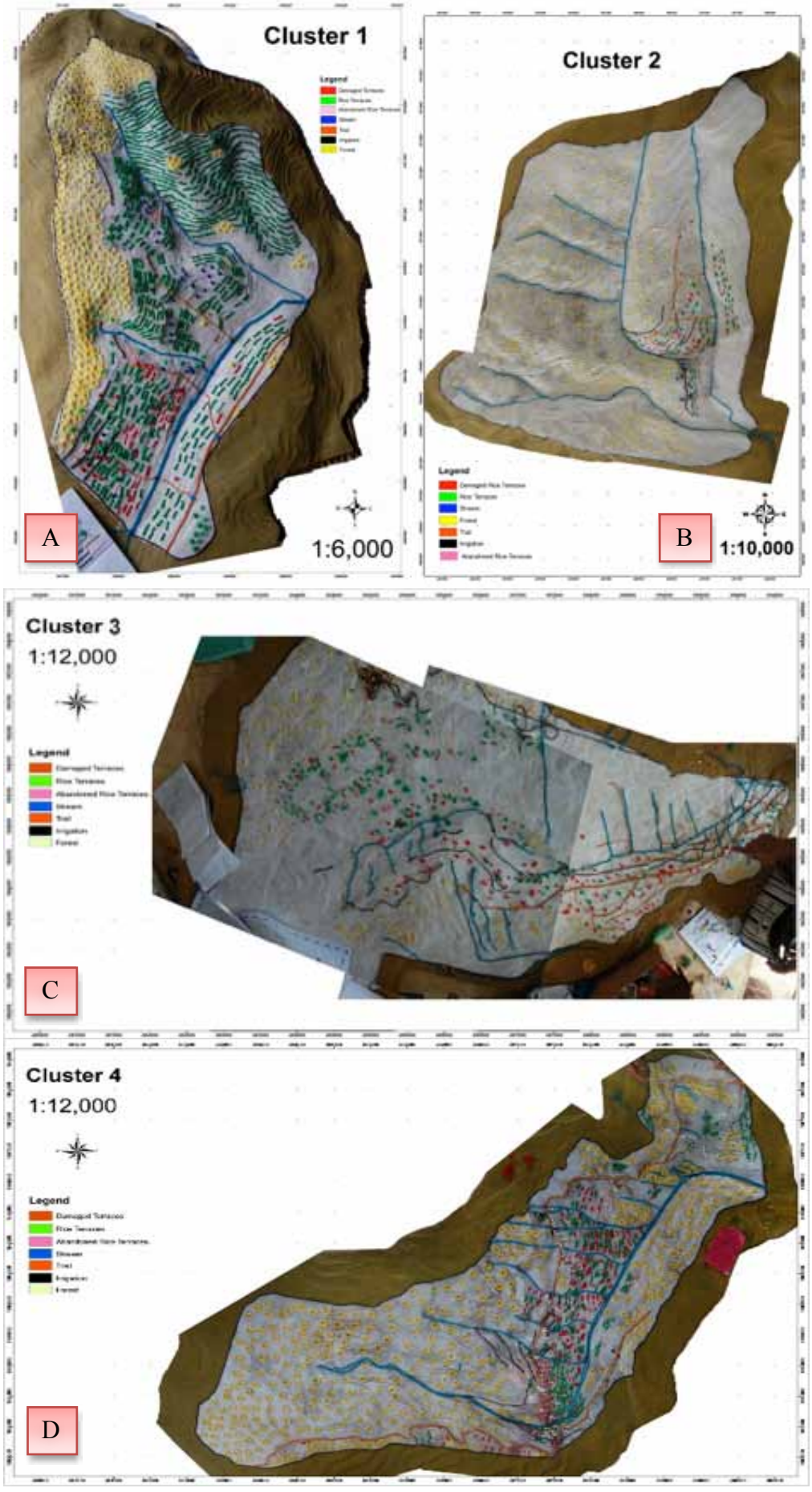

Figure 2. 3D maps constructed by farmer groups through community mapping: Cluster 1 (A), Cluster 2 (B), Cluster 3 (C) and Cluster 4 (D).

truthing. In this activity, the farmers were able to show the expanse of their local spatial cognition and how this was a big input into the development of the community map.

Moreover, the community-based mapping empowered the farmers by exposing them to new methods of geo-spatial analysis and recognizing their local spatial knowledge in the map outputs. This is similar to the results of the study of *McCall and Minang* (*2005*) in Cameroon where they were able to observe the indigenous spatial knowledge of community actors in identifying village boundaries, forest farm areas, forest tracks and even local names for streams and villages.

The community mapping activity focused on the forest woodlots and extent and coverage of rice terraces. The total areas of rice terraces in Clusters 1, 2, 3 and 4 were estimated to be 623 ha, 631 ha, 1,171 ha and 637 ha, respectively, while the damaged terraces ranged from a minimum of 13% (Cluster 2) to a maximum of 20% (Cluster 4). Abandonedterraces were found to be minimal (**Table 1**). On the other hand, Cluster 4 with the biggest area of forest woodlot (**Table 2**), while Cluster 3 contains the highest number of rice terraces. It may be noted that the area for settlements is very pronounced in Cluster 4, as this is where the 'Poblacion' is located.

Community mapping stimulates large group involvement that is important for getting people to think together, share important knowledge and memories, and debate relevant issues that, if left unresolved, will undermine the legitimacy of the map. Also, mapping current and planned land uses enables the communities to see the amount of resource they will soon have or how much resources are being lost. This offers them an opportunity to decide to change their land use and develop management plans to allow resources to recover and persist (*Alcorn 2000*). Furthermore, identifying village and resource boundaries and putting them on the map allows the farmers to clearly understand the extent and attributes of the natural resource. This creates a sense of ownership and belongingness, which results in their conscious participation in resource conservation (*Jantakad and Carson 1998*). In addition, outputs in community mapping help address conflicting boundaries where clearly defined resource boundaries are presumed to lead to clear ownership and enforcement of rules and regulations. These in turn are considered essential ingredients in achieving success in community-based resource management (*Pagdee et al. 2006*).

The management plans prepared by the farmers were the product of the interaction of the different farmer groups and the available resources, strategies and achievable recommendations for the sustainability and protection of their rice terraces. It was observed that the plans developed by the farmers were almost the same in terms of the objectives and strategies, but differed in the implementation, costs and scheduling.

Farmers identified the "restoration and rehabilitation of the abandoned and damaged rice terraces" as the main objective. The specific objectives were to rehabilitate the irrigation system, to repair and restore damaged and abandoned rice terraces, to reforest open and idle lands in the woodlots, to conduct IEC regarding the conservation of the Ifugao Rice Terraces, and to implement pest control measures. The 3D maps (**Figure 2**), which were the bases of the management plans, highlight the specifics of the plans such as the location of reforestation areas, terraces to be restoredand rehabilitated and irrigation systems to be established.

Basically, the strategies and activities identified by the clusters in their management plans are the same. However, differences were noted in the clusters' cost estimates for different activities. Initially, some clusters revealed higher estimates than those revealed by other clusters. This behavior is consistent with human nature where people tend to reveal high values if they think that these will be the basis of actual payments in the future. However, during the presentation of plans the community agreed that the implementation of plans should reflect their tradition of putting up counterpart labor. This finding confirms that people do not base their decisions purely on the purpose of maximizing profits but also on factors influencing behavior such as social cooperation, local norms and religious beliefs (*Frank 1987*; *Deci and Ryan 1985*; *Heinrich et al. 2001*; *Ajzen and Fishbein 2005* as cited in *Sommerville et al. 2009*). Similarly, *Berkes* (*2004*) concluded that in community-based conservation, monetary incentives are not always the basis for making decisions. He found that equity and empowerment that result from the community-based planning and management process are often more important than their financial counterparts.

In the course of management plan preparation, it was observed that the farmers were not used to referring to the watershed as the planning unit. The resistance could be due to their familiarity with political boundaries, as well as their exposure to the usual approach of using political units as management units. Initially, a conflict emerged when farmers belonging to different barangays but were grouped in one cluster insisted that they should work based on their barangay boundaries. This conflict is considered to be natural to any community-based management approach stems from the heterogenous composition of the farmer groups and the non-convergence of institutional and resource boundaries. In community-based resource management, conflicts usually arise due to heterogeneity of participants in terms of ethnic, economic class, socio-cultural and gender divisions (*McCall and Minang 2005; Measham et al. 2011*). Further, the study of *Berkes*

Table 1. Estimate of extent of rice terraces in different conditions.

Condition of Rice Terraces	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Abandoned	5	1	5	1	12	1	-	0
Damaged	15	2	79	13	170	14	125	20
Undamaged	603	97	547	86	990	85	512	80
Total	623	100	631	100	1172	100	637	100

Table 2. Extent of forest woodlot and terraces in the study area.

Land Use	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Forest	182	23	1,273	67	517	31	1,600	72
Rice Terraces	623	77	631	33	1,172	69	637	28
Abandoned	5	1	5	1	12	1	0	0
Damaged	15	2	79	13	170	14	125	20
Undamaged	603	97	547	86	990	85	512	80
Total	805	100	1,904	100	1,688	100	2,237	100

(*2006*) mentioned that resource boundaries rarely match institutional boundaries and this mismatch problem is due to several ecological reasons like the complexity and dynamics of ecosystems, uncertainty, irreversibility, and disturbance. *Blaikie* (*2006*) described that community boundaries of jurisdiction may make a little sense in the rational management of an identified natural resource with boundaries that may bear no resemblance to community boundaries such as a watershed, mobile fish populations, or the habitat of an endangered species of fauna. This experience may imply that it takes time for people to appreciate and get used to the watershed as a planning unit.

Community-based resource assessment in combinationwith community mapping proved its potential as a management planning method for the rice terraces of Hungduan. This approach promoted effective participation, successful application of indigenous knowledge, empowerment and development of political confidence and expertise of farmers. The participation and involvement of the farmer groups in the various steps of the process encourage 'ownership' of the plan and help reduce conflict. This level of involvement of stakeholders is considered a key factor for a successful management regime not only for the marine environment (*Pomeroy and Douvere 2008*) but for other ecosystem resources as well. It also helped promote community cohesion and developed a positive link between the community and the local government. These elements are considered to be essential in the conservation and management of the rice terraces of Hungduan.

CONCLUSION AND RECOMMENDATIONS

The community-based approach combining indigenous knowledge with classroom and research techniques proved to be effective in generating reliable and timely information, which is important in the development of management plans for natural resources. It also confirms that community-based approach is significant and more superior than top-down approach because it does not only build capacity that insures sustained implementation but also develops a shared sense of ownership of the research results among the community.

The preparation of management plans was facilitated by the use of the 3D map, which enabled the farmers to visualize the extent and location of problem areas. This also allowed them to come up with realistic estimates of damaged areas, which they used in management plan preparation. Resource managers may thus consider the use of participatory resource assessment and mapping and community-generated 3D models in planning. The use of satellite images may be included to validate map outputs especially at provincial and regional level planning.

Finally, it is recommended for the government to promote a better appreciation for the watershed as a management unit not only among planners but also down to the community level because ultimately, it will be the communities who will be at the forefront of implementing watershed and natural resources management projects.

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